A material and process for providing a corrosion inhibitor cationic film on the exterior aluminum surface of a weapon when contained in a submarine launch tube. An effervescent tablet containing a corrosion inhibitor material is disposed within the launch tube with the weapon and, upon flooding of the launch tube with seawater, the effervescent tablet releases the corrosion inhibitor material into the water to form a solution that coats the exposed aluminum surfaces of the weapon with a cation film of the corrosion inhibitor material.
EFFERVESCENT CATIONIC FILM FORMING CORROSION INHIBITOR MATERIAL AND PROCESS

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the U.S. of America for governmental purpose without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

(1) Field of the Invention

This invention relates generally to a material and process for providing a protective corrosion inhibitor coating to an aluminum surface and relates specifically to a material and process for providing a cationic film corrosion inhibitor coating to the exposed aluminum surfaces of submarine weapons positioned in submarine torpedo tubes for launch.

(2) Description of the Prior Art

Since the introduction of high-strength aluminum alloys for construction of submarine weapons, a continuing problem has been seawater induced corrosion. As used herein, "aluminum" is considered to include aluminum and all aluminum alloys. Numerous attempts have been made to eliminate or minimize this corrosion problem but none have proven completely successful. Some of the techniques considered have included providing a paint or special coating on the weapons and/or the torpedo tubes, use of sacrificial anodes attached to the weapons during tube storage, and the use of premixed corrosion inhibitors in the torpedo tube to replace the conventional use of seawater. All of these methods have limitations and valuable weapon assets continue to be lost to the ravages of corrosion. Additionally, the repair of corrosion damage on the weapons is a time consuming and expensive liability.

Paint and coatings on the weapons suffer from the serious disadvantage of having their integrity broken by scratches and abrasions resulting from repeated tube loading and unloading evolutions. These scratches and abrasions, not only expose the bare aluminum but, also create an unfavorably large cathode-to-anode area ratio with the unpainted torpedo tubes which intensifies the corrosion reaction. Limited coating repair can be performed on the submarine or tender but the original integrity can never be fully restored without making extensive repairs to the weapons. At present, touch-up painting of the weapons, combined with routine preventive maintenance, is the primary corrosion prevention method.

Efforts to coat the interior of torpedo tubes with tar-based paints, to minimize the cathode-to-anode area ratio, have also been considered but no fully successful paint has been found that will maintain adhesion over a long period of time. The resulting paint chips damage the torpedo tube slide valve seals and, even when successful, painting of torpedo tubes is a difficult maintenance problem.

The use of sacrificial anodes, such as zinc and magnesium, attached to the weapon, has been shown to result in a significant reduction of corrosion levels. However, the resulting zinc and magnesium hydroxide precipitates cause serious problems in the operation of the torpedo tube slide valves and in the contamination of the submarine trim and drain system, and as a result, preclude this process from being used.

The use of corrosion inhibiting solutions in the weapon tubes instead of seawater has also been considered but never implemented because of the large volume required for the repeated flood down and draining evolutions which occur. Since space is at a premium on all submarines, there is currently no place to store the required large quantities of inhibitor solutions. Also, some trim and drain system modifications could be expected.

SUMMARY OF THE INVENTION

There is thus a definite need in the art for an improved method to eliminate or minimize the seawater induced corrosion of submarine weapons.

Accordingly, it is an object of the present invention to utilize the advantageous corrosion inhibiting features of the prior art systems while minimizing the disadvantages thereof.

Another object of the present invention is to provide a corrosion inhibitor process for submarine weapons therefor that occupies a minimum of space onboard the submarine.

Another object of the present invention is to provide a corrosion inhibiting process that can be used to supplement current procedures now used on submarine weapons.

A further object of the present invention is to provide an improved process for inhibiting corrosion on submarine weapon systems exposed to seawater that imposes no additional maintenance requirements on the submarine crew.

An additional object of the present invention is to provide a material and process for providing a cation film surface coating on the naturally occurring aluminum oxide surfaces of aluminum and aluminum alloy objects.

According to the present invention, the foregoing and additional objects are attained by combining a premeasured amount of water soluble corrosion inhibitor material with an inert effervescent compound to produce an effervescent tablet. That tablet, upon contact with seawater, naturally disperses to produce a water solution of the corrosion inhibitor material in the seawater. The premeasured amount of corrosion inhibitor is based upon the volume of seawater remaining in a submarine tube when it contains a weapon. In practice, the appropriate size, or weight, effervescent tablet is placed in the dry weapon tube along with the weapon prior to a flood down operation. Upon flood down, effervescence of the tablet releases the corrosion inhibitor into solution with the seawater. This solution of corrosion inhibitor forms a protective cation film on any exposed aluminum oxide surfaces on the weapon. Since the inhibitor is fully water soluble, there is no adverse impact on torpedo tube slide valve operation or the trim and drain system of the weapon tube.

BRIEF DESCRIPTION OF THE DRAWING

The sole drawing figure is a part schematic, part sectional view of a typical submarine launch tube and weapon assembly utilizing the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, portions of a typical submarine launch system are schematically shown and
The present invention relates to the elimination of oxygen reduction reactions occurring at weapon surfaces and the provision of a protective cation film on the naturally occurring aluminum oxide surfaces of the weapon. The invention is employed in a weapons system that includes a method for applying a corrosion inhibitor material to weapon surfaces to prevent or inhibit corrosion, thereby prolonging the service life of the weapon. The method involves loading, flooding, and draining a launch tube, applying an effervescent material to the interior of the launch tube, and subsequently flooding the launch tube to wash the effervescent material off the walls of the launch tube. The effervescent material reacts with the interior surface of the launch tube and the effervescence action produces a protective cation film of said aluminum oxide surface on the weapon.
5. The method of claim 1 wherein the launch tube is a weapon launch tube on a submarine and including the step of loading an aluminum surfaced weapon within the launch tube when placing the effervescent material therein and wherein the step of filling the launch tube with water comprises flooding the launch tube with seawater and the corrosion inhibitor solution resulting therefrom also produces a protective cation film of the corrosive inhibitor material on the aluminum surfaced weapon.

6. The method of claim 5 wherein the water soluble corrosion inhibitor is selected from the group of corrosion inhibitor materials consisting of nickel chloride, praseodymium chloride, neodymium chloride and cerium chloride.

7. A method of simultaneously coating the exposed aluminum surface of a weapon in a launch tube on a submarine with a corrosion inhibitor film, comprising: Providing an effervescent tablet containing a quantity of a water soluble inhibitor material; inserting the effervescent tablet within the weapon launch tube when the weapon is loaded into the tube; and flooding the tube with seawater to cause the effervescent tablet to disperse and form a solution of the corrosion inhibitor material that coats the exterior surface of the weapon with a protective cation film of the corrosion inhibitor material.

8. The method of claim 7 wherein the corrosion inhibitor material is selected from the group of corrosion inhibitor materials consisting of nickel chloride, praseodymium chloride, neodymium chloride and cerium chloride.

9. The method of claim 7 wherein the effervescent tablet delivers a concentration of corrosion inhibitor material of approximately 1000 ppm in the volume of seawater that floods the weapon tube.