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CATHODIC PROTECTION FOR WATER TANKS

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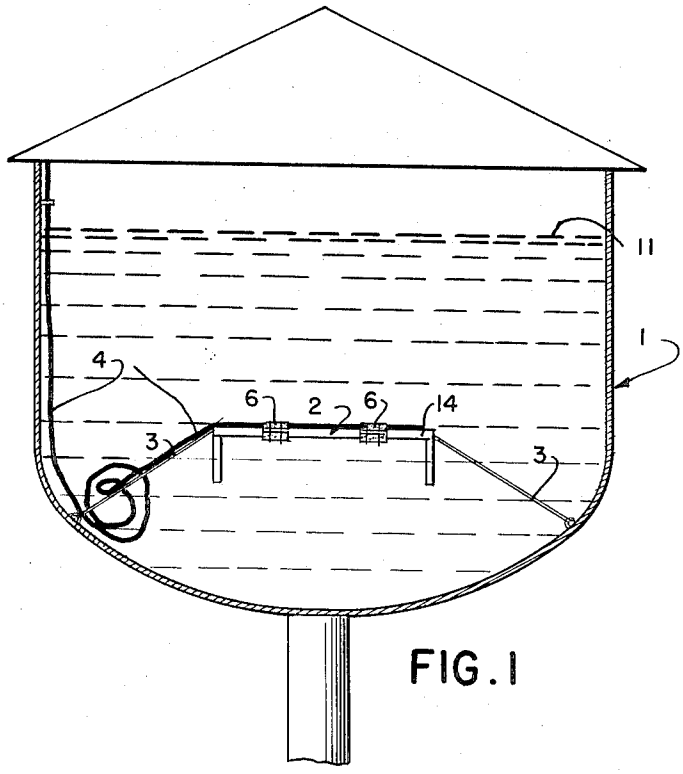



FIG. 1

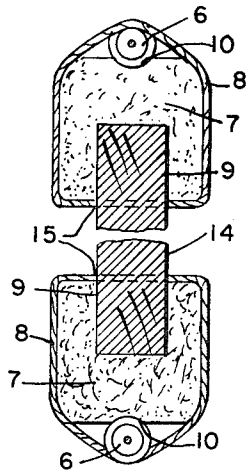



FIG. 3

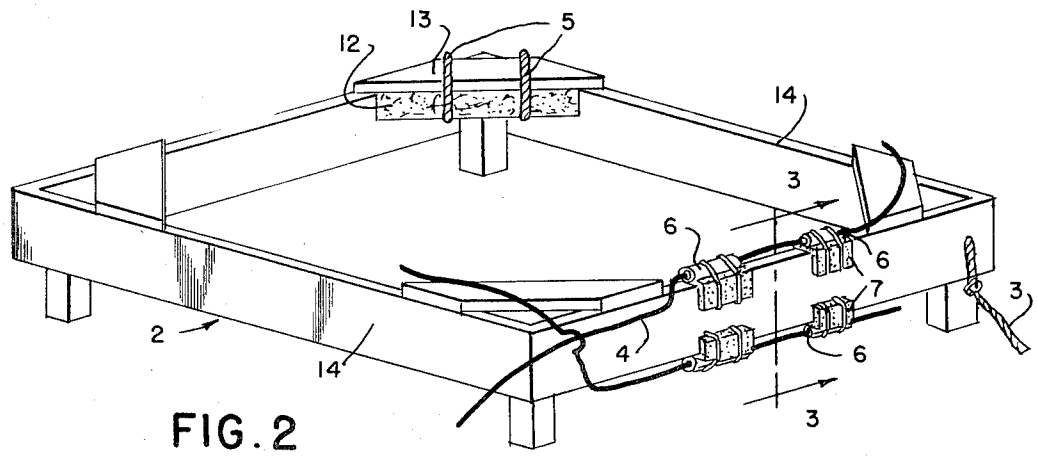



FIG. 2


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# CATHODIC PROTECTION FOR WATER TANKS

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## ABSTRACT OF THE DISCLOSURE

The present invention discloses a support system for cathodic protection apparatus used in liquid containing metal tanks wherein submerged anodes are attached to buoyant submerged means, which means is maintained in a totally submerged condition by flexible attachment to the walls of the water tank, thereby preventing ice accumulation on and damage to the anodes.

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment to us of any royalty thereon.

## BACKGROUND OF THE INVENTION

The invention generally relates to structure for supporting anodes inside liquid containing tanks to provide cathodic protection for the tanks and to prevent the formation of ice on the anodes.

## SUMMARY OF THE INVENTION

The impressed current method of cathodic protection for liquid containing metal tanks is well known in the art. In the absence of cathodic protection, metal tanks, particularly those containing ionic solutions, establish localized electrolysis on the interior of the tank causing corrosion on the tank wall.

By inserting anodes into the tank and sending direct current through the anodes a current flow is established from the anode, through the liquid, the tank wall, and to a ground, although the tank itself may serve as a ground. This system prevents corrosion of the tank.

The anodes must be suspended in the liquid in some manner. The roof of the tank serves as a means for attaching the cable to which the anodes are connected. Since the liquid level in the tank is variable, the cable attached to the roof and several of the anodes connected to the cable may be above the liquid level. In colder climates during the winter months these exposed parts have ice deposited on them which can result in damage to the cable or the anodes due to the weight of ice accumulation. Loss of anodes results in the breakdown of the cathodic protection and requires yearly repair of the protection system.

It is, therefore, an object of the present invention to provide means for suspending anodes in a liquid containing tank such that the anodes will not be susceptible to damage due to ice accumulation.

This object is achieved by securing by some flexible, non-metallic means such as a rope, nylon cord or polyethylene cord, a buoyant submerged means to the lower walls of the tank, and attaching the anodes to the buoyant submerged means.

The buoyant submerged means which may be of any material which will float in the liquid in question is maintained below liquid level by a tie line from the means to the tank walls, preferably being attached in such a manner that the means will be prevented from attaining lateral movement which would cause the anodes to contact the tank walls.



## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view partly in section of the water tank and the buoyant submerged means attached to the walls by tie lines;

FIG. 2 is an isometric view of the buoyant submerged means showing anode attachments on one side member; and

FIG. 3 is a sectional view taken on line 3—3 of FIG. 2 showing the anodes attached to a side member of the buoyant submerged means.

## DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows tank **1** which may be of any configuration or size containing liquid to level **11**. Within the tank, but below liquid level is buoyant submerged means **2**. Buoyant submerged means **2** is kept from floating to the surface by tie lines **3** which are attached at one end to the tank's lower surface by any suitable attaching means and at the other end to the buoyant submerged means **2**, thereby restraining the buoyant submerged means **2**.

FIG. 2 shows buoyant submerged means **2** in an isometric view as being square or rectangular in shape. The shape of buoyant submerged means **2** is not, of course, limited to this configuration, but may take on any desired configuration so long as it remains buoyant. Further, buoyant submerged means **2** may be of any material which will float in the liquid contained by the tank.

In the embodiment of FIG. 2 tie lines **3** attach to the four corners of buoyant submerged means **2**. This type of attachment prevents lateral movement of buoyant submerged means **2**, thereby preventing damage to the anodes from contact with the tank wall. Any sort of attachment which will both secure the buoyant submerged means **2** to the tank and prevent lateral movement of buoyant submerged means **2** is within the scope of the invention.

As shown in FIG. 2, buoyant submerged means **2** is made from wood and its buoyancy is increased by the addition of flotation cells **12** which are attached at the interior corners of buoyant submerged means **2** by block **13** and securing lines **5**. The flotation cells may be of any material which will increase the buoyancy of buoyant submerged means **2** and may be styrofoam or the like.

As shown in FIG. 1, direct current passes through electrical line **4** from outside the tank. Electrical line **4** is insulated and secured to the side of tank **1** until electrical line **4** reaches the point at which one of tie lines **3** is attached to the tank **1**. At this point electrical line **4** is looped to permit slack in electrical line **4** and is attached along the length of tie line **3** to submerged means **2**. The anodes **6**, which may be of any standard design, are connected serially "in line" with electrical line **4** and are attached to both the top and bottom of side members **14** of buoyant submerged means **2**.

Anodes **6** are attached to side members **14** as shown inin FIG. 3 by means of block **7** and tie line **8**. Block **7** has first longitudinal groove **10** which is shaped to conform to the shape of the anode **6**. Andoe **6** rests in groove **10** thereby providing added stability. Block **7** has a second groove **9** which is shaped to conform to the configuration of the top and bottom sides of side member **14**. Side member **14** is inserted into groove **9** such that the sides of block **7** partially enclose side member **14**.

After block **7** has been placed on side member **14** and anode **6** has been laid into groove **10**, tie line **8** is inserted through hole **15** in side member **14**, is wrapped around block **7** and anode **6**, and is tried to secure anode **6** to side member **14**. There are a plurality of anodes attached to both the top and bottom of side members **14** in like fashion. Block **7** is employed to prevent damage to anode

6 and should be a substance such as polystyrene or the like which will not provide a hard anode-block interface.

It is to be understood that any suitable anode attaching technique is within the purview of this invention, the configuration of the buoyant submerged means 2 determining how the anodes should be attached.

We claim:

1. A method of protecting a metallic liquid containing tank against corrosion comprising the following steps:

(a) attaching anode means and associated electrical conductors to a non-conducting buoyant support means;

(b) totally submerging said buoyant support means and attached anode means in the contained liquid by anchoring means directly communicating with a lower portion of said tank; and

(c) impressing direct current to said anode means through said associated electrical conductors which emanate from a power source.

2. A method of protecting a metallic liquid containing tank against corrosion according to claim 1 wherein said anchoring means are flexible.

3. A method of protecting a metallic liquid containing tank against corrosion according to claim 1 wherein said anode means are in direct contact with said buoyant support means.



4. A method of protecting a metallic liquid containing tank against corrosion according to claim 1 wherein said associated electrical conductors emanate from a power source located outside said tank.


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