United States Patent

[11] 3,616,422

[72] Inventors Gordon L. Doremus;
Jack G. Davis, both of Houston, Tex.

[21] Appl. No. 817,916
[22] Filed Apr. 21, 1969
[45] Patented Oct. 26, 1971
[73] Assignee Cathodic Protection Service
Houston, Tex.

[54] GALVANIC ANODE
5 Claims, 4 Drawing Figs.

[52] U.S. Cl. 204/197
[51] Int. Cl. C23f 13/00
[50] Field of Search 204/197, 196

[56] References Cited

UNITED STATES PATENTS

2,303,778 12/1942 Wesley ..... 204/197 X
2,656,314 10/1953 Osterheld 204/197

OTHER REFERENCES

Cathodic Protection of Submarine Pipeline, Bull. 191 pub. by Federated Metals Div. Amer. Smelting and Refining Co., New York 1958

Primary Examiner—F. C. Edmundson
Attorney—R. Werlin

ABSTRACT: A galvanic anode adapted particularly for the cathodic protection of relatively large diameter pipelines submerged in water bodies. The anode consists of a pair of semicylindrical segments constructed of a suitable galvanic metal and having completely embedded within the galvanic metal steel core or armature sections, adapted to be connected together to join the anode sections into a "bracelet" about the pipe.

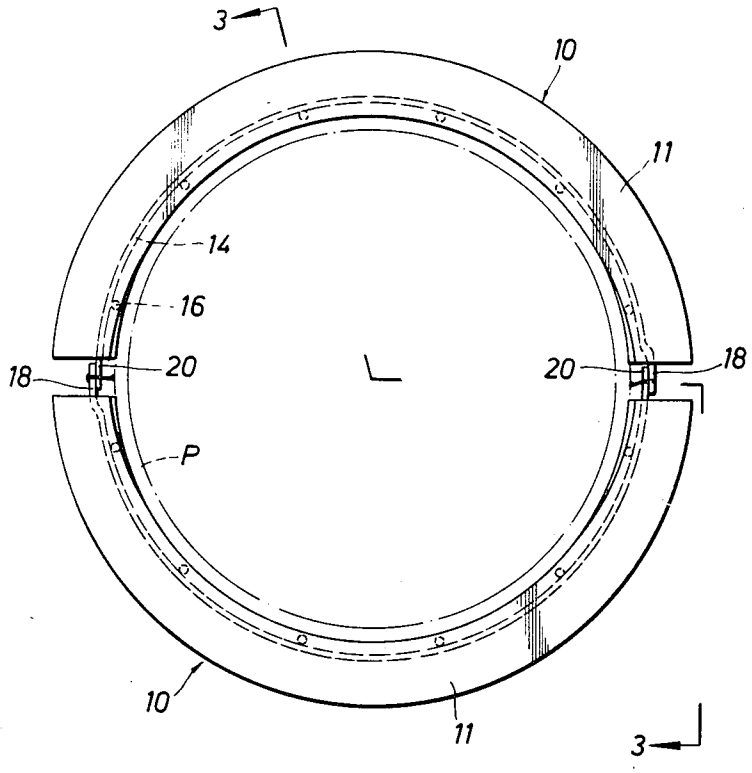


FIG. 1

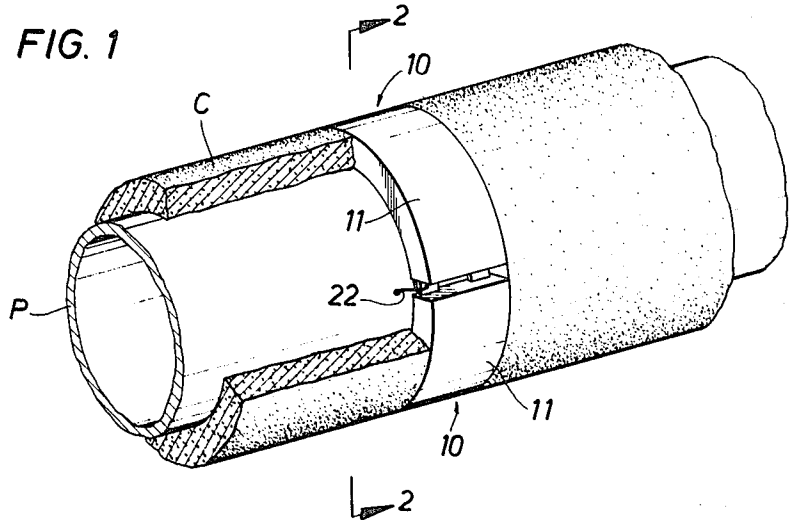
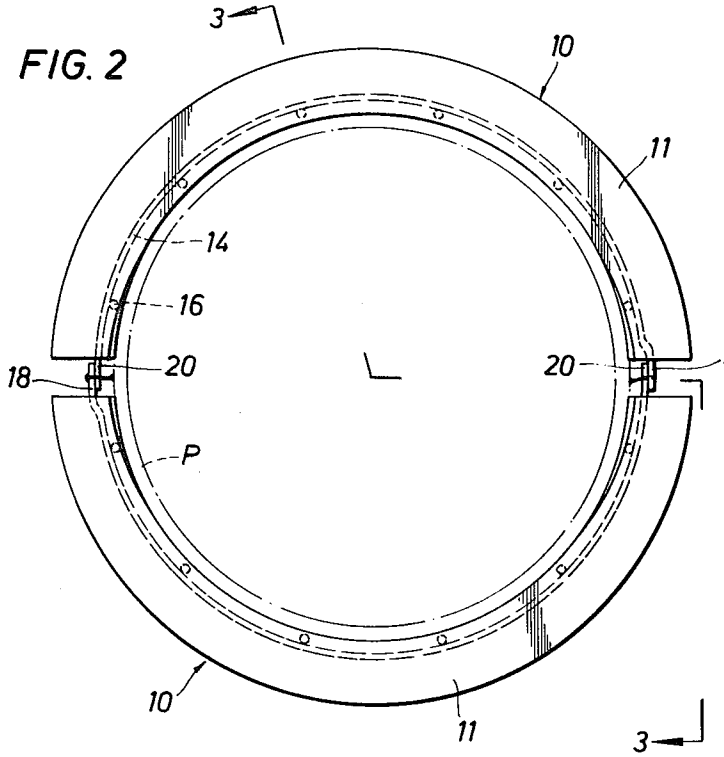


FIG. 2



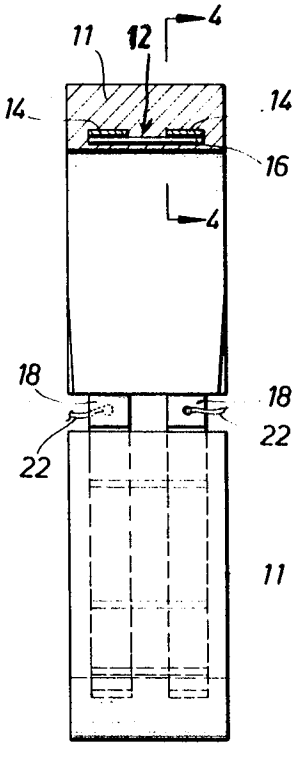


FIG. 3

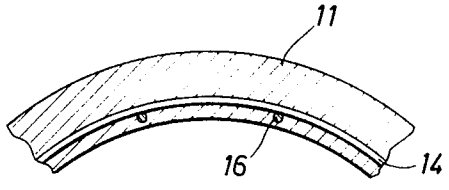


FIG. 4

Gordon L. Doremus &
Jack G. Davis
INVENTORS

BY

ATTORNEY

GALVANIC ANODE

Cathodic protection of submerged pipe lines is currently accomplished by means of so-called bracelet anodes which conventionally consist of semicylindrical segments each fabricated from a plurality of arcuate anode segments, each of which has a longitudinal steel core protruding from the opposite ends thereof. The protruding ends of the cores are welded to semicircular steel bands external to the anode material. The construction of this type of anode is wasteful of labor in requiring multiple handling of the several pieces in forming each bracelet segment. Moreover, the resulting half-bracelets are mechanically weak and often badly deformed in shipping and handling. This is particularly true where anodes are required for relatively large diameter pipe lines, for example 24 inch and larger, for which a relatively large number of arcuate segments are required to make up each half-bracelet. This conventional construction also results in a large area of exposed bare steel demanding protective current of its own from the anode material unless properly coated.

The deficiencies of the above-described conventional bracelet anodes are obviated by the construction contemplated by the present invention wherein each half-bracelet is cast as a continuous semicylindrical segment of anode metal in which is completely embedded, during casting of the anode, a concentric steel core or armature. The latter consists of a pair of spaced-apart parallel straps made from mild sheet steel cross-linked with small diameter steel rods. The ends of the cores protrude from the ends of the anode segments and are provided with offset portions of complementary shape adapted to form the joints by which the segments are connected together to complete the bracelet. Short bending tabs are provided for attachment to the armature joints for electrically connecting the cores to the (cathodic) pipe metal to be protected.

Other and more specific objects and advantages of this invention will become more readily apparent from the following detailed description when read in conjunction with the accompanying drawing which illustrates a useful embodiment in accordance with this invention.

In the drawing:

FIG. 1 is a perspective view, partly in section, showing the anode in accordance with this invention mounted on a pipe line which is also encased in a protective and weighting coating of cement;

FIG. 2 is an end elevational view of the anode;

FIG. 3 is a side view partly in elevation and partly in section taken on line 3—3 of FIG. 2; and

FIG. 4 is a fragmentary cross-sectional view taken along line 4—4 of FIG. 3.

Referring to the drawing, the anode comprises a pair of identical semicylindrical segments, designated generally by the numerals **10**, and adapted when joined at their ends, to completely embrace a pipe P to be protected thereby. By reason of their identical construction, the description of one segment will be equally applicable to the other.

The segment **10** comprises a solid one-piece, semicylindrical body **11** of a suitable anode metal, such as zinc, aluminum, magnesium and alloys thereof, and is formed to an inner radius substantially equal to that of the outside of the pipe about which is to be disposed so as to fit closely thereabout. The angular length of body **11** is made slightly less than 180° to provide a short open space between the opposed ends of the segments to accommodate the joints between the core sections by which the anode segments are connected together as will appear subsequently. The several end surfaces of body **11** are made substantially flat as illustrated.

Body **11** is provided with an armature or core, designated generally by the numeral **12**, constructed of a metal cathodic to the anode metal. Preferably the metal is mild steel but may

be any other metal sufficiently below steel in the electromotive force scale to be effective for cathodic protection. Core **12** is completely enclosed within the body of the anode metal which is cast about the core during forming of the anode segment.

Core **12** is fabricated from at least two bars **14—14** of flat steel disposed in spaced-apart parallel relation and cross-linked by a plurality of angularly spaced, small diameter steel rods **16** to provide a latticelike structure which is formed to a curvature substantially concentric with that of body **11** and on a radius intermediate the inner and outer radii of body **11**, so as to lie closely adjacent the inner wall of body **11**.

The length of bars **14** are made sufficiently greater than the angular length of body **11** to project short distances from the opposite ends of the latter. One projecting end **18** of each bar is offset laterally outwardly to define a socketlike joint member for receiving the non-offset end **20** of the opposed core bar which forms the other joint member by which the cores of the opposed anode segments may be connected together as by welding, in order to complete the bracelet-type anode for the pipe about which it is mounted, as best seen in FIGS. **1** and **2**.

Since these bracelet-type anodes are ordinarily installed over the conventional corrosion barrier coating on the pipe, short bonding cables **22** may be secured to the completed bracelets, preferably at the joints between the core segments, and suitably bonded to the pipe metal to complete the protective circuit.

When the described anodes have been placed about pipe P and the cores connected to the pipe, as seen in FIG. **1**, the pipe, particularly if it is to be submerged in marine bodies, may be encased with cement C (FIG. **1**) for weighting and additional protective purposes in accordance with conventional practices.

From the foregoing, it will be evident that the bracelet anodes constructed in accordance with this invention, provide a simple, easily fabricated, solid structure, which may be installed with a minimum of labor cost to provide highly effective cathodic protection for a pipeline.

What we claim and desire to secure by Letters Patent is:

1. A galvanic anode for cathodic protection of pipe lines, comprising:
   a. a pair of semicylindrical segments adapted to embrace a pipe line, each segment comprising:
      1. a continuous semicylindrical body of a galvanic anode metal;
      2. A metal core cathodic to the anode metal concentrically embedded entirely within the anode metal adjacent the inner periphery of said body;
      3. said core comprising:
         a. at least two axially spaced parallel metal bars;
         b. a plurality of angularly spaced metal rods interlinking said bars;
         c. each of said bars having end portions projecting from opposite longitudinal edges of the anode body to form joint elements for connecting one of said segments to the other in pipe-embracing relation.

2. An anode according to claim **1** wherein said anode metal is a member selected from the group consisting of aluminum, zinc, magnesium, and alloys thereof.

3. An anode according to claim **1** wherein said core is constructed of mild steel.

4. An anode according to claim **1** including electric current conductor elements connected to said core for electrically connecting the core to the pipeline.

5. An anode according to claim **1** wherein one of said end portions is offset laterally to receive the non-offset end portion of an opposed bar to form the joint therebetween.

* * * * *