

UNITED STATES PATENT OFFICE

2,653,854

CORROSION INHIBITING PACKAGING MATERIAL AND METHOD OF MAKING

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No Drawing. Application October 17, 1949,
Serial No. 121,886

7 Claims. (Cl. 21—2.5)

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This invention relates to packaging materials, and is particularly directed to a novel coated sheet material particularly suitable for packaging therein metal articles which are to be protected from corrosion and rusting.

The corrosion and rusting of packaged metal articles before or after shipment or in transit is a problem of serious magnitude which has so far only been partially solved, due to the extreme sensitivity of metal articles, particularly highly polished articles, to the deleterious effects of water, in liquid or vapor form, especially in the presence of acids.

While it is theoretically possible to package metal articles in a rust-free, corrosion-free atmosphere, the real problem is in accomplishing this by economically practical means. Toward this end, wrapping materials, such as for example, kraft paper, have been coated or impregnated with moisture proofing materials, including waxes, pitch and the like, in attempts to prevent or minimize the passage of moisture or moisture-containing air therethrough.

While such measures are helpful, they are not wholly satisfactory in eliminating corrosion of metal articles packaged in such wrapping materials because of the fact that even though a vapor-tight barrier film be incorporated in the wrapping medium, the atmosphere inside the package may and frequently does contain some water vapor. Furthermore, in paper wrapping or packaging materials wherein such barrier film is in the form of a "core" or layer between paper sheets, the corrosive effect of the paper surfaces themselves against the surfaces of a metal article may be considerable in view of the normally acid reaction of paper.

More recently, it has been proposed to apply rust-inhibitors and corrosion inhibitors of one kind or another to wrapping materials in lieu of or in addition to the wax or other vapor barriers used. Recent developments in the art have been directed particularly to rust and corrosion inhibitors whose vapor pressure is great enough to result in the accumulation, in a closed or semi-closed atmosphere, such as a package, of a functional quantity of inhibitor vapor dispersed through such atmosphere, whereby to discourage or even prevent corrosion and rusting of a metal article exposed to such environment.

Unfortunately, it has been found that such volatile rust and corrosion inhibitors of the prior art are not entirely suitable for all applications. An important difficulty associated with the use of such rust and corrosion inhibitors as coatings,

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components of coatings, or as impregnants of packaging materials which are to be used to contain metal articles, lies in the fact that, where the packaging material is paper, such inhibitors are ineffectual, or practically so, due to the fact that paper has a pH, ordinarily on the acid side. In an acid atmosphere, inhibitors which normally would be satisfactory, are considered to be ineffectual, unless the acidity is neutralized or alkalized.

Accordingly, a principal object of the present invention is to provide a rust inhibiting paper base wrapping medium.

Another object is to provide a novel wrapping material formed of paper and having coated thereon a volatile rust inhibiting material which is effective under acid conditions.

A further object is to provide a coated wrapping paper containing a rust and corrosion inhibiting material which functions in an acid atmosphere.

According to the present invention, I have discovered that certain amine salts may be used with a surprisingly high degree of rust-and-corrosion-inhibiting effectiveness, as coating components of wrapping paper which is to be used for packaging metal articles, even when the paper has a pH below 7.0. This is entirely unexpected in view of the accepted teachings that amine salts are ineffective, as rust and corrosion inhibitors, in an acid medium.

The particular compound I prefer to use in preparing the preferred wrapping paper of my invention, and which has been shown to be extremely satisfactory, is the reaction product of dicyclohexylamine and caprylic acid, prepared by mixing a stoichiometric quantity (144 g.) of caprylic acid with dicyclohexylamine (169 g.) at room temperature. The mixture is stirred until the reaction is substantially complete—for about ten minutes. While caprylic acid is the preferred aliphatic acid, other fatty acids may be used, if desired, although I have found that caprylic acid is not only preferable from a price standpoint, but what is more important, seems to produce, with dicyclohexylamine, a volatile product which is preferable from a performance standpoint.

In preparing the wrapping medium of my invention, I add one portion of the reaction product of dicyclohexylamine and caprylic acid prepared as above to an equal portion of molten wax mixture consisting of one-third paraffin wax, having an AMP melting point of 133–135° F., and two-thirds microwax having a drop melting point of 195–200° F. The dicyclohexylamine caprylate

readily dissolves in the wax. The mixture is then placed in a squeeze roll impregnator of a paper coating machine at a temperature of about 205° F., and applied to the paper which is to be coated. While the amount of coating may be varied over a rather wide range, I have found that the application of 10 pounds of the coating mixture to a 30 pound paper (3000 ft.² weight 30 pounds) whereby to increase the weight of the paper to 40 pounds, provides a paper which has excellent corrosion and rust inhibiting properties and is admirably suited for use in wrapping metal articles normally subject to rusting or corrosion.

Among the advantages of the coating composition forming a part of my invention, is its effectiveness in an acid medium, which permits its use with ordinary papers, such as kraft paper, having a pH below 7.0, without the necessity of neutralizing the paper or of adjusting the pH above 7.0.

Another advantage lies in the ease with which solution of the reaction product of dicyclohexylamine and caprylic acid in molten wax occurs, which permits the wax to serve not only as a diluent, but on cooling and solidification, as a vapor barrier itself. Thus it is unnecessary to use volatile solvents as is required with other inhibitors in applying the inhibiting medium of my invention to the paper.

A further advantage of my invention lies in the fact that the reaction product of dicyclohexylamine and caprylic acid which comprises the coating material used in preparing wrapping materials for packing metallic articles, is non-toxic as established by extensive feeding tests. This is important where the metallic articles to be protected are to be used, for example, in the fabrication of food containers from sheet or plate.

While I have described my invention in terms of specific embodiments, it is to be understood that changes within the spirit and scope of my invention will readily suggest themselves to those skilled in the art, and it is therefore not intended that my invention be limited except as required by the appended claims.

A still further advantage of my invention lies in the unexpectedly high degree of efficiency in corrosion prevention achieved when a paper sheet material, containing on at least one of its surfaces a coating of the reaction product of dicyclohexylamine and a fatty acid, also has, structurally incorporated therewith, a moisture and water impervious film or layer, as for example pitch, rubber hydrochloride and other

moisture and vapor barrier materials commonly used for such purposes.

I claim:

1. A packaging material for inhibiting rusting and corrosion of metallic articles packaged therein, comprising a paper sheet having uniformly coated thereon an effective quantity of the reaction product of dicyclohexylamine and caprylic acid.
2. A packaging material for use in protecting metal articles to be wrapped therein against rusting and corrosion comprising a paper sheet material uniformly coated with a wax solution of dicyclohexylamine caprylate.
3. A rust and corrosion inhibiting wrapping medium comprising paper sheet material having at least one side thereof covered with a wax solution of dicyclohexylamine caprylate, said paper sheet material having a pH below 7.0.
4. A packaging material for use in protecting metallic articles wrapped therein against rusting and corrosion comprising a paper sheet material uniformly coated with a mixture of wax and the reaction product of dicyclohexylamine and caprylic acid, said paper sheet material having a pH below about 7.0.
5. A method of making a wrapping material for use in protecting metallic articles against rusting and corrosion which comprises applying, to a paper sheet material having a pH below 7.0, a uniform coating of a molten wax solution of the reaction product of dicyclohexylamine and caprylic acid.
6. A sheet material comprising a paper sheet having one surface coated with a wax solution of the reaction product of dicyclohexylamine and caprylic acid, and having the opposite surface coated with a moisture and water impervious material.
7. A sheet material comprising a laminated paper sheet having a core of moisture and water impervious material, and having at least one of the paper sheet surfaces coated with a wax solution of the reaction product of dicyclohexylamine and caprylic acid.

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