Sept. 30, 1969 W. F. HIGGINS 3,470,077

SACRIFICIAL ANODES AND METHOD OF USING SAME

Filed Sept. 7, 1967

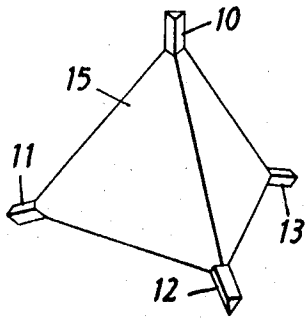
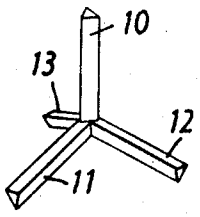


Fig. 1.

Fig. 2.



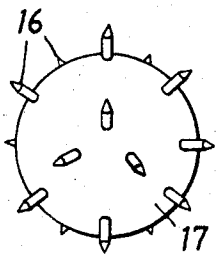


Fig. 3.

INVENTOR:
WILLIAM FREDERICK HIGGINS
By: Wolfe and Wolfe
ATTORNEYS

United States Patent Office 3,470,077
Patented Sept. 30, 1969

3,470,077

SACRIFICIAL ANODES AND METHOD OF USING SAME

William Frederick Higgins, Swinton, England, assignor to Magnesium Elektron Limited, Swinton, England

Filed Sept. 7, 1967, Ser. No. 666,156
Int. Cl. C23f 13/00
U.S. Cl. 204—148 11 Claims

ABSTRACT OF THE DISCLOSURE

An anode comprising a block of sacrificial metal and a metal core embedded therein and projecting therefrom. The block and the core are so arranged that in any position of the anode when placed on a surface of a structure it rests on three separate portions of the core, said three separate portions being small in area relative to the weight of the anode so as to provide a high unit loading.

This invention relates to cathodic protection of a metal structure against corrosion using a sacrificial anode and to the problem of providing a simple but effective electrical contact between the sacrificial metal of the anode and the structure to be protected.

It is well known that a galvanic anode will only function if it is in electrical contact with the structure to be protected.

In the past this has been achieved (1) by the development of steel or other metal cores, cast or otherwise fixed in the body of the anode proper and (2) by welding, bolting, clamping, wiring, or otherwise fixing in good electrical contact such core member or part thereof to the structure to be protected.

These methods of fixing are often expensive and difficult and if insecurely applied may fail and allow the anode to become detached, in which case it no longer fulfils its purpose.

According to the present invention an anode device for protecting a metal structure against corrosion comprises a block of sacrificial anode metal and a metal core that is embedded in the anode metal and projects from the anode metal and is so arranged that in any position of the anode device, when placed on a surface of the structure to be protected, it rests on three spikes, edges, corners or pointed ends on the core. The sharpness of the spikes together with the weight of the anode are sufficient to make and continue the necessary contact with the cathode metal. The end of each spike may be provided with a number of subsidiary spikes so aligned that the anode, in whichever position it is placed, is supported on vertical spikes, so assisting the effectiveness of the contact. Or again in place of an actual spike the end of the protruding rods may be cut at right angles when the anode will rest on three sharp edges or corners, depending on the cross-sectional forms of the rods. The same effect is achieved as with the sharp spike, however, and the essence of the invention is that a very small area of contact is provided so that the unit loading is heavy and the contact therefore good. It can be calculated that if an anode weighing 2 lbs., is supported on three sharp spikes each quarter of a square hundredth of an inch in area, then the pressure per square inch would be 12 tons which is the compressive yield point of mild steel. Consequently a spike sharper than this is unnecessary since it would be distorted and flattened until the increase in area which resulted enabled the steel to carry the weight. If sharper spikes were desired a high tensile steel tip could be provided and this would be advantageous in the case of an anode resting on a metal surface already covered with scale such as a cistern which had been in use for several years.

In the case of a small anode such as is currently used to protect a cold water storage cistern and which may weigh about 2 lbs., the device may be simply dropped into the cistern and the pointed spikes will make contact with the galvanized coating, thus avoiding the need for any special means of attachment.

In the case of a marine tanker where the bottom of the ballast or oil compartments may consist of heavily rusted steel it may be necessary to clean such steel down to bare metal, when first placing the anode, in the location of the spike protrusions; but thereafter the weight of the anode (usually from 50–200 lbs.), together with the vibration which is caused by the ships' propulsive machinery and the operation of cathodic protection itself will suffice to keep the points of contact free from rust or scale.

The invention applies to all sacrificial or galvanic anodes composed to magnesium, zinc, aluminum and their various alloys.

By way of example two constructional forms of the invention will now be described with reference to the accompanying drawings, wherein:

FIGURE 1 is a perspective view of an anode device made in accordance with the invention;

FIGURE 2 is a perspective view of the core thereof; and

FIGURE 3 is a perspective view of another form of anode device made in accordance with the invention.

A domestic cold water anode device suitable for protecting a galvanized cistern is shown in FIGURE 1. The core (FIGURE 2) consists of four iron rods **10, 11, 12, 13**, which are one quarter inch diameter and 5 inches long welded together at a common joint, the rods each having one end welded to the other rods at the joint. The rods extend from the joint in star formation. The angle between any adjacent bars is the same as the angle between other adjacent bars. The bars are of triangular section so that each of their free ends has three sharply pointed corners. The projecting ends of the bars form the corners of a regular tetrahedron. Magnesium base alloy forms the anode metal **15** and is cast round the central junction in such volume that the four rods protrude sufficiently to support the complete structure on any three points when placed on the surface of the article to be protected.

A tanker anode is shown in FIGURE 3. A number (e.g. 12 to 24) of pointed iron rods **16** are welded together in a cluster of regular formation so that their free ends are in approximately spherical formation. The rods each extend from a central joint outwards. A spherical or near spherical mass of aluminium base alloy **17**, such as that known as high purity aluminium +5% zinc is cast round the central boss allowing the printed ends or spikes to protrude sufficiently so that the anode is supported on any three spikes. In the event of moving or rolling the anode will always come to rest on three spikes. Such an anode may weigh up to about 200 lbs. and the diameter of the rods and quality of the steel will be sufficient to support the weight without distortion or blunting.

In addition to the main advantage of requiring no special means of attachment a further advantage is the simplicity with which the anodes can be removed when desired. This asset will be of considerable value to tanker owners who wish to use magnesium or aluminium alloy anodes, yet because of the fear of sparking when the compartment is full of inflammable or explosive vapour, hesitate to do so. The absence of a permanent means of fixing or supporting facilitates their removal when oil is carried and replacement when in ballast.

If desired the anode device may be provided with one or more ropes, chains or other means to limit its extent of movement.

I claim:

1. An anode device for protecting a metal structure against corrosion comprising a block of sacrificial metal and a metal core embedded in the sacrificial anode metal and projecting therefrom, said block and said core being so arranged that in any position of the anode device when placed on a surface of the structure to be protected it rests on three separate portions of the core, said three separate portions each being small in area relative to the weight of the anode so as to provide a high unit loading.

2. An anode device as claimed in claim 1 wherein the core consists of a number of rods connected together at a common joint and projecting from the joint in various directions and anode metal is cast around the joint and rods to leave only the free ends of the rods exposed.

3. An anode device as claimed in claim 2 wherein the sacrificial metal is a magnesium base alloy.

4. An anode service as claimed in claim 2 wherein the sacrificial metal is an aluminum base alloy.

5. An anode device as claimed in claim 2 wherein four rods are provided with their free ends at the corners of a regular tetrahedron.

6. An anode device as claimed in claim 5 wherein the sacrificial metal is a magnesium base alloy.

7. An anode device as claimed in claim 2 wherein 12 to 24 rods are welded together so that their free ends are in an approximately spherical formation.

8. An anode device as claimed in claim 7 wherein the sacrificial metal is an aluminum base alloy.

9. An anode device as claimed in claim 1 wherein the sacrificial metal is a magnesium base alloy.

10. An anode device as claimed in claim 1 wherein the sacrificial metal is an aluminium base alloy.

11. A method of providing cathodic protection of a metal tank against corrosion comprising placing on the bottom of the tank an anode device comprising a block of sacrificial metal and a metal core embedded in the sacrificial metal and projecting therefrom, said block and said core being so arranged that in any position of the anode device when placed on a surface of a structure to be protected it rests on three separate portions of the core, said three separate portions each being small in area relative to the weight of the anode device so as to provide a high unit loading.

References Cited

UNITED STATES PATENTS

3,048,535	8/1962	Sabins	204—197
3,125,499	3/1964	Bender	204—197

FOREIGN PATENTS

471,458	2/1951	Canada.
944,031	12/1963	Great Britain.
960,723	6/1964	Great Britain.
980,860	1/1965	Great Britain.

JOHN M. MACK, Primary Examiner

T. TUNG, Assistant Examiner

U.S. Cl. X.R.

204—197, 286, 288, 289

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,470,077 Dated September 30, 1969

Inventor(s) William Frederick HIGGINS

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, line 4, delete "anode".

SIGNED AND
SEALED
FEB 17 1970

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents