

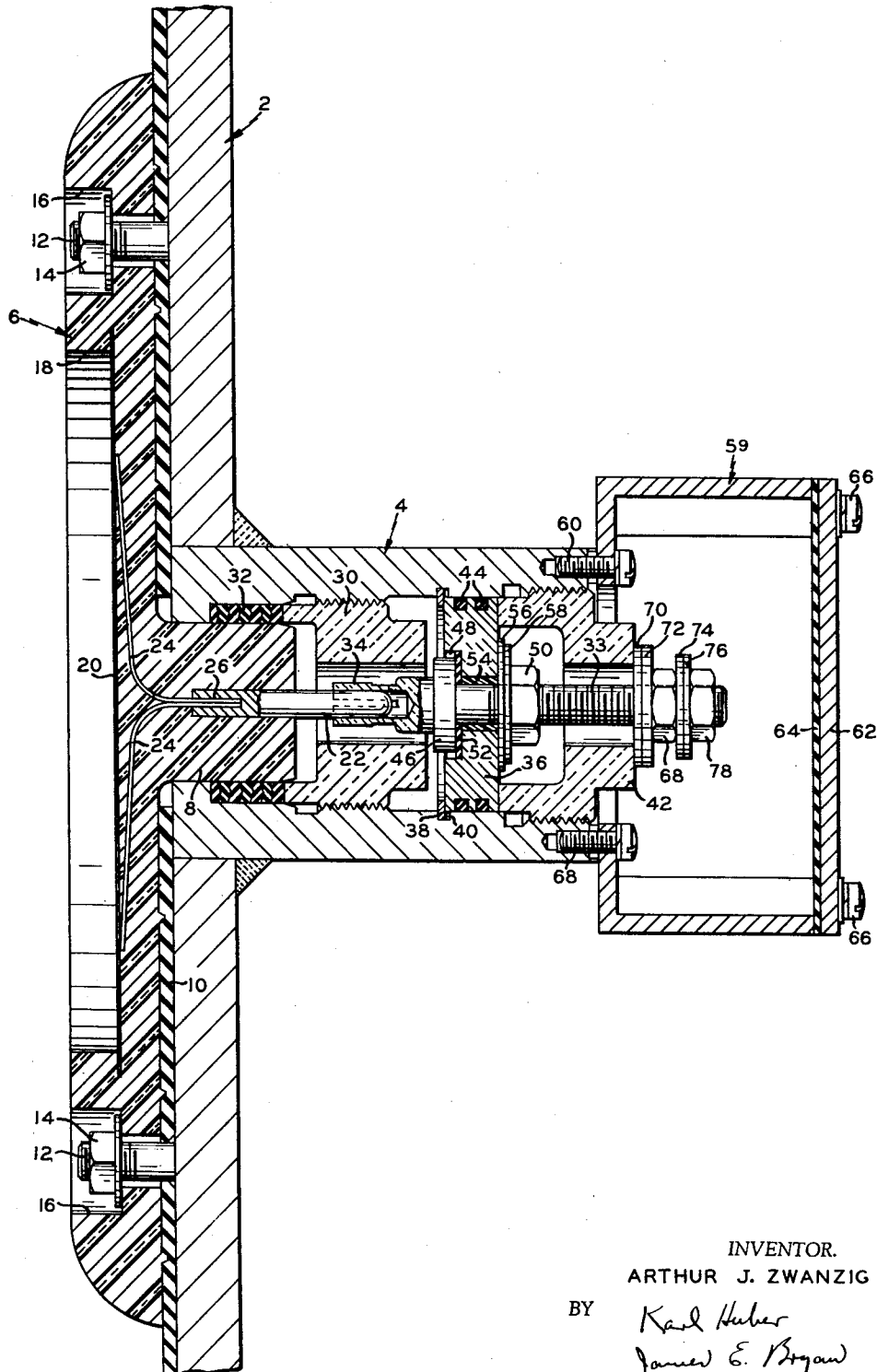
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1

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2 Claims. (Cl. 339-94)

This invention relates to an anode for use in connection with a cathodic protection system for ship hulls, or the like, and also to a stuffing box or packing gland for use therewith.

Most corrosion in aqueous solution 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.

Anodes for use in cathodic protection systems are electrodes affixed to the wetted portion of a ship hull and are connected to the positive pole of a current source carried by the ship, the negative pole being grounded to the hull. The electrical connection to the anode is preferably made by insulated leads through the hull which have to be waterproof and tight enough to withstand the elevated liquid pressures on the hulls of submerged submarines, for example.

The present invention is concerned with an anode for use in cathodic protection systems, especially of ship hulls and comprises a body portion of insulating material, e.g. a polyester resin reinforced with fiberglass and several wires individually imbedded therein, these wires constituting the conductors between the anodic surface of a disc of metal, preferably platinum or an alloy thereof, secured to one surface of the insulating body portion, and are connected to a source of current by a packed lead-in device through the hull. By using a plurality of wires, preferably made from platinum or its alloys, a higher degree of tightness is obtained than heretofore. This result is due to the fact that the surface along which leakage can take place is diminished, as compared to prior anodes with only one conductor. Further, when molding the plastic body portion around the wires, the fact that the wires have only a small diameter and are able to move slightly at the crucial moment of molding the plastic around them, contributes greatly to obtaining a waterproof assembly.

In accordance with a preferred embodiment of the invention, the polyester body has a T-shaped, longitudinal cross section, thus providing a flat portion which supports the anode disc, and a stem normal thereto which carries the electrical connection. This shape permits the anode to be tightly secured into a ship hull by means of a stuffing assembly around the stem portion.

In the accompanying drawing this preferred embodiment is represented by a longitudinal cross section through the anode and the stuffing assembly.

2

A ship hull 2 is drilled and a steel tube 4 is secured thereto by welding.

The body portion of the anode consists essentially of a plate of polyester resin reinforced with fiberglass having the form of a flat circular plate 6 having the stem 8 thereon and having a T-shaped cross section. The stem 8 is fitted into the bore of the tube 4 and inserted until the plate 6 lies flush against the neoprene blanket 10 which separates the hull 2 from the anode and thereby serves as a dielectric shield, as is customary in anode assemblies; the frame securing the edges of the blanket 10 to the hull 2 is not shown in the drawing.

In order to secure the plate 6 to the hull, the latter is provided with the studs 12 spot welded at the corresponding locations to enter into bores in the plate 6, the latter being tightly fastened in place by the nuts 14 received in the counterbores 16.

In the outer surface of the plate 6, a circular recess 18 is machined into which, flush with the bottom of the recess, is mounted the anode, which consists of a circular platinum metal disc 20 of greater diameter than the diameter of the recess 18. By mounting a thin anode in the recess of the plate-shaped body portion, the customary use of a protecting grid is eliminated and thereby the electrical output of the anode is increased.

A connector pin 22, preferably made from brass and being gold plated to insure durability, is inserted axially into the stem 8 and partly imbedded therein. The electrical connection between the connector pin 22 and the disc is accomplished by a plurality of wires 24 individually imbedded into the body portions 6 and 8. These wires as well as the anode disc 20 are made preferably from platinum or alloys of platinum because of the resistance of this metal against corrosion and its conducting properties. In order to obtain a long path of the wires through the polyester resin body and to distribute the current uniformly, a starlike configuration of the wires 24, spreading out radially from the center has been found suitable in which the outer wire ends are welded to the disc 20 and the inner ends are bent towards the stem 8, united into a bundle and silver soldered into an axial bore 26 provided in the imbedded portion of the connector pin 22.

The form of the polyester resin plate, i.e. a cross section in T-shape having a cylindrical stem portion 8, insures further protection against leakage since the stuffing tube 4 in which the stem is inserted is used as the gland for at least one stuffing box. However, for greater security, at least one additional packing unit is provided within the same tube, as illustrated in the drawing.

The first packing unit consists of a threaded jam nut 30 which serves to compress the packing material 32, preferably a cold flowing material such as polytetrafluoroethylene, between the stem 8 and the stuffing tube 4. Since the jam nut 30 has an annular shape, an aperture is provided for the portion of the connector pin 22 protruding from the stem 8.

Electrical connection with the connector pin 22 is made by the stud 33 which terminates in a socket 34 engaging the connector pin.

Within the tube 4 a steel ring 36 is inserted which bears against a flat spring collar 38 inserted into a circular groove 40 in the tube 4 and maintained centered therein by its resiliency. The steel ring 36 is pressed against the collar 38 by a second threaded jam nut 42 and serves two purposes, i.e. by holding within two circular grooves in the ring 36 two O-rings 44, the ring 36 together with the spring collar 38 and the jam nut 42 constitutes a second, auxiliary packing unit which prevents leakage into the ship in case of leakage through the main packing unit, until the damage can be repaired. Further, the steel ring 36 serves to maintain the stud 33 in position along the

3

axis of the assembly. This is accomplished by enlarging a portion of the stud into a shoulder 46 bearing against a circular recess 48 in the cylinder 36. When tightening the nut 50, the stud 33 is firmly held in place whereby electrical insulation and water tightness are assured by the washer 52 and the tube 54, made from any suitable material e.g. neoprene, and a fiber washer 56 and the steel washer 58, inserted between the nut 50 and the steel ring 36.

The stud 33 protrudes from the packing assembly through the circular opening in the jam nut 42 into the connecting box 59 which is secured onto the tube 4 by means of the bolts 60 and sealed by a cover 62 provided with a gasket 64, the cover 62 being secured by the bolts 66. A first nut 68 upon the stud 33, inside the connector box 58 and bearing against an insulating washer 70 and steel washer 72 maintains the stud 33 centered along the axis of the assembly whereas the two brass washers 74, 76 serve to receive the lug of a lead-in cable, not illustrated in the drawing, the latter being secured by tightening the second nut 78.

In providing an anode assembly which is leak proof and also of small dimensions, it was found by tests that the device according to the invention is able to resist a liquid pressure of 3600 pounds per square inch without leaking when the diameter of the stem portion 8 measures 1.5 inches, and the outer diameter of the packing gland, and therefore the bore to be drilled into the ship hull, being 3 inches.

This application is a division of co-pending application Serial Number 682,336, filed September 6, 1957.

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 removable lead-in seal, first and second packing units mounted in series inside one common stuffing tube, each unit comprising a packing and a jam nut, the packing of each of said units engaging the inner wall of said com-

4

mon stuffing tube, each of the jam nuts cooperating with the common stuffing tube, an insulating plug forming the centrally sealed portion of said first packing unit, a connector pin axially imbedded in said plug and protruding therefrom towards the second packing unit, a flat spring collar being inserted in a groove in the inner wall of the stuffing tube for maintaining said cylindrical plug between it and the jam nut of said second packing unit, and a female connector insulatedly extending through the second packing unit for engaging the protruding portion of the connector pin.

2. In a removable lead-in seal, first and second packing units mounted in series inside one common stuffing tube, each unit comprising a packing and a jam nut, the packing of each of said units engaging the inner wall of said common stuffing tube, each of the jam nuts cooperating with the common stuffing tube, an insulating plug forming the centrally sealed portion of said first packing unit, a connector pin axially imbedded in said plug to protrude therefrom towards the second packing unit, the second packing unit including a cylindrical plug carrying O-rings within peripheral grooves, said O-rings engaging the inner wall of said common stuffing tube, a flat spring collar being inserted in a groove in the inner wall of the stuffing tube for maintaining said cylindrical plug between it and the jam nut pertaining to said second packing unit, and a female connector insulatedly extending through said cylindrical plug for engaging the protruding portion of the connector pin.

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