April 26, 1960 E. P. ANDERSON 2,934,484

MOUNTING DEVICE FOR REFERENCE CELLS IN CATHODIC PROTECTION SYSTEMS

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FIG. 1

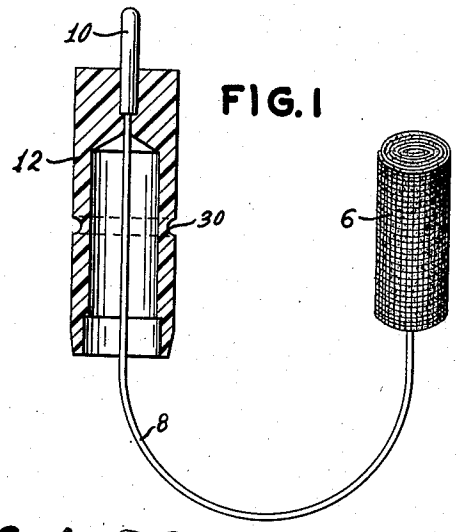


FIG. 2

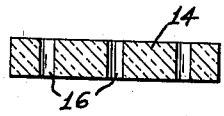


FIG. 4

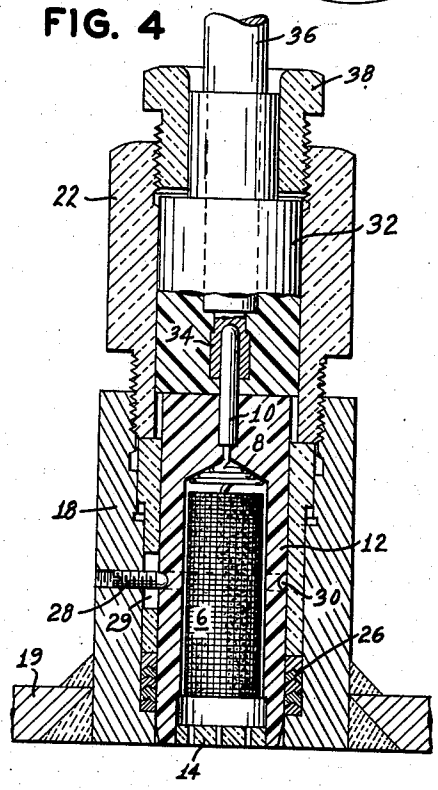
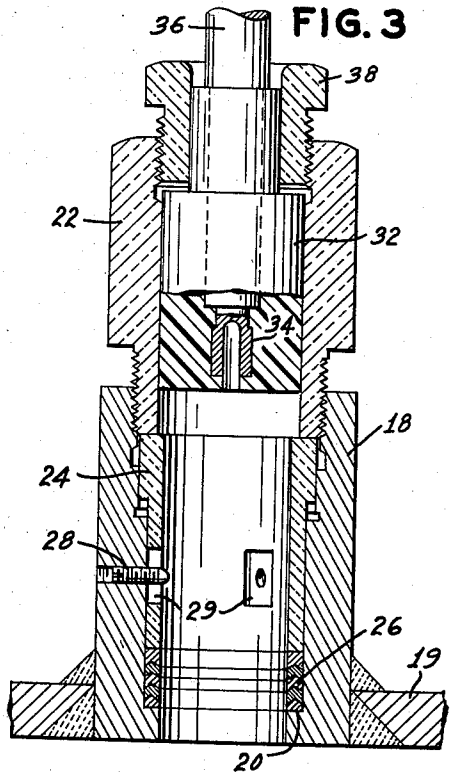


FIG. 3



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MOUNTING DEVICE FOR REFERENCE CELLS IN CATHODIC PROTECTION SYSTEMS

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10 Claims. (Cl. 204—195)

The present invention relates to cathodic protection systems for preventing corrosion of ship hulls or other metallic structures immersed in sea water or other electrolytes and, more particularly, the invention is concerned with a device for mounting reference cells, useful in such cathodic protection systems, in ship hulls or the like.

Most corrosion in aqueous solutions behaves similarly to a battery. Due to metallurgical differences in the steel plating or differences in the chemistry of the water, certain areas of the steel act as the noble side of a battery and are called cathodes while other areas become the active side and are called anodes. In a suitable electrolyte, such as sea water, current will flow within such a local battery.

Protection against corrosion is achieved by changing the potentials surrounding these small local anodic and cathodic areas and, upon applying current from an external anode, the local anodic and cathodic areas of the ship hull will all become cathodic with respect to the surrounding sea water. When this condition is attained, theoretically all local corrosion will cease, but practically cathodic protection can be considered successful if only superficial surface rusting occurs on the protected surface.

Whereas insufficient potentials do not protect the hull against corrosion to the desired extent. excessive current damages the painted areas of the hull and therefore an optimum exists which is known to be subject to fluctuations. This optimum being a function of the degree of polarization of the immersed surface, it is customary to determine the polarization by means of a reference cell which is actually a half cell consisting of a single electrode. When immersed in the electrolyte, a difference of potential between the half cell and the polarized surface is generated and the produced current is used to control the power supply to the anodes of the cathodic protection system such as is described in co-pending application S.N. 513,111, filed June 6, 1955, now Patent No. 2,844,935.

Reference cells, frequently referred to as half cells and having one single electrode, customarily of silver chloride upon a structure of metallic silver, are generally used in connection with cathodic protection systems and the present invention provides a device for conveniently mounting the silver-silver chloride combination hereinafter referred to as the half cell electrode.

In accordance with the invention the device comprises a jacket, secured for example by welding in a port in a ship hull, in the case of cathodic protection of a hull, which jacket contains a casing mounted therein. By means of a packing compressed between the jacket and the casing, the latter is maintained in place, whereby a pressure-tight seal is obtained. The casing serves to protect the half cell electrode which can be easily replaced from inside the ship.

The invention will be further illustrated by reference to the accompanying drawing in which

Figure 1 is a longitudinal section through a casing and a side view of a half cell electrode before assembly,

Figure 2 is a similar section through the closure plug of the casing,

Figure 3 is a longitudinal section through the jacket assembly, and

Figure 4 is a longitudinal section through the entire device after assembling the components of Figures 1 to 3.

The half cell electrode consists of a silver wire screen 6 as shown in Figure 1, impregnated with precipitated silver chloride, rolled in the shape of a cylinder and connected to a wire 8, e.g., a silver wire, the other end of which leads to a connector pin 10. The pin 10 is mounted in the end portion of a casing 12 of insulating, preferably plastic, material and having a cylindrical shape which receives in a cavity therein the rolled half cell electrode 6, the wire 8 being coiled in the upper portion of the cavity as shown in Figure 4. When the electrode 6 and wire 8 are thus assembled, a closure plug 14, shown in Figure 2, provided with a plurality of bores 16 is inserted in the mouth of the cavity in the casing 12. Thereby a cartridge type of replaceable half cell is provided which is easy and convenient to handle, store, and use in connection with the cooperating jacket assembly shown in Figure 3.

This assembly consists of a cylindrical jacket 18 secured for example by welding in a port in the hull 19. The jacket 18 has a cylindrical recess 20 machined in the inner wall thereof and is provided with an internal thread at the opposite end thereof.

An annular jam nut 22 is threaded into the jacket 18 and bears against an annular gland 24 which is axially moved to compress a packing 26 between the end of the recess 20 and the gland 24.

When assembling the device, the casing 12 containing the electrode 6 and sealed by the plug 14 is mounted in the cavity as shown in Figure 4. In order to secure the casing in position, the wall of the jacket 18 is provided with one or more preferably three, radially arranged threaded bores having set screws 28 therein which project through slots 29 in the gland 24 to engage a circular groove 30 machined in the outer wall of the casing 12. Thus, the casing is maintained within the jacket until all of the assembling steps are performed. Under the pressure of the gland 24, the packing 26 produces a tight seal between the inner wall of the jacket 18 and the outer wall of the casing 12.

In order to provide an electrical connection from the half cell electrode to the control circuit of the cathodic protection system on a ship, the center of the annular jam nut 22 is filled with a plug 32 of insulating, plastic material which supports an axially positioned socket 34. Electrical connection between the socket 34 and a cable 36 is made within the plastic plug 32, which is maintained in its position by a circular nut 38 threadably secured in the end portion of the jam nut 22.

The device of the invention permits replacement of the silver chloride half cell without dry docking the ship. After removing the jam nut 22, and removing the set screws 28, the used half cell can be ejected into the sea by inserting a new casing 12 from inside the ship in one operation.

It will be obvious to those skilled in the art that many modifications may be made within the scope of the present invention without departing from the spirit thereof, and the invention includes all such modifications.

What is claimed is:

1. In a cathodic protection system for ships, the hull of a ship, an opening through the hull below the water line, a stuffing box mounted axially in said opening to face the water, an insulating casing having constant cross sec-

tional dimensions, the opening through said stuffing box being at all points greater than the cross section of said casing, the casing forming the centrally sealed element of the stuffing box to permit ejection of the casing into the water and insertion of a new casing from inside the ship following release of the stuffing box pressure, a reference half-cell electrode being secured in said casing, stop means mounted in the inner wall of said jacket for releasably securing said casing against longitudinal movement in said jacket, and means for connecting the reference half-cell electrode to the cathodic protection system.

2. In a cathodic protection system for ships, the hull of the ship, an opening through the hull below the water line, a stuffing box mounted in said opening facing the water and protruding to a point inside the ship, the stuffing box including a removably arranged casing, a reference half-cell electrode being secured in said casing, and means for electrically connecting the reference half-cell electrode to the cathodic protection system.

3. In a cathodic protection system for ships, the hull of the ship, an opening through the hull below the water line, an outer jacket axially secured in the opening facing the water and protruding to a point inside the ship, a casing removably arranged in the jacket, a reference half-cell electrode mounted in said casing, a packing inserted between the jacket and the casing, means for compressing the packing, and means for connecting the reference half-cell to the cathodic protection system.

4. In a cathodic protection system for ships, the hull of the ship, an opening through the hull below the water line, an outer jacket axially secured in the opening, one end of the jacket facing the water, the other end protruding inside the ship, a casing mounted in said jacket, a reference half-cell electrode arranged in said casing, pressure means for removably sealing the casing in the jacket to permit ejection of the casing into the water following release of the pressure, and means for electrically connecting the reference half-cell electrode to the cathodic protection system.

5. In a cathodic protection system for ships, the hull of the ship, an opening through the hull below the water line, a stuffing box mounted in said opening to face the water, a casing forming the centrally sealed element of the stuffing box and adapted to be ejected into the water and replaced by another casing following release of the stuffing box pressure, the opening through said stuffing box being at all points greater than the cross-section of said casing, a reference half-cell electrode being secured in said casing, and means for electrically connecting the reference half-cell electrode to the cathodic protection system.

6. In a cathodic protection assembly for mounting in a wall having a surface to be protected, a half-cell electrode, a jacket secured in an opening in the wall, the jacket having an opening therethrough and continuing through the wall, a casing in the jacket having said electrode mounted therein, the cross-section of said bore at any location being at least as great as that of the casing to permit ejection of the casing into the electrolyte, means mounted in the inner wall of said jacket for releasably securing said casing against longitudinal movement in said jacket, a packing inserted between the jacket and the casing, and means for compressing the packing.

7. In a cathodic protection assembly for mounting in a wall having a surface to be protected, a half-cell electrode, a jacket for mounting at an opening in the wall, the jacket having a bore therethrough, a casing in the jacket having said electrode mounted therein, the diameter at any location of said bore being at least as great as that of the casing to permit ejection of the casing through the opening and the concurrent insertion of a new casing, a packing inserted between the jacket and the casing, and means for compressing the packing.

8. In combination, an electrolyte, the wall of an object in contact with said electrolyte, a cylindrical jacket secured axially in an opening in the wall, the jacket having its front face flush with the contacting surface of the wall, a substantially axial cylindrical bore through the jacket and continuing through the wall, a half-cell electrode, a cylindrical insulating casing in the jacket having said electrode mounted therein, the diameter of said bore at any location being at least as great as that of the casing to permit ejection of the casing into the electrolyte, at least one set screw mounted in the hull of the jacket and engaging the casing, a packing inserted between the jacket and the casing, and means for compressing the packing.

9. In combination, an electrolyte, the wall of an object in contact with said electrolyte, a half-cell electrode, and a cylindrical, threaded jacket secured axially in an opening in the wall, a substantially axial cylindrical bore through said jacket and continuing through the wall, a cylindrical casing in the jacket having said electrode mounted therein, the casing having a perforated plug closure in its end portion facing the electrolyte, the diameter at any location of said bore being at least as great as that of the casing to permit ejection of the casing into the electrolyte, a packing inserted between the jacket and the casing, and means for compressing the packing.

10. In a reference cell assembly for cathodic protection systems, an outer jacket, a consumable reference electrode, an inner casing holding said consumable electrode and mounted in said jacket, packing mounted in the wall of said jacket, means for compressing said packing to obtain a seal between said jacket and said casing, said casing being provided with an electrical terminal on one side of said packing, means for securing a matching electrical terminal to said jacket, a portion of said casing on the other side of said packing being perforated, and means mounted in the wall of said jacket for engaging said casing and preventing longitudinal movement thereof, the inner diameter of said jacket being greater than the diameter of said casing throughout the length of said casing, whereby a new electrode casing may be inserted from one end of said jacket while the old casing is ejected from the other end of said jacket.

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