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CATHODIC PROTECTION APPARATUS

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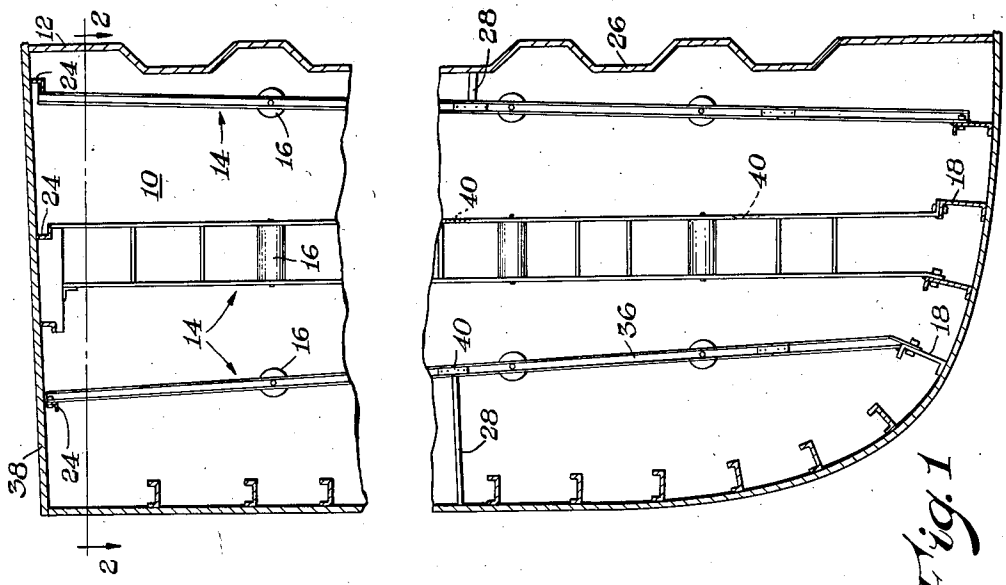


Fig. 1

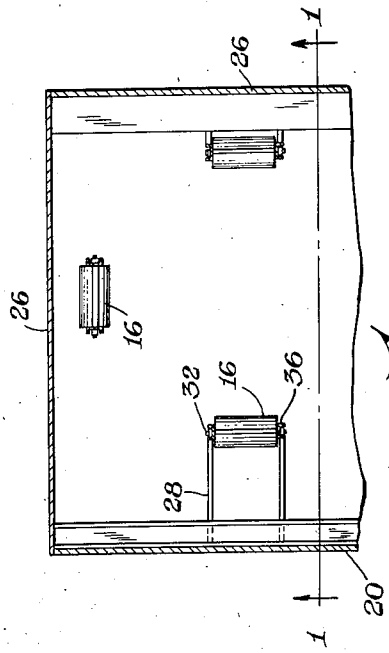


Fig. 2

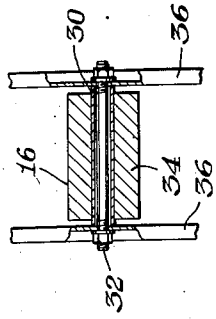


Fig. 3

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CATHODIC PROTECTION APPARATUS

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This invention relates to the cathodic protection of metallic surfaces against electrolytic corrosion, and particularly to means for protecting corrodible metal structures such as the interior portions of tanks.

The cathodic protection of tanks and compartments of ships, particularly ballast tanks which are filled with sea water, has been accomplished in the past with some degree of success. In such cathodic protection systems, the galvanic anodes are usually bolted to special anode hangers which project from the hull or other parts of the ship. Such installations require scaffolding to attach each anode hanger to the hull and to attach anodes to the hangers. Repeated scaffolding in the tanks, such as would be required when replacing consumed anodes with new ones, is not only expensive but often times cannot be conveniently installed due to the maze of cross-bracing in the tank. Thus, the expense of achieving cathodic protection in this manner often proves prohibitive.

Further, when the anodes are mounted on hangers attached to the hull, uneven protection often occurs due to the large current between the anode and that part of the hull which is closest thereto.

Another difficulty in connection with the installation of anodes on hangers is that the hangers are usually welded to the hull, and if the steel adjacent to the weld crystallizes and fractures, loosening the hanger, the anodes which are thus loosened and which are exposed to air may rub against steel and cause sparking. Since gases in explosive concentrations may be present in the tank, sparking would represent an important safety hazard.

Accordingly, a principal object of this invention is to provide an improved means for providing cathodic protection to the interior portion of tanks or compartments.

Other objects of this invention are to provide means for effecting more uniform, safer and more economical cathodic protection of the interior portion of tanks or compartments.

The above and related objects of this invention are achieved by mounting galvanic anodes as rungs on metallic ladders which are suitably disposed within a tank or compartment of a ship. All or part of the rungs of the ladder may be galvanic anodes, the number of anodes depending on the requirements of the installation. The ladders are inserted into the tank or compartments in small sections which, in view of the cross bracing in the tank, facilitate their placement into position for mounting.

Cable means may be used to move the ladders into mounting position in the tank or compartment, eliminating the need for scaffolding. Anodes may be replaced without using scaffolding, since the ladder structure is utilized in raising the anodes into mounting position.

The invention, as well as additional objects and advantages thereof, will best be understood from the following detailed description in connection with the accompanying drawings, in which:

Fig. 1 is an elevational view, partly in section, of a tank or compartment of a steel tanker vessel in which

galvanic anodes are mounted in accordance with this invention; taken along the line 1—1 in Fig. 2.

Fig. 2 is a plan view, partly in section, taken along the line 2—2, in Fig. 1, and

Fig. 3 is an elevational view, partially in section, and on an enlarged scale showing details of mounting a cored galvanic anode in a ladder in accordance with this invention.

Referring to Figs. 1 and 2, there is shown a compartment 10 in a ship 12. Three ladders 14 having a plurality of galvanic anodes 16, such as magnesium anodes, for example, attached thereto each have one end anchored to channel irons 18 welded to the lower part of the hull 20. The other end of each of the ladders 14 is bolted to the bottom of the deck supporting structure 24. Protection against side sway and vibration of the ladder 14 carrying the anodes 16 is provided by the braces 28 which engage each ladder 14 intermediate of its ends and are anchored to bulkhead 26 or hull 20 of the ship 12.

As is shown more clearly in Fig. 3, each anode 16 comprises a hollow steel core 30 around which the consumable metal portion 34 of the anode, usually magnesium or an alloy thereof, is cast. The anode 16 is held in place on the ladder 14 by a bolt 32 which passes through the channel iron side pieces 36 of the ladder 14 and through the anode core 30. The bolts 30 are secured, under tension, to the ladder 14 with a lock nut and washer to insure good electrical contact between the core 30 of anode 16 and the channel iron side pieces 36 of the ladders 14. The number of anodes 16 which are attached like rungs along the ladder 14 depends on the current density and anode life requirements of the cathodic protection installation.

The ends of the ladder are, for safety, both bolted and welded to channel irons 18 and to the deck supporting structure 24.

The spacing and disposition of the ladders 14 within the compartment 10 may be changed to meet particular cathodic protection requirements, but the ladder arrangement shown has proven suitable for many installations. Although only one section of the compartment 10 is shown, in practice other ladders would be similarly disposed within the remainder of the compartment.

The ladders 14 are usually pre-fabricated into lengths or sections which can conveniently be handled within the compartment 10 which usually has considerable cross bracing (not shown). Ten foot ladder lengths have proven to be very practical, but longer lengths have been installed in tank compartments without undue difficulty due to the longer length of the ladder section.

It has been found that the ladders 14 may be conveniently raised into position within the tank compartments without scaffolding. A hoist (not shown) is mounted on the deck 38 above where the ladder is to be secured to the deck supporting structure 24. To facilitate the raising of the ladder, a small hole, large enough to permit a cable to pass through, is drilled in the deck, and a line from the hoist is passed therethrough and is attached to the ladder 14. The ladder 14 is then raised and held in position until it is bolted to the deck supporting structure 24. The worker who secures the ladder to the deck supporting structure 24 uses the ladder 14 as his scaffolding while working.

After the ladder 14 has been bolted and the sections or lengths spliced together, as at 40, the ladder is also welded in place as a safety measure. The cross braces 28 may be installed at this time.

The ladder may be installed either with the rung-like anodes 16 mounted thereon, or the anodes 16 may be mounted later, in the same manner as when consumed anodes are being replaced. The hole in the deck, through which passed the cable for raising the ladders, is closed

after the ladders are installed by welding a bolt therein.

Thus, it can be seen that the present invention provides a convenient, economical means of providing cathodic protection to interior surfaces of tanks or compartments.

That which is claimed is:

1. A cathodic protection system comprising, within a tank having metal surfaces to be cathodically protected, a ladder having metal side pieces made of a metal which is galvanically similar to the surface to be protected connected electrically and mechanically to the said surfaces, and including at least one galvanic anode as a rung thereof, said galvanic anode being electrically and mechanically connected to the side pieces.

2. A cathodic protection system in accordance with claim 1, wherein a plurality of said ladders are disposed within said tank.

3. A cathodic protection system in accordance with claim 1, wherein said anode is secured to said ladder in a readily detachable manner.

4. In a system for cathodically protecting a steel structure immersed in a corrosive aqueous medium, protective means connected mechanically and electrically to the structure and in position to be immersed in the medium and including a ladder comprising a plurality of structurally rigid steel side pieces, and a plurality of rung-like galvanic anodes having hollow steel cores disposed between a pair of said side pieces with said cores in electrical and mechanical contact therewith.

5. A cathodic protection system comprising within a tank having metallic inner surfaces secured to and supported by a metal framing structure, an array of ladders having metal side pieces disposed within said tank and mechanically and electrically secured to said framing structure, at least a part of the rungs of said ladders being galvanic anodes having steel cores which are detachably but electrically conductively secured to said side pieces, said side pieces being cathodic to said anodes.

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