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RUST PREVENTION AND REMOVAL

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This invention relates to compositions for preventing the oxidation of metals, particularly iron, and for the removal of rust or similar oxidized material from such metal surfaces, as well as compositions possessing both of the attributes referred to, and also to methods of producing and utilizing such compositions, and to articles carrying surface protecting coatings produced with such compositions.

While a number of compositions have been suggested in the prior art for use as rust preventing materials, these compositions have not generally proved satisfactory in practice. The various types of proposed prior art compositions have failed to produce protective coatings sufficient to prevent the oxidation or rusting of metal surfaces on which they were applied, such failures being particularly noticeable after long periods of exposure. For example, in connection with metal ships and boats, protection of the metal surfaces against oxidative changes and rusting is particularly necessary as when such vessels may be tied up for storage and other purposes, and particularly when such non-use extends over relatively long periods of time. Furthermore, when such ships or boats are returned to service, repainting of the metal surfaces is generally required, and unless the composition has properties of enabling ready removal of any oxidized matter or rust, etc. from the surfaces, elaborate cleaning methods are required before adequate paint coatings can be applied. It is also essential that any residual film of material left on the surface after the removal of the protective coating must be such as not to affect adversely the adherence or other properties of the paint which is to be applied. Prior art compositions have not proved satisfactory for any of these purposes.

Among the objects of the present invention is the production of compositions which protect surfaces against the formation of rust or other oxidized materials, and also desirably enable ready removal of any oxidized materials or rust that may form on such metal surfaces, even after or during storage over long periods of time; such compositions being applicable not only to metal ships and vessels, mentioned above by way of example, but such compositions are equally useful when applied to any metal object or structure which is to be or has been exposed to the atmosphere or other corrosive media.

Other objects of the present invention include the methods of utilizing such compositions in the protection of the indicated metal surfaces, and also the articles themselves when carrying such protective coating.

Still further objects and advantages will appear from the more detailed description set forth below, it being understood, however, that this more detailed description is given by way of illustration and explanation only, and not by way of limitation, since various changes therein may be made by those skilled in the art without departing from the scope and spirit of the present invention.

In accordance with the present invention, compositions are desirably employed which protect metal surfaces against rusting or undesired oxidative change, or enable ready removal of any oxidized or rusted spots on such metal. As the main body or vehicle of such composition, mineral or petroleum oil distillates or fractions are particularly desirable. Such mineral or petroleum oil distillates accordingly constitute the bulk and major portion of the compositions employed in accordance with the present invention.

These mineral and petroleum oils and their fractions and distillates, however, do not exhibit properties in and of themselves sufficient for the indicated purposes, and accordingly components are included therewith, preferably soluble in the petroleum or mineral oil fraction or distillate, which give such compositions valuable properties for use for these purposes. A particularly important type of component to be utilized in such compositions includes materials which increase the interfacial tension of such compositions with respect to metal surfaces. Polar bodies generally exhibit such properties, and among such polar bodies there may particularly be mentioned the higher fatty acids, particularly of unsaturated character, such as oleic acids. However, the types of polar bodies that may be utilized are exemplified by a wide variety of materials among which the following may be noted: ketones, aldehydes, alcohols or mixed derivatives of the aliphatic, unsaturated, or benzene series, as well as the naphthenes. In some instances it is found desirable to employ as the polar substance, or substances, various compounds of the hydrocarbon type containing sulphur bound in the molecule, or the derivatives of such product. When suitably blended with the organic material, sulphur not only increases the penetrative properties of the composition, but also adds to the protective qualities of the coating by combining chemically with any rust that may be present, and thus forming protective layers. Both the

protective and penetrative effects of the sulphur compound are sometimes assisted by incorporating into the same compound or composition some of the halogens, and in some instances oxygen, thus producing hydrocarbon derivatives which contain the sulphur and the halogen or the sulphur and the oxygen, or all three of such components, bound into the molecule.

In addition to the layer of coating immediately in contact with the metal, which is formed by the polar bodies, it is also desirable to build up other layers above the initial or polar layer. In particular it is important to include in the composition, components which will produce a layer or membrane at the surface of contact between the coating and the air, as such surface layers add considerably to the abrasion- and weather-resistant properties of the coating. Desirably, however, formation of a hard final coating which would be difficult of removal, is avoided in compositions for the purposes herein set forth. For producing the additional layer just referred to, the various drying oils either separately or in combination, including both the vegetable and animal oils, may be employed. In general such oils should be given a special treatment, different in many cases from that of an ordinary paint oil, though the usual operations of blowing, boiling, etc. are naturally and desirably included. It has been found that perilla and linseed oils are more generally useful than other oils, but for many special purposes wood oil, soya bean oil and fish oil may be used either separately or in combination.

The protective action of the drying oil may be accelerated by the inclusion of driers in the composition. Various types of driers including the common lead, cobalt and manganese driers may be employed for this purpose. Many of the prepared oils on the market already contain driers but it has been found in general that by the use of special driers the protective properties of the resulting compound can be noticeably increased. It has also been found desirable at times in choosing the driers, to exercise care that the agent included for the purpose of accelerating oil-oxidation shall not also be capable of promoting the oxidation and corrosion of the iron or other metal surface.

The film materials need not, however, be limited to the siccative oils, but other types of materials, such as the resins, both natural and synthetic may be employed. As exemplary of natural resins there may be mentioned cumar, damar, kauri, manila, pontianak, sandarac, and rosin, as well as the esters of the acid resins such as rosin ester, etc.

However, where resins are employed they desirably may be chosen from the synthetic resins, including, for example, resins of the phenol-formaldehyde type, of the phthalic-glyceride type, etc. Such resins, particularly of the oil-soluble type, that is, soluble in mineral oils or fractions or distillates thereof, are the most desirable types to be employed.

In addition to resins it has been found very useful at times to use one or more waxes either of the mineral or vegetable types. The former include paraffin, ceresin, and ozokerite. Among the more useful vegetable waxes there may be particularly mentioned Japan wax, candelilla, carnauba, beeswax, bayberry wax, etc.

Where glyceride oils are employed in the composition, rancid oils may be employed as a source of the polar bodies, such rancid oils containing oleic and other acids. And when such rancid oils are employed, they offer a source of both the film-forming or sponge-forming materials, as well as the polar bodies. The various glyceride oils employed may be given a partial hydrolysis or saponification if desired, to produce acids therein for such purposes.

Other components may be included for their special function, such as pine oil, and rosin oil. Other special ingredients are those used as chemical inhibitors of corrosion such as ammonium chromate or tricresylphosphate.

In compounding the compositions, materials are desirably chosen that will produce solutions, since clear solutions of the components or compositions which are apparently in homogeneous condition are more desirably employed. However, emulsions, suspensions, and dispersions of various types may be employed for satisfactory use in this connection.

A specific example of a particular type of material that may be and has been desirably employed in this connection is illustrated by the following: 10% boiled linseed oil, including drier, pine oil 2%, oleic acid 2%, drier 0.5%, and the balance petroleum oil.

Another type of composition illustrating a specific formulation is the following: bodied perilla oil, 5%; oleic acid, 1%; drier, 1%; pine oil, 2%; tricresylphosphate, 5%; and the remainder, petroleum oil.

The proportions indicated are not limiting since various proportions of the stated ingredients can be utilized. However, the bulk of the composition should desirably be a mineral oil fraction or petroleum oil fraction, or distillate, and desirably will constitute the major proportion of the composition. A lesser proportion of the film-forming material, such as the siccative oil, may be employed, whereas the other components need be present only in minor proportions. The polar body should be present in a sufficient amount to give the composition the desired interfacial tension.

For particular purposes the following will illustrate variations in the proportions of ingredients that may be employed: 5 to 20% of the siccative oil, 1 to 5% of pine oil, 0.5 to 5% of the polar material, such as oleic acid, and 0.1 to 5% of drier. Tricresylphosphate or other chemical inhibitor may be used in proportions of from 1 to 10%.

Sulphur compounds or sulphurized products have been indicated above as particularly desirable for use as polar bodies as exemplary thereof any of the sulphurized oils may be employed, the particular product used depending to some degree on the material available to the manufacturer, at least cost. Various ways of producing sulphurized oils, minerals, vegetable or animal may be employed and the following is merely illustrative of one such procedure. A desired quantity of lard oil is heated to about 400° F. (200° C.) and small quantities of sulphur added to the heated oil from time to time until the total amount of sulphur used is equal to about 26% based on the lard oil. Considerable sulphur is lost by volatilization as sulphur derivatives; but the heating is continued until the sulphur which remains in the composition is in such combination that a bright copper strip immersed for five minutes in the heated mixture or compound is not more than slightly tarnished, the resulting product is such that the sulphur present in combined state still exists in a condition where it has an attraction for the metal surface so that the sulphur compounds attach themselves to the

metallic surface to act as a polar body and to form a protective component of the composition.

It has been pointed out above that the vegetable oils or other siccative oils employed in the composition in amounts less than the hydrocarbon oil or distillate may be given special treatments to particularly adapt them to the purposes in hand, thus an oxidized siccative oil may be carried to a point of oxidation greater than that which would normally be employed for an oxidized oil used in a coating composition of the varnish type. The reason for this is that such treated oils not only form in time a protective or semi-protective coating or part thereof, but they also act as catalysts in inducing certain changes in the petroleum oil or fraction present in the composition. In other words while for ordinary coating compositions like paints and varnishes the siccative oil is given a preliminary oxidation to an extent sufficient to enable that oxidation to continue in the presence of the drier, in connection with compositions employed in accordance with the present invention, the oxidative change in the siccative is desirably carried further so that it will also enhance or effect a change in the petroleum oil or distillate.

These considerations are further exemplified by the fact that driers may be utilized in the present compositions to the extent of 4 or 5 times as much as those employed in ordinary paint and varnish compositions.

The compositions illustrated by the examples given above exhibit not alone desirable properties of protecting the surfaces against rust, but they maintain those properties over long periods of time, since the presence of film-forming or sponge-producing layers give coatings which tend to retain themselves on the indicated surfaces, even when boat surfaces coated therewith, for example, remain in contact with water. These compositions also exhibit many other desirable properties. Any rust or oxidized spots that may appear on the metal surfaces are readily removed at the time that these compositions are to be removed from the metal surfaces in preparation for a painting operation. And in this connection, it should be pointed out that the surface which has carried a protective composition of the character set forth herein, is in a much better condition for the reception of paint than such a surface would be had it carried merely a petroleum material. In addition, the compositions of the character set forth herein, particularly when containing the polar bodies, such as oleic acid, are of exceptionally desirable character, since these compositions penetrate into any minor cracks or irregularities at the surface of the metal, and give protection which is carried into those defective portions of the metal.

If desired, the penetration power of the composition may be increased by including therein a more or less volatile solvent particularly of organic character. The degree of penetration is effected by the viscosity of the composition as well as the interfacial tension. While the petroleum derived ingredients are inexpensive and reduce the viscosity, the interfacial tension of these materials is not marked. On the other hand chlorinated compounds ranging from carbontetrachloride on the one hand to the more complex chlorinated derivatives, such as trichlorethylene, etc. may be utilized since they act to produce the requisite reduction in viscosity and also at the same time to increase the interfacial tension of such compositions containing such ingredients. A wide variety of the liquid chlorinated hydrocarbon of the aliphatic series may thus be employed but desirably such components are utilized in the compositions when the latter are applied to surfaces not confined in enclosed spaces. The amounts of the chlorinated derivatives employed may vary within rather wide limits but in general need not exceed about 10% of the mixture, although in some instances larger amounts can be employed advantageously for special uses. Other volatile materials particularly aliphatic hydrocarbon derivatives including ethers, ketones, aldehydes, etc. may be employed or mixtures of chlorinated and non-chlorinated volatile substances can be utilized.

Having thus set forth my invention, I claim:

1. A rust preventing and removing composition comprising about 10% of boiled linseed oil including drier, 2% of pine oil, 2% of oleic acid, and the remainder petroleum oil distillate.

2. A rust preventing and removing composition which forms a tacky coating, said composition comprising from 5 to 20% of boiled linseed oil, 0.1 to 5% drier, 1 to 5% pine oil, 0.5 to 5% of oleic acid, and the remainder petroleum oil distillate.

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