United States Patent

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[21]	Appl. No.	882,127
[22]	Filed	Dec. 4, 1969
[45]	Patented	Oct. 26, 1971
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- [54] ANODE ASSEMBLY FOR CATHODIC PROTECTION SYSTEMS 4 Claims, 4 Drawing Figs.
- [51]
 Int. Cl.
 204/286, 204/290 F, 204/297

 [50]
 Field of Search
 204/147, 20

148, 196, 197, 286, 297

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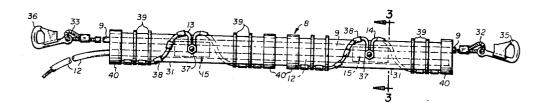
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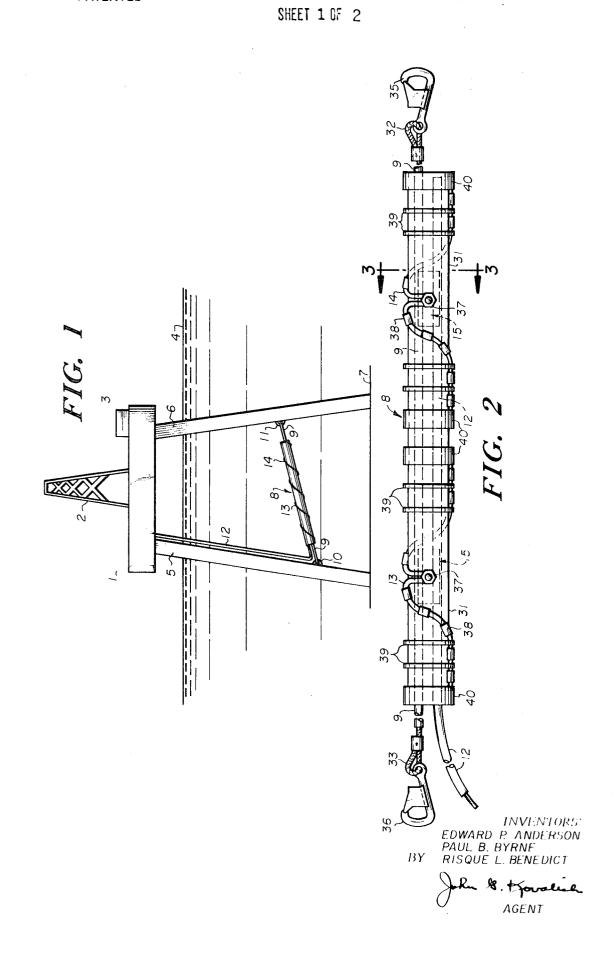
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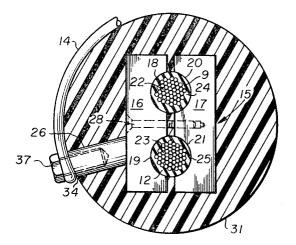
ABSTRACT: An anode assembly for cathodic protection systems, especially for the cathodic protection of submerged spaced supporting legs of offshore platforms, comprising an elongated carrier cable adapted for spanning the spaced submerged legs of the platform and carrying an elongated anode along the length of the cable intermediate the ends thereof, the anode being spaced from the connecting ends of the cable to provide for substantially uniform current distribution to the platform legs.



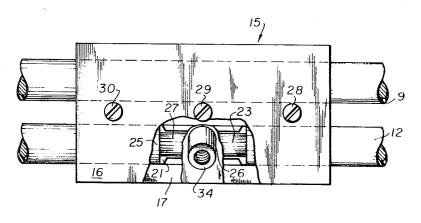
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ANODE ASSEMBLY FOR CATHODIC PROTECTION SYSTEMS

BACKGROUND OF THE INVENTION

An anode mounted on a structure to be cathodically protected generally requires that the anode be insulated from he structure by a dielectric shield around the anode location in order to achieve proper current distribution to the structure being cathodically protected. Without an adequate dielectric shield area around the anode, the current distribution on the 10 cathode surface is not uniform because the resistance through the electrolyte varies considerably from he anode location to the more remote areas of the structure being protected. Consequently, the areas of the structure immediately adjacent the anode could be under more current protection than required while the more remote areas could be underprotected It was found that if a dielectric material, which was impervious to the severe electrochemical reactions inherent in cathodic protection, could be applied in a radius of several feet around the 20 anode, then it was possible to achieve relatively uniform current distribution at a considerable distance from each anode, for example, a series of spaced anodes on a ship's hull. It was further found in the cathodic protection of ship hulls that the useful life of the dielectric shields is about 5 years or so, but 25 this is not a particular disadvantage because the ships can be drydocked at 5 year intervals, or so, and the dielectric shields can be replaced. However, the use of dielectric shields on the submerged legs of offshore platforms is a more serious matter because they don't come into drydock and must remain in 30 place for at least about 20 years, which is longer than the expected life of any dielectric shield material known to date for cathodic protection purposes. Therefore, the present invention contemplates the provision of an active anode remotely positioned from the surfaces being cathodically protected with the elimination of any need for a dielectric shield on the surfaces being protected.

SUMMARY OF THE INVENTION

The invention deals with an anode for cathodic protection systems, especially for the cathodic protection of submerged spaced supporting legs of offshore platforms, comprising an elongated carrier cable adapted for spanning the spaced submerged legs, an elongated electrical conductor positioned ad- 45 jacent to and along the length of the cable, an electrically conductive clamp means clamping the carrier cable and the electrical conductor in parallel spaced relationship and in electrical contact with the electrical conductor, the cable, conductor and clamp means being embedded in an elongated mass of in- 50 sulation material, an electrically conductive member, e.g. a nipple, extending from the clamp through the insulation material, and an elongated anode, e.g. a wire, mounted on the external surface of the insulation material along the length thereof and electrically connected to the electrically conduc- 55 tive member.

DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates an exaggerated elevational schematic view of an offshore platform incorporating the anode assembly of the invention, 60

FIG. 2 illustrates an elevational side view of the anode assembly of the invention,

FIG. 3 illustrates a cross-sectional view along lines 3-3 of 65 FIG. 2, and

FIG. 4 illustrates a partly elevational and partly brokenaway side view of a clamp according to the invention including a carrier cable and electrical conductor clamped therein.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 is an exaggerated schematic view of an offshore platform 1 carrying on its upper surface working structures such as derrick 2 and housing 3. The platform 1 is supported above the ocean surface 4 by a plurality of spaced metal legs of 75 which legs 5 and 6 are shown rising upwardly from the ocean floor 7. The legs, e.g. legs 5 and 6, are cathodically protected by means of the anode assembly of the invention generally designated as 8 and which comprises an elongated carrier cable 9 spanning the spaced submerged legs and connected to connectors such as eyebolts 10 and 11 each mounted on a submerged leg. The carrier cable carries an electrical conductor 12 which leads to the cathodic protection power system (not shown) on the platform. The cable also carries elongated anodes 13 and 14 such as wire anodes, along the length of the cable intermediate the ends thereof, the anode being spaced from the connecting ends of the carrier cable to provide for substantially uniform current distribution to the platform legs.

FIGS. 2 to 4 show the particular anode assembly according 15 to the invention, which comprises the elongated carrier cable 9 adapted for spanning the spaced submerged legs of an offshore platform, or other structures supported by spacedapart submerged metal legs. The assembly further comprises an insulated electrical conductor 12 positioned adjacent to and lengthwise of the cable. The cable 9 and conductor 12 are clamped together in parallel spaced relationship by means of an electrically conductive clamp means generally designated by the numeral 15. The clamp, for purpose of illustration, is shown as of rectangular configuration, but it may also be of substantially cylindrical configuration. As illustrated, the clamp 15 is composed of a pair of mating clamp sections 16 and 17 each channelled on one surface as at 18, 19 and 20, 21, respectively, each of semicircular cross section, so that when the channelled surfaces are positioned adjacent each other they cooperate to form passages of substantially circular cross section for embracing the cable 9 and conductor 12 passing therethrough. As illustrated by FIG. 2, the assembly is provided with a plurality of clamps 15 spaced from each other 35 lengthwise of the cable 9 and conductor 12 with the cable and conductor mounted therein as illustrated by FIGS. 3 and 4. Both the carrier cable 9 and conductor 12 are shown as having a core composed of a plurality of wires 22 and 23, respectively, with the cores being covered by insulation material 24 and 40 25, respectively. One of the clamp sections 16 is provided with an electrically conductive nipple 26 extending outwardly thereof, and the channels 19 and 21 are of reduced cross sec-

tion intermediate their ends so that when assembled, as illustrated by FIG. 4, they form a throat 27 intermediate the ends of the channels. In order that current may be transmitted to conductive clamp 15, the insulation 25 of conductor 12 is stripped off at the location of throat 27 whereby the throat is in electrical contact with the wires 23 of conductor 12. When the two clamp sections 16 and 17 are assembled with the cable 9 and conductor 12 mounted therebetween as illustrated by FIG. 4, the clamp sections are secured together by means of bolts or screws 28, 29 and 30 as illustrated. Having clamped the carrier cable 9 and conductor 12 according to FIG. 4, with the conductor in electrical contact with the clamp 15, the cable 9, conductor 12 and the clamp 15 are embedded in an elongated mass of insulation material 31 e.g. neoprene, as by molding, over a length intermediate the ends 32 and 33 of the carrier cable 9, but with the nipple 26 extending from the clamp 15 through the insulation leaning its end portion 34 exposed through the insulation 31. The nipple 26 is an effective electrically conductive member between the clamp 15 and the elongated anode hereinafter more particularly described. As illustrated by FIG. 2, the ends 32 and 33 of the carrier cable 9 are provided with hooks 35 and 36, respectively, for mounting the cable on connectors 10 and 11 of the legs 5 and 6 and thereby spanning the legs as illustrated in FIG. 1.

Having embedded the cable, conductor and clamp as described above at a location intermediate the ends of the ca70 ble, one or more elongated anodes 13 and 14, e.g. in the form of wire, are mounted on and lengthwise of the surface of the elongated insulation mass 31, e.g. a cylindrical mass. When a plurality of anodes are employed they are spaced from each other along the length of the insulation mass 31. The anodes are positioned in electrical contact with the exposed ends 34

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of the nipples 26 and secured thereto by means of securing bolts 37 as illustrated by FIGS. 2 and 3. However, any other effective securing means may be employed. Preferably, the anode wires, as illustrated, are composed of a titanium, niobium or tantalum wire having spaced platinum sleeves 38 5 mounted thereon along the length thereof. A plurality of retaining rings 39 of insulation resin material are mounted along the length of the insulation mass 31 to retain the anode against the surface of the mass or cylinder 31. A tubing 40 of the same material is advantageously used to retain the end 10 portions of the anode.

As above described, the invention contemplates the provision of an anode remotely positioned from the surfaces being cathodically protected to provide for substantially uniform current distribution. In order to effect the uniform current distribution, the anodes are located on the insulation mass 31 intermediate the ends of the carrier cable with opposite portions of the cable from the location of the ends of the anode to the ends of the cable each being at least as long as the length of the wire anode, or the combined length of a plurality of 20 anodes when a plurality of anodes as illustrated by FIG. 2 are employed. For example, if the anode or combined anodes employed lengthwise of the cable have a length of about 40 feet, then the opposite portions of the cable leading from the vicinity of ends of the anodes to ends of the cable would each have a 25 length of about 60 feet.

Various modifications of the invention are contemplated within the scope of the appended claims.

We claim:

1. An anode assembly for cathodic protection systems comprising an elongated carrier cable having opposite ends, an elongated electrical conductor positioned adjacent to and along the length of the cable, the cable and conductor being embedded in an elongated mass of insulation material along a portion thereof intermediate the opposite ends of the cable, an electrically conductive means in electrical contact with the electrical conductor and extending through the elongated mass of insulation material, the electrically conductive means comprising an electrically conductive clamp embedded in said insulation material and clamping the cable and the electrical conductor in parallel spaced relationship, and an elongated anode mounted on the external surface of the insulation material along the length thereof and electrically connected to the electrically conductive member.

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2. An anode assembly according to claim 1, wherein said electrically conductive clamp comprises an electrically conductive nipple extending through the insulation material.

3. An anode assembly according to claim 1, wherein the elongated anode is a wire anode composed of titanium, niobium or tantalum having spaced platinum sleeves mounted thereon along the length thereof.

4. An anode assembly according to claim 1, wherein opposite portions of the cable from the ends of the anode to the ends of the cable are at least as long as the length of the anode.

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