United States Patent

Jennings

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[54] CORROSION-INHIBITING TOOLBOX

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[51] Int. Cl. C23f 11/02

[58] Field of Search 21/2.5, 61, 91, 82–90

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[57] ABSTRACT

The toolbox is preferably designed with a close-fitting cover and contains therein a carrier for a volatile corrosion inhibitor. The toolbox is preferably of injection molded synthetic polymer composition material, including a continuous hinge of the same material. The carrier in the toolbox is preferably an open-cell foamed resilient synthetic material, while the corrosion inhibitor is preferably in the form of amine nitrite crystals deposited in the foam material.

6 Claims, 6 Drawing Figures

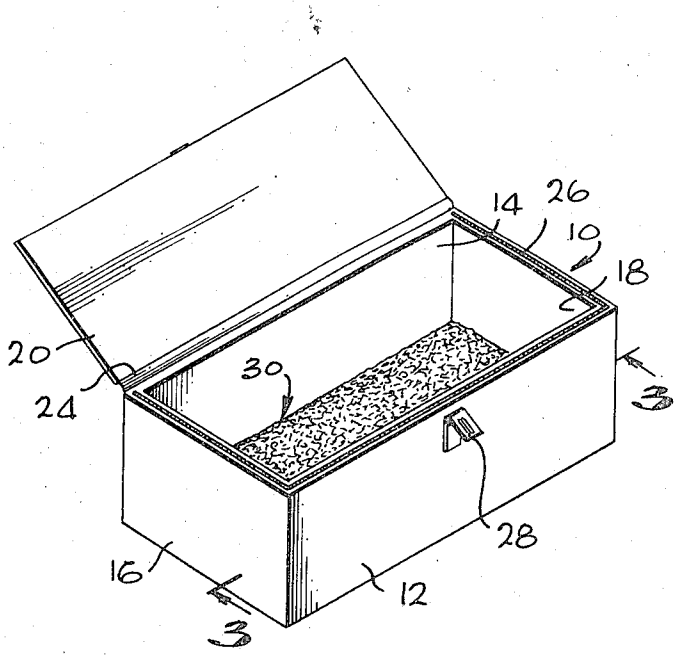


Fig. 1

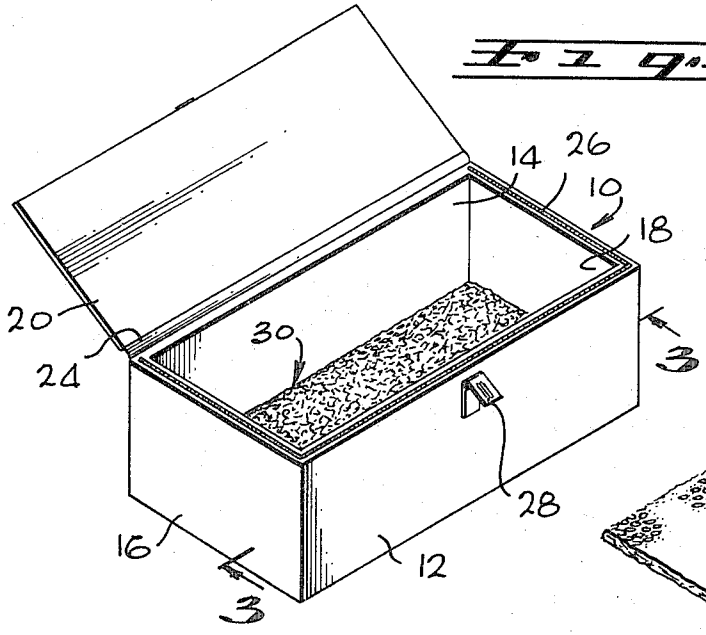


Fig. 2

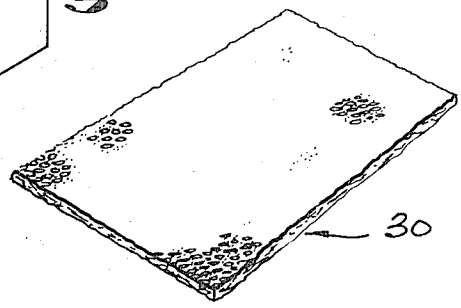


Fig. 3

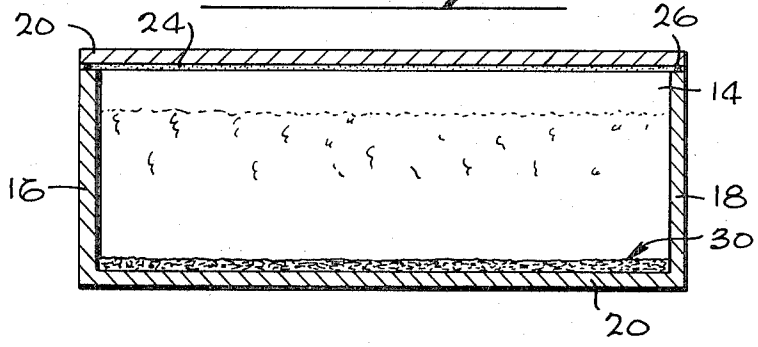
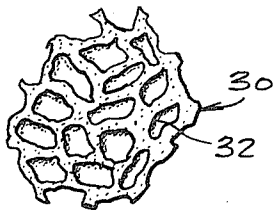


Fig. 5



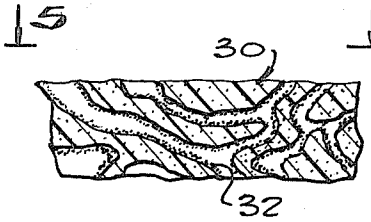
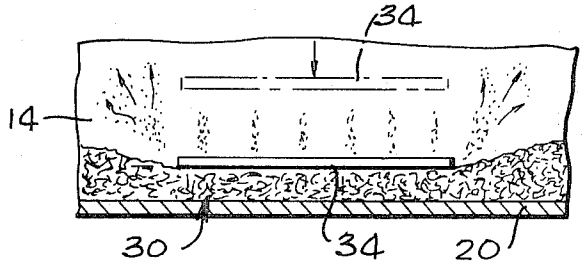


Fig. 4

Fig. 6



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CORROSION-INHIBITING TOOLBOX

BACKGROUND OF THE INVENTION

1. Field of the Invention

The toolbox has a volatile corrosion inhibitor in a carrier therein.

2. Description of the Prior Art

Corrosion has been a natural process which has caused the degradation of many manmade structures. In order to prevent corrosion, wrapping materials have been created which have a chemical therein which inhibits or prevents the rusting of iron and steel, for a reasonable length of time, as long as the metals are quite well wrapped. This has been quite useful for the protection of parts between manufacture and use, including through shipping and reasonable periods of storage.

However, man must continually use tools and most of them are made of steel. Corrosion protection is sometimes obtained by plating, but some tools cannot be properly plated. Thus, they are subject to rusting in most environments. The tools in professional use are usually used with sufficient regularity so that they have a coating of oil maintained thereon. However, tools in home use often go for quite a period between times of actual employment so that their oxidation degradation goes unnoticed and unprotected by oil coating. Of course, the higher the humidity, the faster the oxidation takes place, so that the most severe environment is found in the toolboxes on boats. The presence of salt in the air also seems to advance oxidation rates of iron-containing materials. Thus, toolboxes on boats present the most severe problem and most of these toolboxes are found to be full of rusty tools.

SUMMARY OF THE INVENTION

In order to aid in the understanding of this invention, it can be stated in essentially summary form that it is directed to a corrosion-inhibiting toolbox which has a carrier therein, with a volatile amine nitrite corrosion inhibitor within the carrier so that vapors from the corrosion inhibitor tend to fill the toolbox to protect tools therein from corrosion.

Accordingly, it is an object of this invention to provide a toolbox which contains a corrosion inhibitor. It is a further object to provide a toolbox which is especially well sealed to resist the escape of corrosion-inhibiting vapor from the interior of the toolbox. It is another object of this invention to provide a carrier within the toolbox, which carrier has a volatile corrosion inhibitor therein. It is still another object to provide a carrier in the form of a resilient foamed open-cell material having the volatile corrosion inhibitor impregnated therein, with the foamed material in the bottom of a toolbox so that the placement of tools in the toolbox causes flexure of the foam to expel vapor therefrom.

The features of the present invention which are believed to be novel are set forth with particularity in the appended claims. The present invention, both as to its organization and manner of operation, together with further objects and advantages thereof, may be understood best by reference to the following description, taken in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the corrosion-inhibiting toolbox of this invention, with the inhibitor carrier partly broken away.

FIG. 2 is a perspective view of the carrier for the volatile corrosion inhibitor.

FIG. 3 is an enlarged section taken generally along the line 3–3 of FIG. 1.

FIG. 4 is a greatly enlarged fragmentary section through the resilient foamed open-cell material shown in FIG. 2, illustrating the volatile corrosion inhibitor deposited on surfaces therein.

FIG. 5 is a fragmentary top plan view, taken generally in the direction of arrows 5—5 of FIG. 4.

FIG. 6 is an enlarged section, similar to a portion of FIG. 3, showing the operation of the carrier when a tool is placed in the toolbox of this invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The corrosion-inhibiting toolbox is generally indicated at 10 in FIGS. 1 and 3. The toolbox is of conventional toolbox configuration. It has front and back 12 and 14, ends 16 and 18, and a bottom 20. These parts are preferably integrally and monolithically formed so that there is no leakage out of corner joints. However, if the toolbox is carefully made, it can be constructed of sheet metal with its corners sealed, as by sealant. Additionally, the toolbox 10 has a top or lid 20 which is carried on back 14 by means of hinge 24. The lid is of such design as to fairly well seal with respect to the front, back and ends. Seal 26 is illustrated in the form of a resilient sealing member of circular cross section, although other sealing means can be employed. Lid latch 28 is employed to obtain sealing pressure.

A preferable construction of the toolbox 10 is a construction in which it is injection-molded as a single unit. In such a case, polypropylene is preferred because of its flexibility in hinging. On the other hand, if injection molding of other materials is desired, ABS styrene is a suitable material. In such a case, hinge 24 is separately formed and attached by any conventional means, such as being clamped to the balance of the box. A continuous polypropylene hinge is preferred, in order to maintain full sealing along the hinge side of the top. However, a piano-type hinge can be employed, if it is fairly carefully made with a minumum of opening space, although with somewhat less success. Thus, the corrosion-inhibiting toolbox 10 is especially designed to close as tightly as is practical together with economic construction and further considering the desirability that the lid is quickly and easily opened.

Carrier 30 is preferably in the form of a foamed resilient synthetic polymer composition material having open cells. Open-cell resilient polyurethane, in its lightest densities, is a suitable material, as are other foamed open-cell resilient synthetic polymer composition materials. A rectangular portion of the carrier 30 is cut to be of such size as to preferably fit in the interior of the toolbox on the bottom 20.

Carrier 30 contains a volatile corrosion inhibitor. Salts liberating nitrite ions in neutral or alkaline compositions act to inhibit corrosion. Several nitrite salts have suitable volatility to provide a corrosion-inhibiting vapor. The vapor acts in corrosion inhibition when the vapor atmosphere is maintained around the ferrous metallic structure to be protected. Dicyclohexyl ammonium nitrite is a suitable material for this purpose. It has a moderately low vapor pressure, to thus provide a long-lasting vaporization.

Diisopropyl ammonium nitrite has a higher vapor pressure and, thus, provides more rapid vapor buildup in a closed space, to provide rapid initial protection. A combination of these volatile solid amine nitrite salts provides the desirable features of both nitrites, i.e., rapid initial vapor buildup, followed by long-lasting protection. Other similar materials, particularly in the somewhat volatile solid amine nitrite class, are suitable. Volatility should be in the range from 1×10^{-3} to 5 to 10^{-2} millimeters of mercury at 68° F. to provide a desirable volatility range.

The above-identified materials are crystalline in form and, in accordance with this invention, comprise the volatile corrosion inhibitor which is impregnated into carrier 30. As somewhat diagrammatically illustrated in FIG. 4, crystals 32 of the volatile corrosion inhibitor become coated or deposited on the walls of the cells. An impregnation of the volatile corrosion inhibitor of 3 grams to the cubic foot of carrier 30 is considered optimum, in order to provide fairly long-lasting protection. Furthermore, the carrier 30 is cut to a thickness of from one-quarter to one-half inch, depending in general upon the volume of the toolbox, the tightness of the lid seal, the number of times it is expected to be opened over the life of the corrosion inhibition and the vapor pressure of the crystalline amine nitrite.

In use, for proper corrosion inhibition, the volatile corrosion inhibitor in carrier **30** must regenerate the corrosion inhibition atmosphere every time the toolbox is opened. When the carrier **30** is placed in the bottom of the toolbox, as illustrated, the placement of a tool **34** into the box causes compression of the carrier **30** so that it expels a portion of the corrosion inhibition vapor. The vapors of the indicated amines are heavier than air, and thus tend to remain in the box, as illustrated in FIG. **3**. Thus, use of the toolbox tends to expel the corrosion inhibition vapor from the carrier **30** so that an adequate supply is maintained with the box for tool protection. Adequate protection is obtained, as long as the box lid **22** is maintained closed, except when in actual use, as long as the crystals in the carrier **30** are vaporizing. By selection of those correct amine nitrites and by placement of adequate amount of the crystalline volatile corrosion inhibitor in the carrier **30**, as described above, a reasonable length of time of protection is obtained, experiments indicating 6 months to a year in normal use on a boat continuously exposed to sea air. When the inhibitor material is exhausted, the toolbox can continue to be employed with corrosion inhibition, by replacement of the exhausted carrier **30** with a new one containing its new supply of the corrosion inhibitor.

While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that changes and modifications may be made without departing from this invention in its broader aspects, and, therefore, aim in the appended claims is to cover all such changes and modifications as fall within the true spirit and scope of this invention.

I claim:

1. A corrosion-inhibiting toolbox having a bottom, walls and a substantially enclosing lid, said lid being hinged to one of said walls and being repeatedly openable for access to the interior of said toolbox and being repeatedly closable to substantially enclose the interior of said toolbox, the improvement comprising:

a substantially water-free carrier within and positioned on the bottom of said toolbox for receiving tools placed in said toolbox, said carrier being a resilient open-celled foam material which is repeatedly deflectably squeezable by the gravity load of said tools placed in said toolbox; and

a volatile corrosion inhibitor comprising crystals of volatile amine nitrite in said carrier so that corrosion-inhibiting amine nitrite vapor is emitted from said carrier upon each placement of a tool on said carrier to at least partially fill the interior of said toolbox to inhibit the corrosion of ferrous metallic tools placed therein, whereby said tools can be repeatedly used and, between uses, stored in the tool load produced corrosion inhibition atmosphere in the closed toolbox.

2. The toolbox of claim **1** wherein said crystalline amine nitrites are selected from the group consisting of dicyclohexyl ammonium nitrite and diisopropyl ammonium nitrite, and mixtures thereof.

3. The toolbox of claim **1** wherein at least said walls and said bottom of said toolbox are unitarily formed of injection moldable synthetic polymer composition material.

4. The toolbox of claim **3** wherein said crystalline amine nitrites are selected from the group consisting of dicyclohexyl ammonium nitrite and diisopropyl ammonium nitrite, and mixtures thereof.

5. The toolbox of claim **3** wherein said toolbox lid is unitarily formed with said sides of said toolbox.

6. The process of inhibiting corrosion of ferrous metallic tools comprising the steps of:

placing a substantially water-free resilient foamed open-cell material containing a volatile crystalline amine nitrite ferrous metallic corrosion inhibitor therein in the bottom of a toolbox;

placing a tool within the toolbox so that the foam material is squeezed by the gravity load of the tool on the foam material to emit amine nitrite corrosion inhibition vapors therefrom;

closing the toolbox lid to substantially enclose the interior of the toolbox so that the corrosion-inhibiting amine nitrite vapor is present around the tool in the toolbox until the toolbox lid is next opened to inhibit the corrosion of the tool between the toolbox openings; and

periodically repeating the steps of placement

of a tool within the toolbox to squeeze the amine nitrite corrosion inhibition vapors from the foam material and closing the toolbox lid to substantially enclose the interior of the toolbox, so that tools can be repeatedly used and, between uses, stored in the tool load produced corrosion inhibition atmosphere in the closed toolbox.

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