

[54] **METHOD OF PROTECTING A METALLIC SURFACE FROM CORROSION AND RESULTANT ARTICLE**

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[58] Field of Search **117/75, 49, 94, 132 BE; 336/90**

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[57] ABSTRACT

A corrosion protection system for metal. The metal surface to be protected is first cleaned of dirt, grease and the like, preferably by grit blasting. The cleaned surface is then coated first with a primer to promote adhesion between the metal and the basic protection coating. A protective top coat, preferably an epoxy, is applied over the primer either by spraying or fluid bed. Finally, an impact resistant over coat is applied over the epoxy top coat preferably by spraying to prevent damage to the top coat during handling.

4 Claims, 2 Drawing Figures

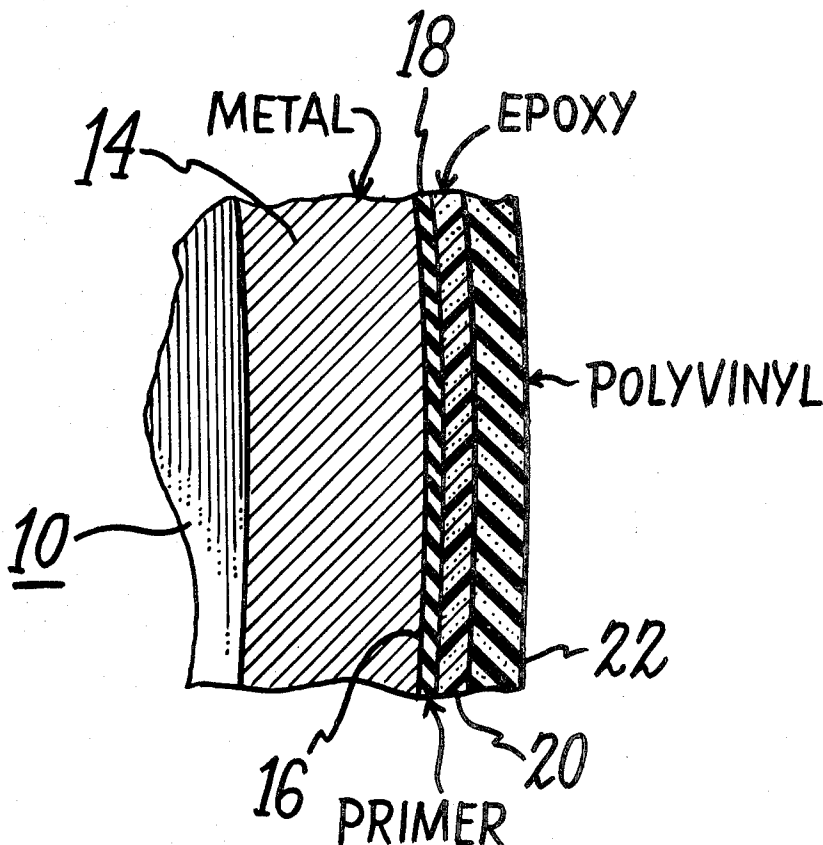
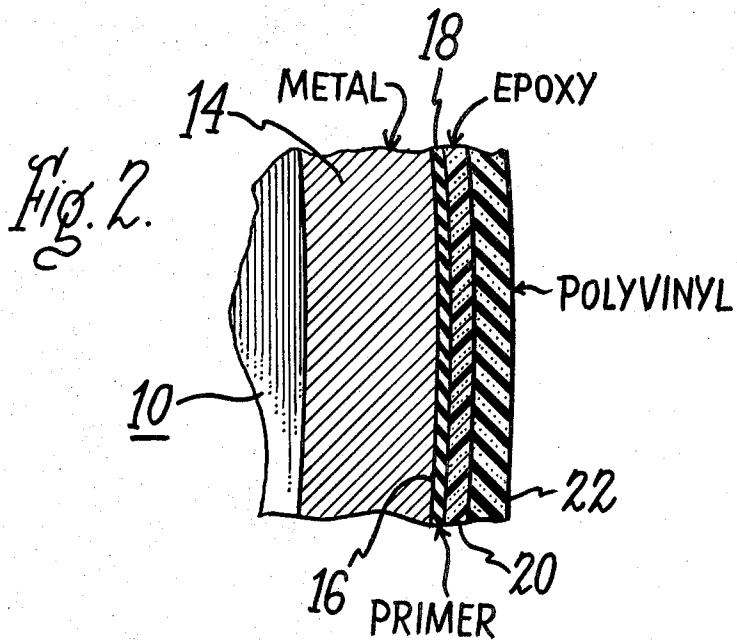
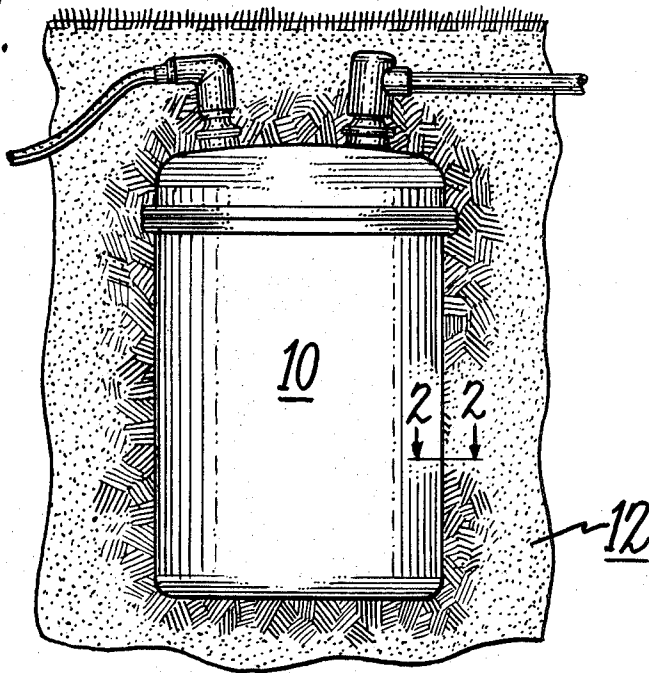


Fig. 1.



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METHOD OF PROTECTING A METALLIC SURFACE FROM CORROSION AND RESULTANT ARTICLE

BACKGROUND OF THE INVENTION

This invention relates to metal coating and more particularly to a metal corrosion protection system.

As is well known, many types of metal structures are exposed to the environment and are subject to corrosion from such environment. Some structures are often exposed to a particularly hostile environment, such as sea water, sea air and the like. Examples of metal structures which may be exposed to the environment are bridges, ships, pipe lines and, of particular importance to this invention, buried or subsurface transformers. While all metallic structures are subject to corrosion, most are provided with periodic maintenance, especially when exposed to hostile environments to prevent severe damage to the metal structure from corrosion. However, subsurface or buried structures in the electrical utility field, such as subsurface transformers are usually expected to operate over an extended period which may be, for example, up to 30 years, with little or no maintenance and frequently at elevated temperatures. This expectation places stringent requirements on any corrosion protection system which is used to prevent the corrosion of the metal tanks of these subsurface transformers. A number of finish or coating systems for protection of metal from corrosion are presently available. Many are used on subsurface transformers. However, all presently known systems have recognized weaknesses which have caused many manufacturers to use stainless steel tanks for subsurface transformers. As will be understood, stainless steel tanks add substantially to the cost of manufacturing of these devices. This has been considered necessary by some manufacturers since most finishes either deteriorate due to the hostile environment underground or else are so high priced and difficult to apply in required thicknesses that they are considered economically unattractive. As is well known, many synthetic coatings are hydrolytically unstable or have a high permeability to water. Many also have low impact resistance or poor abrasion resistance leaving the metal substantially unprotected after sustaining blows or abrasion. Thus, there is presently a need in the metal coating field, and particularly with reference to subsurface transformer tanks, for a coating or finish system which will protect the metal surface from corrosion for a substantial period of time.

It is, therefore, one object of this invention to provide a novel metal corrosion protection system.

A still further object of this invention is to provide a novel method of coating a metallic surface to prevent the surface from corroding.

A still further object of this invention is to provide a novel protective coating system utilizing a plurality of coats.

A still further object of this invention is to provide a novel protective coating system for subsurface transformer tanks.

SUMMARY OF THE INVENTION

In carrying out this invention in a preferred form, a metal member to be protected is first cleaned of all dirt, grease and the like. A primer coating compatible both to the cleaned metal and to a barrier top coat is then

applied to the clean metal member. A top coat of thermosetting resinuous material is coated over the primer and cured to provide basic corrosion protection. An over coat of resinuous material having good impact resistance is then coated over the thermosetting resinuous material coat providing impact protection to such coat.

The invention sought to be protected will be particularly pointed out and distinctly claimed in the claims appended hereto. However, it is believed that this invention and the manner in which its various objects and advantages are obtained as well as other objects and advantages thereof will be better understood by reference to the following detailed description of the present preferred embodiment, particularly when considered with the accompanying drawing.

BRIEF DESCRIPTION OF DRAWING

FIG. 1 is a plan view of a subsurface distribution transformer buried in the earth and utilizing the corrosion protection system of this invention; and

FIG. 2 is a sectional view on an enlarged scale taken on the line 2—2 of FIG. 1 showing a portion of the tank and the details of the preferred form of metallic corrosion protection system of this invention.

DESCRIPTION OF PREFERRED EMBODIMENT

In the preferred form of this invention, a metal surface, such as the surface of a transformer tank, which is to be protected from corrosion, is first cleaned and then provided with a primer coat. A top barrier coat and an over coat of various compatible synthetic resins are then applied to the primer coated metal, each resin performing a desired function so as to provide the best possible protection of the metal surface.

A particular type of metal surface needing protection is shown in FIG. 1. As is there shown, a transformer tank 10 is buried in earth 12 providing subsurface electrical power distribution in a well known manner. The transformer tank 10 is usually made of a mild steel provided with a corrosion protection coating or finish thereon. As earlier noted, buried transformers are often subjected to severe hostile environmental conditions, and present day protective coatings do not provide desired maintenance free protection which is needed for such subsurface transformers. This invention provides a novel, long life, maintenance free corrosion protection system. The preferred form of the corrosion protection system of this invention is best seen in FIG. 2, which is an enlarged sectional view of a portion of the transformer tank of FIG. 1.

As can be seen in FIG. 2, transformer tank 10 comprises a metal wall member 14 with its outer surface 16 being first coated with a primer 18. Primer 18 is shown as being coated with the epoxy top coat 20 which provides the primary corrosion protection of surface 16. A final over coat 22 of a polyvinyl is applied over the epoxy top coat 20 to provide impact protection to the epoxy coating 20.

In carrying out this invention, the surface to be protected such as surface 16 of metal 14 must be thoroughly cleaned. All oil, grease, dirt, rust and the like must be removed from the surface. In the preferred embodiment, this is done by grit blast cleaning, although other types of cleaning may be used. After the surface 16 is completely cleaned, a primer 18 is coated over the entire surface 16. In the preferred embodiment, a solvent spray is used and the sprayed primer is an epoxy

resin having metal salts, such as zinc chromate or lead oxide added thereto, and a polyamide hardener.

As will be understood, the metal salts provide additional corrosion protection to metal surface 16. Also, fillers are provided to the primer to make its coefficient of expansion substantially the same as metal 14 to prevent loss of adhesion during expansion and contraction of metal 14. The preferred thickness of the primer is approximately 2 mils, although primer coatings as thin as 0.25 mils have been found adequate. As will be understood, the basic function of the primer is to provide a transition layer between the metal surface and the top coat promoting adhesion of such top coat. Thus it will be understood that the primer must be compatible both with the metal surface and the top coat. Since, in the preferred embodiment, an epoxy top coat is used, an epoxy primer is also used.

In the preferred form of the invention, the primer is allowed to air dry for approximately one hour to insure removal of the solvent. The primer is cured at the same time as the epoxy top coat, although it could be cured before adding the top coat, if desired. The primer is a commercially available material, compatible with top coat 20.

The epoxy top coat 20 is a commercially available epoxy coating which is thinned with a solvent so as to enable the solvent spraying of the top coat over the primer. The preferred solvent epoxy spray material is sold by the Glidden Company under the trademark NU-PON. Similar types of solvent spray epoxy materials are available from other commercial sources. The solvent in the epoxy spray material goes off at room temperature and the epoxy may then be cured for one hour at 140° C.

In the preferred embodiment, the epoxy to be coated is sprayed to a thickness of between 5 and approximately 10 mils. It has been found that for adequate corrosion protection at least 5 mils of epoxy top coat must be provided. More than 10 mils of epoxy is considered uneconomical, due to the added cost of material and extra time and expense to obtain a thicker coating.

After the epoxy top coat has been cured, an over coat of polyvinylchloride is then solvent sprayed over the epoxy material. The polyvinylchloride spray material is also available commercially, a preferred material being obtained from Sherwin-williams Company. The polyvinylchloride material is sprayed to a thickness of 15 to 20 mils and is then cured at a temperature of 125° C. for approximately 20 minutes. The polyvinylchloride material has good impact resistance prior to aging and provides a protection to the epoxy primary coating during the storage and handling of the coated metal, such as, for example, a coated transformer tank.

As will be apparent from the above description, many types of thermoplastic material could be utilized for an over coat as long as they are sufficiently compatible with the epoxy to provide good adhesion thereto and had good impact resistance for at least the period of time required for handling, storing and shipping of the coated metal device. In the preferred embodiment polyvinylchloride has been selected due to its compatibility with the epoxy and its cost.

While there has been shown and described the present preferred embodiment of the corrosion protection system of this invention, it will be understood that such system may be applied to any metallic surface which may be subject to hostile corrosive environments. Further, it will be understood that the invention herein set forth is particularly described as to its limits by the attached claims.

What is claimed as new and which it is desired to secure by Letters Patent of the United States is:

1. A method of protecting a metallic surface from corrosion comprising:

- a. thoroughly cleaning said metallic surface,
- b. applying a thin epoxy primer coat to said surface within the range of 0.25 to 2 mils,
- c. applying to said primer coated surface an epoxy coating within the range of 5 to 10 mils in thickness and curing said coating and said primer coat, and then
- d. applying an over coat of polyvinyl chloride within the range of 15 to 20 mils in thickness and curing said polyvinyl chloride over coat.

2. A method of protecting a metallic surface from corrosion as set forth in claim 1 in which said primer coat is a solvent spray epoxy material and said primer coat is air dried for approximately one hour before applying said epoxy coating.

3. A metal surface having a corrosion protection system thereon comprising a primer coating of epoxy firmly adhering to said metal surface, a primary corrosion coating of epoxy material in the range of 5 to 10 mils in thickness adhering to said primer coating and a polyvinyl chloride over coat in the range of 15 to 20 mils thick bonded to said epoxy primary coating.

4. A distribution transformer tank suitable for sub-surface distribution having a corrosion protection coating system comprising an epoxy primer bonded to the metal surface of the transformer tank, an epoxy primary coat in the range of 5 to 10 mils in thickness bonded to said primer and a polyvinyl chloride over coat in the range of 15 to 20 mils in thickness bonded to said epoxy primary coat.

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