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PROTECTING LIGHT METAL SURFACES
FROM CORROSIONPercy Frederick George, Midland, Mich., assignor
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Mich., a corporation of MichiganNo Drawing. Application November 28, 1941,
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This invention relates to the protection of light metal surfaces, and is more particularly concerned with a method of preventing corrosive attack by water or aqueous media on containers constructed of magnesium and magnesium-base alloys.

It is well known that the surfaces of light metal containers, such as those formed of magnesium or magnesium-base alloys, are subject to corrosive attack by water and water-containing media, especially when such containers are employed for storing liquid hydrocarbons, such as motor fuels and lubricants. This corrosive attack is due to the fact that an aqueous phase is normally present in the containers resulting from condensation of moisture from the atmosphere occasioned by atmospheric temperature changes. Danger of corrosion is enhanced because the aqueous condensate is almost continually in contact with the bottom of the tank, being heavier than the gasoline or other liquid stored therein, and thus its attack is concentrated on a particular surface, increasing corrosion at that point. In addition, most motor fuels contain tetra-ethyl lead and ethylene dibromide, which substances tend to accelerate corrosion.

In an effort to combat this undesirable corrosive action, various inhibitors, such as alkali fluorides, chromates and dichromates, have been introduced into the solution contained in the storage tank. However, the efficiency of these substances is unpredictable and satisfactory inhibition is not always obtained. Further, most of the commonly used inhibitors either deteriorate or are consumed more or less rapidly and must be frequently replaced in order to secure adequate protection.

It is, therefore, an object of this invention to provide a reliable, efficient method of substantially preventing corrosion of magnesium or magnesium-base alloy containers which are in contact with water or other aqueous media. Other objects and advantages will become apparent during the course of the following description.

The present invention is founded on the discovery that corrosion by water or aqueous media of containers formed of magnesium or magnesium-base alloys may be substantially prevented by adding to the fluid to be stored therein a small quantity of a composition consisting of zinc chromate and calcium carbonate, magnesium carbonate, or magnesium oxide. The relative proportions of zinc chromate to calcium carbonate, magnesium carbonate or magnesium oxide in the composition are not critical and may vary over wide limits. It has been found that, in general, a mixture comprising between 5 to 50 per cent of

calcium carbonate, magnesium carbonate or magnesium oxide, the balance being zinc chromate, provides excellent inhibition.

The following example will serve to illustrate the principle of the invention and to show the improved inhibition obtainable by adding a mixture comprising one of the compounds calcium carbonate, magnesium carbonate or magnesium oxide together with zinc chromate, over zinc chromate alone.

Gasoline containing 6 cc. per gallon of "ethyl fluid," a mixture of tetra-ethyl lead and ethylene dibromide, was placed in a container made of an alloy of 6 per cent aluminum and approximately 1.5 per cent manganese, the balance being magnesium, and 5 volumes of water per 100 volumes of gasoline was added. Into the container there was introduced a small quantity of a mixture consisting of 90 per cent zinc chromate and 10 per cent calcium carbonate, and the same was allowed to stand for a period of 70 days, whereupon the solution was removed and the container examined for corrosion. None was apparent. However, when zinc chromate alone was added to a similar solution stored in a similar container, failure of the container due to corrosion occurred after only 20 days.

Various methods of introducing the inhibiting solution into the liquid in the magnesium or magnesium base alloy container may be employed, the only precautionary measure necessary being to make sure that the inhibitor comes in contact with the aqueous phase of the solution. I have found that satisfactory results may be obtained by inserting the mixture in the form of pressed pills or capsules, or again, the mixture in powdered form may be introduced in a porous bag or like container.

While the invention has been described, and will find its most extensive employment, in preventing attack on magnesium or magnesium-base alloy containers used for storing liquid hydrocarbons in contact with water, it may be employed generally to prevent corrosion of such metals when in contact with water or water-containing media. For instance, the inhibitor may be placed in cooling systems where the circulating fluid contacts magnesium or alloys thereof. Other applications and uses for the invention will doubtless occur to those skilled in the art.

I claim:

1. In a method of protecting a container, the inner surfaces of which are formed of magnesium or magnesium-base alloys, from corrosive attack by water or a water-containing medium,

the step which comprises introducing into said container into contact with the aqueous medium a composition comprising a major proportion of zinc chromate and a minor proportion of a compound selected from the group consisting of calcium carbonate, magnesium carbonate and magnesium oxide.

2. In a method of protecting a container, the inner surfaces of which are formed of magnesium or magnesium-base alloys, from corrosive attack by water or a water-containing medium, the step which comprises introducing into said container into contact with the aqueous medium a composition comprising a major proportion of zinc chromate and a minor proportion of calcium carbonate.

3. In a method of protecting a container, the inner surfaces of which are formed of magnesium or magnesium-base alloys, from corrosive attack by water or a water-containing medium, the step which comprises introducing into said container into contact with the aqueous medium a composition comprising a major proportion of zinc chromate and a minor proportion of magnesium carbonate.

4. In a method of protecting a container, the inner surfaces of which are formed of magnesium or magnesium-base alloys, from corrosive attack by water or a water-containing medium, the step which comprises introducing into said container into contact with the aqueous medium a composition comprising a major proportion of zinc chromate and a minor proportion of magnesium oxide.

5. In a method of protecting a container, the inner surfaces of which are formed of magnesium or magnesium-base alloys, from corrosive attack by water or a water-containing medium, the step which comprises introducing into said container into contact with the aqueous medium a composition comprising 90 per cent zinc chromate and 10 per cent of a compound selected from the group consisting of calcium carbonate, magnesium carbonate and magnesium oxide.

6. A composition of matter for preventing corrosive attack on containers at least the inner surfaces of which are formed of magnesium or magnesium-base alloys, when said surfaces are in contact with water or a water-containing medium, comprising a major proportion of zinc chromate and a minor proportion of a compound selected from the group consisting of calcium carbonate, magnesium carbonate and magnesium oxide.

7. A composition of matter for preventing corrosive attack on containers at least the inner surfaces of which are formed of magnesium or magnesium-base alloys, when said surfaces are in contact with water or a water-containing medium, comprising a major proportion of zinc chromate and a minor proportion of calcium carbonate.

8. A composition of matter for preventing corrosive attack on containers at least the inner surfaces of which are formed of magnesium or magnesium-base alloys, when said surfaces are in contact with water or a water-containing medium, comprising a major proportion of zinc chromate and a minor proportion of magnesium carbonate.

9. A composition of matter for preventing corrosive attack on containers at least the inner surfaces of which are formed of magnesium or magnesium-base alloys, when said surfaces are in contact with water or a water-containing medium, comprising a major proportion of zinc chromate and a minor proportion of magnesium oxide.

10. A method of preventing corrosive attack on containers of magnesium or magnesium-base alloys used for the storage of motor fuel containing tetra-ethyl lead by the small proportion of aqueous condensate normally present in said fuel, which comprises introducing into said containers in such position that it contacts the aqueous phase therein, a mixture comprising a major proportion of zinc chromate and a minor proportion of a compound selected from the group consisting of calcium carbonate, magnesium carbonate and magnesium oxide.

11. In a method of protecting a container, the inner surfaces of which are formed of magnesium or a magnesium-base alloy, from corrosive attack by water or a water-containing medium wherein zinc chromate is introduced into the corrosive fluid as an inhibitor, the method of augmenting the corrosion-retarding effect of the zinc chromate which comprises introducing a compound selected from the class consisting of calcium carbonate, magnesium carbonate and magnesium oxide into the container together with the zinc chromate.

12. A method according to claim 11 wherein the added compound is calcium carbonate.

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