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SLUSHING OILS CONTAINING COPPER POWDER

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The present invention relates to an improved slushing oil which is useful in the protection of articles which are stored in an unusually corrosive atmosphere. In particular, the invention relates to a slushing oil containing minor amounts of a metallic copper powder.

Slushing oils are employed for the protection of articles which are kept in storage for a long period of time. The usual function of such oils is the protection of metallic articles from corrosion during storage. The articles to be protected are usually of a nature which precludes the application of other known protective coverings such as metallic coating, vitreous enamel, painting and the like.

One of the usual requirements of a slushing oil is that it must be capable of excluding air and moisture from contact with the metallic surface which it is protecting. Another requirement of a slushing oil is that it should be relatively easy to apply to the surface to be protected and at the same time be susceptible to removal without undue effort. Still another requirement of a slushing oil is that it should not possess any inherent corrosive tendencies in combination with the metal to be protected.

There are a great number of slushing oils known to the art which will meet the usual desideratta of these oils as set forth above. However, there are certain applications in industry for which a suitable slushing compound has not been suggested, to my knowledge, by the art. For example, it is necessary at times during the steel manufacturing process to store quantities of low carbon steel near pickling baths. Since the pickling of steel is accomplished with a strong mineral acid, the atmosphere surrounding these pickling baths is unusually corrosive. In the absence of some means for protection of the steel stored near such baths, excessive corrosion of the stored steel will result with a consequent loss to the profits of the overall manufacturing operation. Accordingly, it is the object of this invention to provide a slushing oil which will protect articles which are to be stored in an acidic atmosphere.

I have now discovered a slushing oil which will effectively protect exposed metal surfaces, and more especially will eliminate the corrosion of low carbon steel in a highly corrosive atmosphere, particularly in an acidic atmosphere.

In brief, the invention is an improved slushing oil containing a minor amount of a metallic copper powder.

The particular slushing oil employed in connection with this invention is not important and any of the slushing oils known in the art and ordinarily used for the protection of surfaces may be employed. Such oils usually comprise a non-drying oil and a thickening agent which are mixed together in proportions such that the final product may be applied and removed with facility. It will have gel-like consistency or a yield point so as not to flow completely from a vertical surface. This property of the slushing oil also holds the copper in uniform suspension in the oil.

The exact proportions are not critical but the oil base usually is present in amounts in the range from about 75 to 99% by weight, while the thickening agent is present in amounts ranging from about 1 to 25% by weight.

The most satisfactory slushing oils for use in connection with this invention will be thixotropic in nature. Thixotropy has been extensively investigated as one aspect of rheology. It is a property possessed by a composition of being liquid under conditions of agitation and of being solid or gel-like when quiescent. Thixotropic compositions may also be defined as undergoing reversible liquid-gel transitions. A characteristic of a thixotropic composition is that the conversion from a solid or gel-like state to a liquid and back again is not dependent on the change of temperature, but rather is dependent on the stresses applied to the gel, firstly to initiate the transition from the gel to the liquid state and then maintain composition in this liquid state. Thixotropic oil compositions are normally solid, in that they do not flow under the conditions of stress normally imposed upon them. The desirability of thixotropy in a slushing oil is obvious in that an oil possessing this property can be applied with facility to a metallic surface and once in place will resist any tendency of such oils to flow from the metallic surface during storage.

The non-drying oil base of the slushing oil may be any oil or mineral, animal or vegetable origin. The mineral oils may be derived from petroleum or coal tar and may occur naturally or may be made synthetically by polymerization of olefins, alkylation, condensations, etc. They may vary in viscosity from 50 to 75 SUS at 100° F., such as are characteristic of the torch oils and the light household oils up through the oils having viscosity of 4500 SUS at 100° F. which are characteristic of certain bright stocks. They include, for instance, raw oils such as waxy oils, and oils refined by various methods, such as de-waxing, acid treating or solvent refining, including the highly refined white medicinal oils.

Examples of the animal and vegetable oils are ordinary castor oil, lard oil, neat's-foot oil, olive oil, coconut oil, palm oil, cottonseed oil, soybean oil, and any of the other naturally occurring oils which are liquid at ambient temperatures, as well as equivalents formed synthetically. These oils may include small amounts of, or be entirely composed of, fatty acids, mono-glycerides, etc.

The thickening agent employed in the slushing oil of this invention may be any of the commonly employed organic or inorganic thickening agents. As illustrative of the organic thickening agents, sodium, calcium, aluminum, lithium or barium soaps may be employed. Such soaps may be prepared from any of the fats or fatty acids known to the art. In some cases, petroleum wax, either crystalline or microcrystalline, such as paraffin wax or petrolatum, may be employed to thicken the oil base. Waxes such as hydrogenated castor oil, beeswax and carnauba wax may be used. Inorganic thickening agents that may be employed would include the silica aerogels and other compounds such as estersils, clays, bentones, etc.

The thickener is dispersed through the oil, with heat if necessary, followed by cooling so as to be uniformly dispersed in the oil and thicken the same.

Other ingredients may also be added to the slushing compounds as may be desirable in some instances, such as any of the chromates or antioxidants.

The copper powder of this invention should be of a size such that essentially 98% of it will pass through a 100 mesh screen. The copper may be present in any amount up to the carrying capacity of the slushing oil but preferably is present in amounts in the range from about 0.1 to 10% by weight of the composition. In the

case of an oil which is to be subjected to an unusually corrosive atmosphere, it will be desirable to incorporate the maximum amount of copper in order to obtain the maximum degree of protection as it appears that the copper is gradually consumed under these conditions. Any convenient means of incorporating the copper powder into the slushing oil may be employed, e. g. mechanical mixing of the powder and oil in a mixing vessel.

As a preferred embodiment of my invention, the following composition was prepared:

86 parts by weight of an unrefined hydrocarbon oil having a viscosity of 110 SUS at 100° F.
10 parts by weight of micro-crystalline wax (petrolatum) having a M. P. of 180–190° F.
1 part by weight silica aerogel (Santocel ARD)
1 part by weight powdered copper metal (98% through 100 mesh)
2 parts by weight stearic acid

The composition of the preferred embodiment was prepared by mixing all of the ingredients together in a mixing vessel at a temperature of 200° F. and cooling to room temperature.

In order to test the effectiveness of the composition of this invention, an ordinary strip of low carbon steel was coated with the composition of the preferred embodiment as given above. A similar strip of steel was coated with one of the ordinary slushing oils of the prior art which contained all of the ingredients of the preferred embodiment except the copper powder. The two strips were suspended in close proximity over a 15% aqueous solution of hydrochloric acid. Air was blown through the hydrochloric acid solution in order to accelerate the corrosive effect of the vapor on the steel strips. After a period of 10 days had elapsed, the steel strip which was coated with the slushing oil of the prior art evidenced severe corrosion. On the other hand, the strip which had been protected by the composition of this invention was found to be entirely free of corrosion.

It will, of course, be obvious to those skilled in the art that many modifications of the invention can be accomplished by changes in the ingredients of the preferred embodiment given above. However, this application for Letters Patent is intended to cover all slushing oils containing a metallic copper powder such as would ordinarily fall within the scope of the appended claims.

I claim:

1. A slushing oil for the protection of steel articles consisting essentially of 86 parts by weight of an unrefined hydrocarbon oil having a viscosity of 110 SUS at 100° F., 10 parts by weight of micro-crystalline wax, 1 part by weight of silica aerogel, 1 part by weight powdered copper metal, and 2 parts by weight stearic acid.

2. A slushing oil for the protection of steel articles consisting essentially of base oil having a viscosity in the range from about 50 to 4500 SUS at 100° F. in amounts from about 75 to 99% by weight of the composition, silica aerogel in amounts from about 1% to about 25% by weight of the composition, and a metallic copper powder in amounts ranging from about 0.1 to 10% by weight of the composition.

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