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E. P. ANDERSON

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CATHODIC PROTECTION ANODE ASSEMBLY

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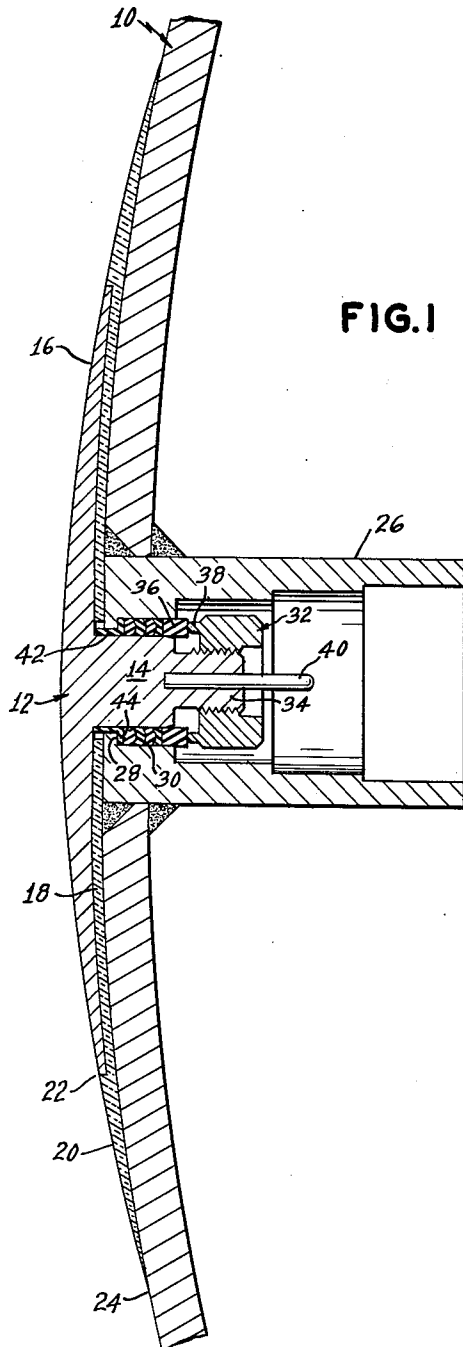
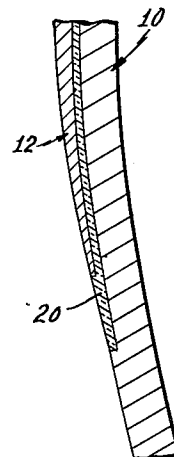


FIG. 2



INVENTOR.
EDWARD P. ANDERSON
BY *Karl Huber*
James E. Bryan
Alan C. Rose
ATTORNEYS

1

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CATHODIC PROTECTION ANODE ASSEMBLY
Edward P. Anderson, Livingston, N.J., assignor, by mesne assignments, to Engelhard Industries, Inc., Newark, N.J., a corporation of Delaware
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This invention relates to an anode assembly for cathodically protecting the hull of a ship and, more particularly, is concerned with an anode assembly causing a minimum of resistance against the relative movement between the ship and the water. This is important for military vessels to eliminate sonic detection by an enemy by means of the sound produced below the water level.

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 ships.

Anode assemblies for the described purpose have been suggested in which a disc-shaped anode is mounted on an insulating sheet made e.g. from neoprene, the sheet being secured to the ship hull and having a larger surface area than the anode to form a circumferential margin. The anode is provided with a stem extending through the hull and cooperating with insulating washers to ensure a tight seal against the surrounding water. In accordance with the invention, the anode surface, the margin of the insulating sheet therearound and the hull form a substantially continuing, streamlined configuration, having minimum resistance to the sea water. As a result, practically no sound is emitted which could be detected by an enemy.

Being provided with a stem which serves for sealing the anode assembly in a bore in the hull, the entire assembly is secured to, and sealed into, the hull according to the invention by means of an especially designed packing unit which maintains it in position solely by the force of a jam nut from inside of the hull, so that the conventional studs and nuts are eliminated and the continuity of the streamlined surface is preserved.

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

FIGURE 1 is a sectional view of an anode assembly, and

FIGURE 2 is a fragmentary sectional detail view of another embodiment of the invention.

Referring to FIGURE 1, the anode assembly mounted in the hull 10 comprises a metallic, disc-shaped anode portion 12 forming one integral unit with a stem 14 and having an outer, curved surface 16, preferably coated with platinum or an alloy thereof, whereas the body 12, 14 may be fabricated from titanium. The disc-shaped portion 12 having suitably the form of a rivet head is received in a recess in an insulating sheet 18 made e.g. from glass-reinforced polyester having a surface area greater than that of the anode disc 12, to form a circumferential margin 20. A continuing surface is obtained, since the depth of the recess is identical with the thickness of the circumferential edge of the anode disc 12, as indicated at 22. Continuity of the surfaces between the hull 10 and the margin 20 is achieved by skiving the edge 24 of the margin 20, so that the thickness of the margin decreases continuously towards the periphery thereof.

The invention further includes an insulating stuffing box assembly for tightly sealing the stem 14 into the hull 10, preferably by means of a tubular gland 26 welded into a bore in the hull 10. The gland 26 has a circular

2

shoulder 28 machined therein, the annular space formed between the stem 14 and the wall of the gland being filled with a conventional packing material 30, e.g. tetrafluoroethylene. An annular, internally threaded jam nut 32 cooperating with an external thread on the protruding portion 34 of the stem 14 serves to compress the packing material 30, preferably over an insulating annular washer 36 mounted between the packing material 30 and an annular projection 38 on the jam nut. Since the washer 36 protrudes into the gland 26 and since the outer diameter of the jam nut is less than the inner diameter of the gland, the jam nut 32 remains spaced and insulated therefrom. Electrical connection with a current source is provided by a connector pin 40 axially secured in a bore in the protruding stem portion 34. An insulating bushing 42 having a flange 44 thereon completes the insulation of the current carrying stem 14 against the gland portion between the shoulder 28 and the neoprene sheet 18.

It will be apparent that compression of the packing 30 is obtained by tightening the jam nut 32 whereby the shoulder formed between the stem 14 and the head 12 bears against the end of the gland 26 and the hull. At the same time, the anode disc 16 together with the insulating sheet 18 is maintained in tight contact with the hull so that the conventionally used outer anode support, maintained by studs through the assembly, is eliminated and the continuity of the surface is preserved.

The embodiment of the invention illustrated in FIGURE 2 provides a recess in the hull 10 which receives the insulating sheet 20, whereby the depth of the recess is substantially identical with the thickness of the insulating sheet to preserve the continuity of the outer surface. Similarly, the anode disc 12 is imbedded into a recess in the sheet 20, as described in connection with FIGURE 1.

The invention has been illustrated herein in connection with a slightly curved portion of a hull. It is noted, that, in the case of flat hull portions the inner surface of the anode head 12 would be a flat surface. In accordance with the invention, however, the outer surface 16 of the anode, the margin 20 and the hull, form a smooth continuous outer surface regardless of the hull shape.

In some cases it has been found useful to provide additional means for maintaining the sheet 18 in its position with respect to the hull 10. This can be accomplished by means of studs welded to the hull and extending through corresponding bores in the margin 20. Such bores would be provided with countersinks which receive a nut cooperating with the stud for firmly securing the margin to the hull. The thickness of the insulating sheet is, of course, suitably proportioned with respect to the size and thickness of the studs and nuts which are employed. The remainder of the counterbore is then filled out with a suitable plastic insulating material in order to form a continuing surface with the surrounding area of the margin. An anode assembly of this general type is described in copending application Serial No. 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 cathodic protection anode assembly, the metal hull of a ship, an insulating sheet secured to said hull, a disc-shaped anode mounted on said sheet, the surface area of said sheet exceeding that of said anode to form a circumferential margin; the anode surface, said margin and said hull forming a substantially smoothly continuing outer surface; said anode having a stem a tubular packing gland secured in a bore in said hull, the stem

3

protruding into said gland, at least one insulating packing compressibly mounted and substantially enclosed between the stem and the gland's inner walls, an annular jam nut threadably engaging the protruding stem portion for both compressing said packing and for forcing said disc-shaped anode toward said hull, the inner diameter of said gland exceeding the outer diameter of said jam nut, and an annular washer arranged between the packing and said jam nut for spacing the jam nut from the gland, said jam nut having an annular projection facing and cooperating with said washer.

2. In a cathodic protection anode assembly, the metal hull of a ship, an insulating sheet secured to said hull, an integral solid metallic rivet-shaped anode having a disc-shaped head with a circumferential edge and a stem thereon; the surface area of said sheet exceeding that of said anode to form a circumferential rim, a recess in said insulating sheet for receiving said head, the depth of the recess being substantially identical with the thickness of the circumferential edge; the outer anode surface, said rim and the hull forming a substantially smoothly continuing outer surface; said stem extending through a bore in the hull, a tubular packing gland secured in a bore in said hull, the stem protruding into said gland, a circular shoulder formed by the inside wall of the gland, at least one insulating packing compressibly mounted and substantially enclosed between the stem and the gland's

4

inner walls, said packing bearing against said shoulder, an annular jam nut threadably engaging the protruding stem portion for both compressing said packing and for forcing said rivet-shaped anode toward said hull, the inner diameter of said gland exceeding the outer diameter of said jam nut, and an annular washer arranged between the packing and said jam nut to protrude into the gland for spacing the jam nut from the gland, said jam nut having an annular projection facing and cooperating with said washer.

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