United States Patent Office 2,784,104 Patented Mar. 5, 1957

2,784,104

WATER DISPLACING CORROSION INHIBITING COMPOSITIONS AND PROCESS OF TREATING METAL SURFACES THEREWITH

Maurice S. Baseman, Keith S. Johnson, and Sherwin E. Baseman, Pittsburgh, Pa.

No Drawing. Application July 5, 1955, Serial No. 520,128

3 Claims. (Cl. 106—14)

This invention relates to oil base compositions which may be applied as coatings to wet surfaces to displace water therefrom so as to provide corrosion-inhibiting coatings on metal surfaces so treated.

The prevention of corrosion of metal surfaces, and particularly of ferrous metal surfaces, has been a considerable problem when such surfaces are exposed to the atmosphere and the elements including rain, snow and high humidity conditions. It has been desirable to apply to such surfaces some quickly and easily applied and removed means which gives good protection. Special wrapping and packaging treatments with dehumidification are costly and difficult. Slushing compounds such as heavy oils and greases have been employed but the applied products are often unsightly, are difficult and expensive to remove, and are not completely satisfactory in preventing corrosion under many conditions. Furthermore, such slushing compounds ordinarily must be applied to bone-dry metal surfaces.

The object of this invention is to provide water displacing corrosion inhibiting compositions which may be easily applied to any metal surface and provide excellent protective coatings thereon.

A further object of the invention is to provide a corrosion inhibiting composition comprising a major proportion of an oleaginous vehicle, a minor proportion of an oil soluble hydrophilic wetting agent and the reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid.

Another object of the invention is to provide a process for treating metal members even when wet with water by applying a composition comprising a major proportion of an oleaginous vehicle, a minor proportion of an oil soluble hydrophilic wetting agent and the reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid.

Other objects will in part be obvious and will in part appear hereinafter.

We have discovered a novel corrosion-inhibiting composition comprising essentially:

(*a*) From 75 to 99.8 parts by weight of a relatively low viscosity oleaginous vehicle, and preferably from 80 to 98 parts thereof,

(*b*) From 10 to 0.1 parts by weight of an oil soluble, hydrophilic wetting agent, and preferably from 5 to 0.5 parts, and

(*c*) From 15 to 0.1 parts by weight of the reaction product of substantially equimolar parts of dicyclohexylamine and octanoic acid and preferably from 15 to 1.5 parts.

The total comprises 100 parts by weight. Small amounts of the order of up to 5% of the weight of the composition may comprise other additives such as phosphates (zinc phosphate), chromates (sodium chromate) and organic corrosion inhibitors (diisopropylamine nitrite), thickening agents such as polyisobutylene, antioxidants such as dimethyltertbutyl phenol, and the like.

The oleaginous vehicle is preferably a relatively non-volatile fluid of a viscosity of from 5 centipoises to 50 poises at 25° C. though ordinarily the viscosity should be less than 20 poises for ease in application. Suitable oleaginous vehicles are various liquid oils and fats such as petroleum hydrocarbon oil, and particularly oil of a viscosity of from 10 centipoises to 5 poises at 100° F., vegetable oils such as castor oil, and synthetic oils such as long chain esters of dibasic acids—for example bis(2-ethyl-hexyl) sebacates and the like sold in the trade as Ucon fluid.

Numerous oil soluble hydrophilic wetting agents may be employed in preparing the compositions. Petroleum sulfonates or mahogany soaps, of which sodium and barium mahogany sulfonate are examples, are quite satisfactory. Sorbitan monolaurate, sorbitan monopalmitate, sorbitan monooleate and sorbitan monopalmitate polyoxyethylene derivatives sold as Tween 40, are other suitable wetting agents.

The reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid is readily produced by simply mixing the two ingredients at room temperatures. The octanoic acid may be any isomer or mixtures thereof, but best results are had with N-octanoic acid or the 2-ethyl hexyl acid. The proportions comprise approximately 100 grams of the octanoic acid to 117 grams of the dicyclohexylamine. The reaction is complete in 10 minutes and produces a crystalline dicyclohexylamine octoate product. The reaction product may be dissolved in a small amount of kerosene or xylol or other organic solvent and then added to the oleaginous vehicle.

The reaction product of dicyclohexylamine and octanoic acid has been found to be exceptionally and uniquely effective. Thus shorter carbon chain acids produce much more readily volatile products with dicyclohexylamine so that after a short period of exposure to the atmosphere they will have disappeared from the coatings of the composition. Acids of longer chain length than octanoic acid have substantially reduced corrosion-inhibiting characteristics.

The oleaginous vehicle, the hydrophilic wetting agent and the dicyclohexylamine octoate may be admixed in any desired order. Good results have been obtained by heating the oleaginous vehicle to 100° F. to 120° F. and stirring in the dicyclohexylamine octoate, the latter being dissolved in a small quantity of kerosene, and then the wetting agent is added.

The composition may be applied to metal members by dipping, brushing, spraying, or roller coating. After a brief drainage, a thin covering film of the composition will be present to protect the metal surfaces. The metal to be treated may be damp or wet with water, and quite cold, but the composition will displace the moisture readily from its surfaces.

Sheet metal members, castings, wire, strip, fabricated members, ship interiors, barrels and other containers, are examples of products that may be treated. Barrels and completely closed structures will be effectively protected if the oleaginous vehicle composition contains 0.1 to 1% of the dicyclohexylamine octoate. Totally exposed members or members subjected to wet or highly humid conditions should be coated with compositions having at least 3% of the dicyclohexyl octoate. Examples of metals which may be effectively protected comprise steel, cast iron, 12% chromium iron or other lower moderately stain-resisting steels, copper, brass and aluminum.

The following examples illustrate the invention:

Example I

Two sets of panels of SAE 1040 steel were dipped in each of two compositions comprising uncompounded

straight mineral oil stock of a viscosity equal to SAE No. 10 with 1% of sodium mahogany sulfonate and 3% and 5% of dicyclohexylamine octoate, respectively. Other panels were dipped in the mineral oil stock with no additive. After outdoor exposure to an industrial atmosphere for 6 weeks, neither of the first two sets of panels showed any corrosion. Even after 5 months of exposure, they were uncorroded. The panels coated with the straight mineral oil stock were plainly rusted in 3 weeks and badly rusted in 6 weeks.

Example II

Steel hydraulic cylinders were coated with a composition comprising 95 parts of straight mineral oil stock of a viscosity of SAE No. 10, 4 parts of dicyclohexylamine octoate and 1 part of mahogany petroleum sulfonate. The cylinders were kept in an atmosphere of 95% relative humidity and subjected to the following cycling test for a total of 28 days: Hold 8 hours at 80° F., heat slowly for 4 hours to 125° F., hold 8 hours at 125° F. and cool slowly in 4 hours to 60° F. No corrosion was found in the cylinders after this 28-day cycling test.

Example III

Wet steel panels were immersed in a 10% dicyclohexylamine octoate, 2% mahogany petroleum sulfonate, and 88% by weight SAE No. 20 oil composition. After withdrawal and drainage, a thin uniform, unbroken coating was present on all the surfaces. The steel panels did not show any rust or corrosion after exposure to an industrial outdoor atmosphere for two months.

The panels in each of these three examples after treatment were coated with a thin layer of the composition and presented a clean appearance. The coatings could be readily wiped off or dissolved completely in one brief dip in a solvent cleaner such as trichlorethylene.

It will be understood that this specification and examples are illustrative and not limiting of the invention.

We claim as our invention:

1. A homogeneous corrosion-inhibiting composition suitable for application to damp and wet metal surfaces, consisting essentially of a solution of from 75% to 99.8% by weight of a liquid oleaginous vehicle consisting essentially of a hydrocarbon lubricating oil of a viscosity of below 50 poises at 25° C., from 10% to 0.1% by weight of a hydrophilic wetting agent dissolved in the vehicle, the wetting agent being selected from the group consisting of petroleum sulfonates, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monooleate and sorbitan monopalmitate polyoxyethylene derivatives, and from 15% to 0.1% by weight of the reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid.

2. A homogeneous corrosion-inhibiting composition suitable for application to damp and wet metal surfaces, consisting essentially of a solution of from 80% to 98% by weight of a liquid oleaginous vehicle consisting essentially of a hydrocarbon lubricating oil of a viscosity of from 10 centipoises to 5 poises at 25° C., from 5% to 0.5% by weight of a hydrophilic wetting agent dissolved in the vehicle, the wetting agent being selected from the group consisting of petroleum sulfonates, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monooleate and sorbitan monopalmitate polyoxyethylene derivatives and from 0.1% to 15% by weight of the reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid.

3. In the method of treating metal surfaces which may be damp or wet with water to provide corrosion-inhibiting coatings displacing any water from the surface, the steps comprising applying to the metal surface a thin coating of a homogeneous composition consisting essentially of, a solution of from 75% to 99.8% by weight of a liquid oleaginous vehicle consisting essentially of a hydrocarbon lubricating oil of a viscosity of from 10 centipoises to 5 poises at 25° C., from 10% to 0.1% by weight of a hydrophilic wetting agent dissolved in the vehicle, the wetting agent being selected from the group consisting of petroleum sulfonates, sorbitan monolaurate, sorbitan monopalmitate, sorbitan monooleate and sorbitan monopalmitate polyoxyethylene derivatives and from 15% to 0.1% by weight of the reaction product of substantially equimolar proportions of dicyclohexylamine and octanoic acid.

References Cited in the file of this patent

UNITED STATES PATENTS

2,330,524	Shields	Sept. 28, 1943
2,634,237	Kopf et al.	Apr. 7, 1953
2,653,854	Schaar	Sept. 29, 1953

OTHER REFERENCES

Condensed Chemical Dictionary (1950), published by Reinhold (p. 137 relied upon).