Sept. 18, 1962 R. C. SABINS 3,054,743

ELECTROLYTIC SYSTEM

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FIG. 1

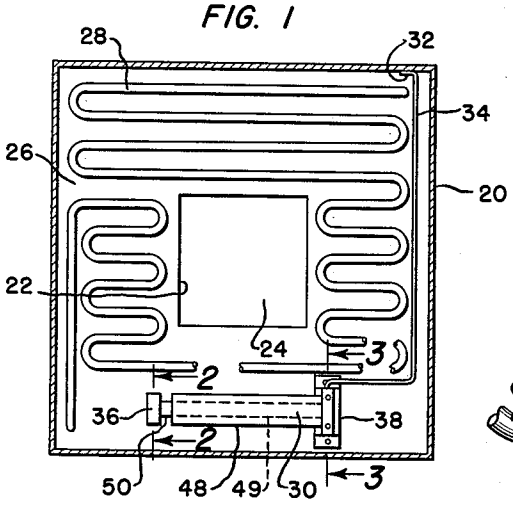
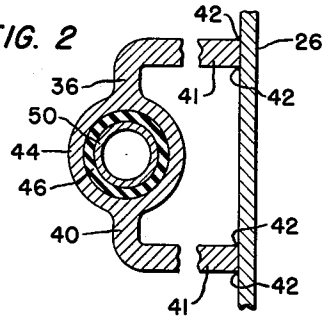


FIG. 2



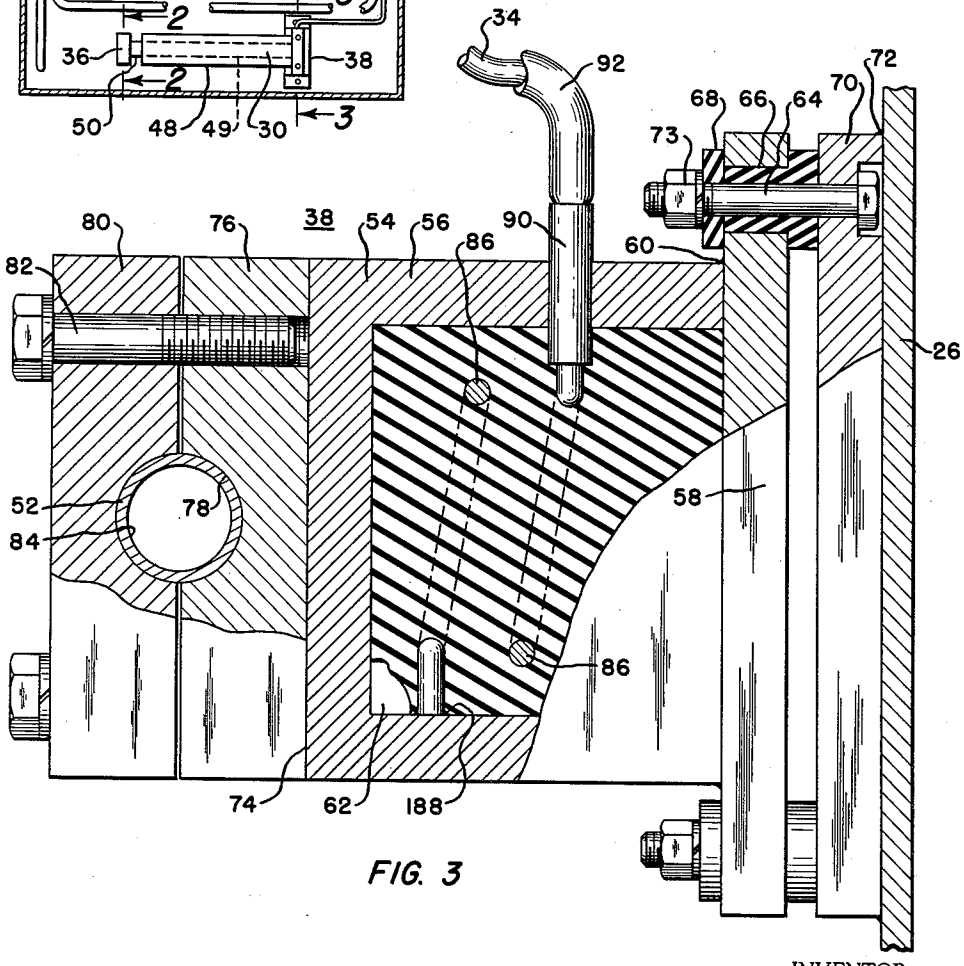


FIG. 3

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ELECTROLYTIC SYSTEM

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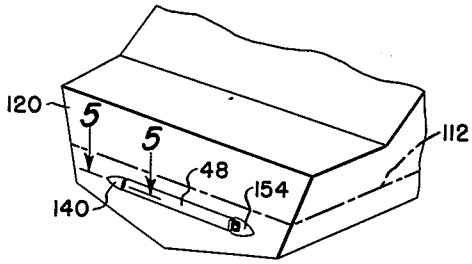


FIG. 4

FIG. 5

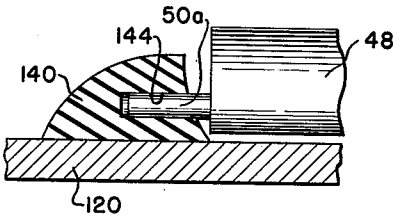
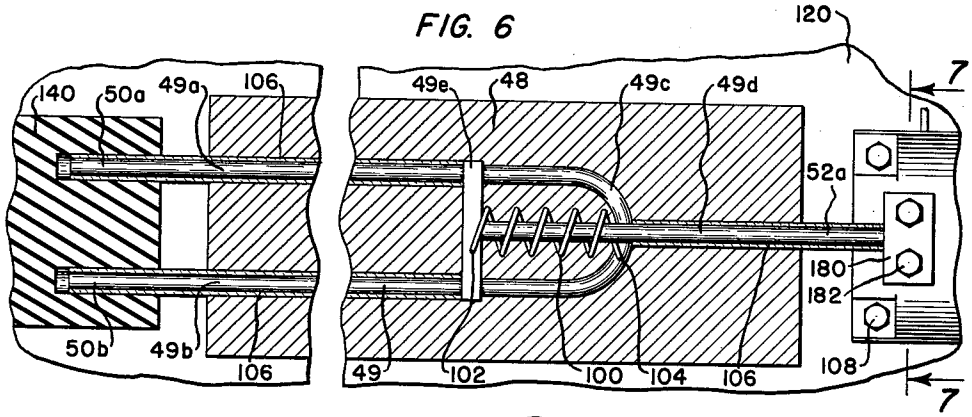


FIG. 6



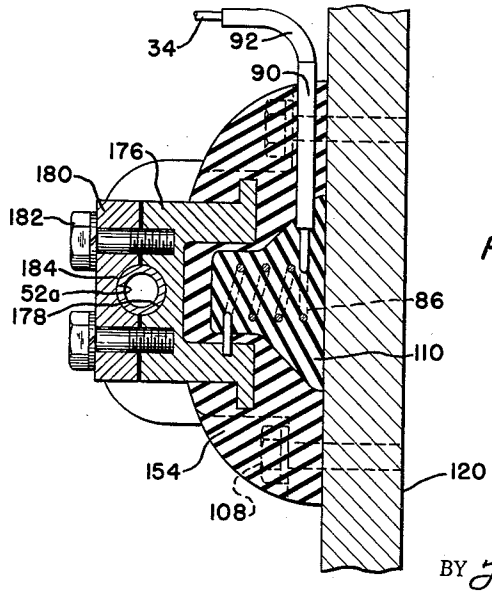


FIG. 7

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ELECTROLYTIC SYSTEM

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12 Claims. (Cl. 204—197)

The present invention relates to anodes and supports therefor and more particularly to anodes of electrolytic systems used for preventing galvanic dissolution of cathodes.

In electrolytic systems of the aforementioned type, it is desirable to provide a resistance in the conductor which connects the anode with the cathodic material. The anode is usually carried by the cathodic material, such as for example the hull of a boat or ship. Also, it is desirable, in such construction, to insulate the support, for the anode, from the hull of the ship.

In one aspect of the present invention, I provide a metallic container for supporting at least a part of the anode. The resistance that is desired is contained in the container, embedded in an insulation. The container, while carried by the cathodic material, is insulated from the cathodic material.

In another aspect of the present invention, the container itself is formed of insulating material, such as nylon. A metal support for the anode is carried by the container, and, the resistance, which is embedded in the container, is electrically connected with the anode.

In another aspect of the invention, the anode assembly comprises a block of sacrificial metal having a terminal extending therefrom, and including a resilient member, in the form of a spring, embedded in the block and electrically connected with the terminal.

More specifically, the anode assembly includes the block of sacrificial material and at least two metal supporting members extending from the block. A resilient member, under stress, is embedded in the block and electrically connected with the supporting members.

In still another aspect of the invention, a part of the conductor members of the anode is embedded in metal-to-metal relationship with the block and another part is insulated from the block by, for example, a sheath of ceramic. In carrying out this phase of the invention, I prefer to have the resilient member in metal-to-metal contact with the block and have the supporting conductor or conductors sheathed in ceramic.

Further objects and advantages will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the invention are illustrated.

In the drawings:

FIG. 1 is a cross-sectional view of a refrigerated tank, showing refrigerator coils attached to a wall therefor and showing one form of my invention applied thereto;

FIG. 2 is a fragmentary sectional view taken on line 2—2 of FIG. 1 but on a larger scale;

FIG. 3 is a fragmentary sectional view taken on line 3—3 of FIG. 1 but on a still larger scale;

FIG. 4 is a fragmentary view of the rear end of a boat or yacht showing the improved anode and the support therefor;

FIG. 5 is a fragmentary sectional view taken on line 5—5 of FIG. 4 but on a larger scale;

FIG. 6 is a longitudinal sectional side view of the improved anode and improved support therefor; and

FIG. 7 is a fragmentary sectional view taken on line 7—7 of FIG. 6 but on a somewhat larger scale.

For the purpose of illustrating one form of my invention, I have applied the same to a refrigerator tank usually employed in ships. In this embodiment the tank is shown at 20 having door opening 22 which is closed by

door 24. This tank contains sea water and is used for storing products to be refrigerated. All or some of the walls of the tank may be provided with refrigerating tubing; here the wall 26 is shown as carrying refrigerating tubing 28.

An anode 30 is carried by the wall 26 and it is electrically connected at 32 by a conductor 34, it being understood that the conductor 34 is insulated from the water in the tank and from the tank itself except at its connection at 32. Two supports 36 and 38 are provided for securing the anode 30 to the wall 26. The support 36 is more clearly shown in FIG. 2 and includes a U-shaped metal bracket 40, the outer legs 41 of which are welded to the metallic wall 26 of the tank as at 42. The yoke 44 of the bracket 40 is cylindrical in shape for receiving a cylindrically shaped bushing 46, formed of insulating material such as rubber.

The anode 30 is herein shown as an elongated block 48 of sacrificial material such as zinc or magnesium alloy. Supporting means 49 for the block includes at least one metallic member extending from either end of the magnesium block 48. This member may be in the form of a continuous pipe or rod having ends 50 and 52. These ends extend outwardly from opposite ends of the block, and the end 50 extends within the rubber tubing 46 and thereby insulatingly supported by the bracket 40.

The support 38 for the end 52 of the supporting member comprises a casing or container. This container 54 is formed of a steel C-shaped member 56, the rear wall of which is closed by a plate 58. The extreme ends of the legs of the C-shaped member are welded as at 60 to the plate 58. The opposite sides of the C-shaped member 56 are closed by plates, one of which is shown at 62. Obviously the member 56 can be cup-shaped and sealed in the same manner with the plate 58.

The plate 58 is carried by a plurality of bolts 64 but is insulated from the bolts 64 by insulating grommets 66 and washers 68; these grommets and washers are preferably formed of nylon. The bolts 64 are suitably carried by a plate 70 which lies parallelly of plate 58 and which is welded as at 72 to the tank wall 26. The container 54 is held in position on the bolts 64 by the nuts 73 on the bolts 64.

The front side 74 of the container 54 carries a bronze or brass block which is suitably secured to the front side 74 as, for example, by silver soldering. The front side of the plate 76 is provided with a horizontally extending and semi-cylindrically shaped socket 78. A block 80 is adapted to be clamped to the block 76 by a plurality of bolts 82 which are threadedly engaged with the block 76. This block 80 is provided with a rearwardly facing, horizontally elongated, semi-cylindrically shaped socket 84 which complements the socket 78 in block 76 to form a horizontally extending socket for receiving the anode-supporting end 52. When these bolts 82 are tightened, the end 52 is tightly clamped between blocks 76 and 80.

The end 52 of the anode support 49 forms a terminal for the anode assembly. The interior of container 54 contains a resistance element 86, one end of which is suitably secured to the metallic container 54 as by silver solder, as at 188. The other end of the resistance element 86 extends through a top wall of the container 54 but is insulated therefrom by a tubular shaped insulator 90. This resistance element 86 is connected to the conductor 34, and, as previously stated, conductor 34 is insulated by an insulated sheathing 92, from the environment of the water and from the tank, and has its other terminal end connected with the tank as at 32.

From the foregoing it will be seen that the anode assembly can be readily removed from or attached to a supporting wall such as wall 26 of the tank. To remove

the anode assembly, it is necessary merely to remove bolts **82** and block **80**. The end **52** of the support **49** can then be removed from the socket section **78** and the end **50** of the support can then be withdrawn from the bracket **40**. In assembling, the end **50** is inserted within the bracket **40**, and then after the end **52** is placed in the socket section **78**, block **80** is added. Thereafter the block **80** is secured in position by bolts **82**, thus clamping the end **52** between the socket section **84** and socket section **78**.

The support for the block of anode **48** may be of the type as shown in FIG. 6, in which the integral anode support **49** includes a U-shaped or hairpin shaped element including legs **49***a* and **49***b*, and a yoke **49***c*, and including a leg **49***d*, including the T-bar **49***e*. The T-bar **49***e* is welded to the legs **49***a* and **49***b*, and the portion **49***d* is welded to the yoke **49***c* to form said integral support. Obviously if this type of support is employed, it would be provided with two insulated sockets for the ends **50***a* and **50***b* of the legs **49***a* and **49***b*. Such type of socket is shown in FIGS. 5 and 6, but in this embodiment, instead of employing a bracket, a nylon block **140** is employed having two sockets **144** for receiving the ends **50***a* and **50***b*. This nylon block **140** may be secured to the cathodic material **120** in any suitable manner.

Inasmuch as there is a different coefficient of expansion between the steel members **49** and the sacrificial metal, it is impossible to maintain a satisfactory metal-to-metal contact between the supporting member **49** and the body of the sacrificial metal. Also during the dissolution process of the anode, an undesirable gap is established between the metal support and the body of the anode. I have found that by moulding the sacrificial metal about a resilient element such as a coil spring under stress, satisfactory contact is maintained between the coil spring and the body of the sacrificial metal. I have shown such a resilient member in the form of a coil spring at **100**. This coil spring is preferably formed of a cadmium coated steel spring having one end welded as at **102** to the T-cross **49***e* and the other end **104** welded to the yoke **49***c*. The spring is attached by fusion to the sacrificial metal.

It is desirable to provide a relatively large mass or body of sacrificial metal so that the labor cost of renewing the anode is reduced to a minimum; however, once such large mass of sacrificial metal is employed, a substantial support must be provided for this mass, and usually steel is employed for such support since other materials will not withstand the fusing temperature of the sacrificial metal such as magnesium alloy. The contact between such steel support and the magnesium alloy provides for a greatly in excess dissociation by local electrolysis when used as an anode in an electrolyte, resulting in wasteful dissolution of anode material and unsightly accumulation of calcarious build up on the conductor steel support. To solve this problem, I have provided for limiting the area of supporting metal in actual contact with the sacrificial metal which it supports. This I accomplish by providing sheaths of insulating material about a major portion of the support **49**. The insulating sheath is herein shown as ceramic material **106**. This ceramic material covers substantially the major portion of legs **49***a* and **49***b* and the major portion of T portion **49***d*. I have found that ceramic material can be coated on the metal and can withstand the fusion temperature of the magnesium alloy when the magnesium alloy is moulded about the support **49**.

The end **52***a* of the support shown in FIG. 6 may be supported by the cathodic material **120** as is shown in FIG. 3, however, another form is shown in FIGS. 6 and 7 wherein the container is formed of nylon and is secured in any suitable manner to the cathodic material **120** as by bolts **108**. In either event, the resistance element **86** is embedded in an air-drying material such as epoxy and versamid 110. In this embodiment block **176** formed of either brass or bronze is moulded in the nylon **154**. This block is provided with a horizontally extending semi-cylindrical socket **178**. Like in FIG. 3, the block **180** is provided with a horizontally extending semi-cylindrical socket **184** which complements socket **178** for clamping the end **52***a* of the support **49** in position. This is accomplished through the bolts **182**. In this embodiment the resistance **86** is suitably connected to the block **176** as by silver solder.

The supports for the anode assembly as shown in FIGS. 5, 6 and 7, is particularly adaptable to the transom end **120** of the hull of a yacht, as is more clearly shown in FIG. 4. This anode assembly, of course, is placed below the water line generally indicated by the dot and dash line **112**. Here again when it is desirable to renew the anode assembly, it is necessary only to remove bolts **182** and then remove the brass or bronze block **180**. The right end of the anode assembly can then be removed from the socket section **178**, and then the entire assembly is moved to the right to withdraw the ends **50***a* and **50***b* from the socket **144** of the nylon block **140**. The reverse is carried out to insert a new anode assembly.

While the forms of embodiments herein shown and described constitute preferred forms, it is to be understood that other forms may be adopted falling within the scope of the claims that follow.

I claim:

1. In combination, an element adapted to be protected against galvanic dissolution; an anode; means comprising a metallic container, insulating means, and metallic support means, said container being carried by said element, said insulating means being interposed between said container and said element for insulating said container from said element, and said metallic support means being secured to said container for carrying said anode insulated from said element; and an electrical resistance within said container and having one end electrically connected to said metallic support means and the other end insulated from said support means and connected with said element.

2. In combination, an element to be protected against galvanic dissolution; means comprising a metallic container and metallic support means for an elongated anode; an electrical resistance within said container and having one end electrically connected with said metallic support means; means insulating the other end from said metallic support means; a conductor connecting said other end of the resistance with said element; supporting members positioned at opposite ends of the anode, one of said members being metallic and being removably carried by said metallic support means; and means including a socket carried by and insulated from said element for removably receiving the other of said members.

3. The combination as defined in claim 1, characterized in that the container contains a plastic insulation and that the resistance is embedded in the insulation.

4. The combination as defined in claim 2, characterized in that the other supporting member is also metallic and that the socket means is insulated from the element.

5. The combination as defined in claim 2, characterized in that the container contains a plastic insulation and that the resistance is embedded in the insulation.

6. The combination as defined in claim 2, characterized in that the container contains a plastic insulation and that the resistance is embedded in the insulation, and further characterized in that the other supporting member is also metallic and that the socket means is insulated from the element.

7. In combination, an element to be protected against galvanic dissolution; an anode; means comprising a metallic container said container forming a support for said anode; an electrical resistance within the container having one end electrically connected with the metallic anode support and having the other end insulated from the

support and connected with said element; threaded members secured to the element and extending outwardly therefrom, said container being removably carried by the threaded members; and means insulating the container from said threaded members and said element.

8. In combination, an element to be protected against galvanic dissolution; an elongated anode; means comprising a metallic container, said container forming a support for said anode; an electrical resistance within the container having one end electrically connected with the metallic anode support and having the other end insulated from the support and connected with said element; threaded members secured to the element and extending outwardly therefrom, said container being removably carried by the threaded members; means insulating the container from said threaded members and said element; supporting members at opposite ends of said anode, one of said members being metallic and being removably carried by said metal anode support; and means including a socket carried by the element for removably receiving the other member.

9. The combination as defined in claim 8, characterized in that the other supporting member is also metallic and that the socket means is insulated from the element.

10. An anode comprising a block of sacrificial metal; an integral supporting means for the block of metal embedded in the metal including a metallic section extending outwardly of one portion of the block forming a support, a second section extending outwardly of another portion of the block; and a resilient metallic member embedded in the block and having the end thereof connected with spaced apart portions of said sections, said resilient metallic member being biased away from its normal position whereby the resiliency of said resilient metallic member tends to urge said member against said block and toward its normal position.

11. An anode comprising a block of sacrificial metal; an integral supporting means for the block of metal embedded in the metal including a metallic section extending outwardly of one portion of the block forming a support, a second section extending outwardly of another portion of the block, said sections being secured to one another for current conduction therebetween; and a resilient metallic member embedded in the block and having the end thereof connected with spaced apart portions of said sections, said resilient metallic member being biased away from its normal position whereby the resiliency of said resilient metallic member tends to urge said member against said block and toward its normal position.

12. An anode comprising a block of sacrificial metal; supporting means for the block of metal embedded in the block including a U-shaped metal section having the tines thereof extending outwardly of one end of the block and including another metal section welded to said U-shaped section extending from the opposite end of the block; said anode including a metallic spring connected to said sections and embedded in the block, said metallic spring being biased away from its normal position, whereby the resilience of said spring tends to urge it against said block and toward its normal position.

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