

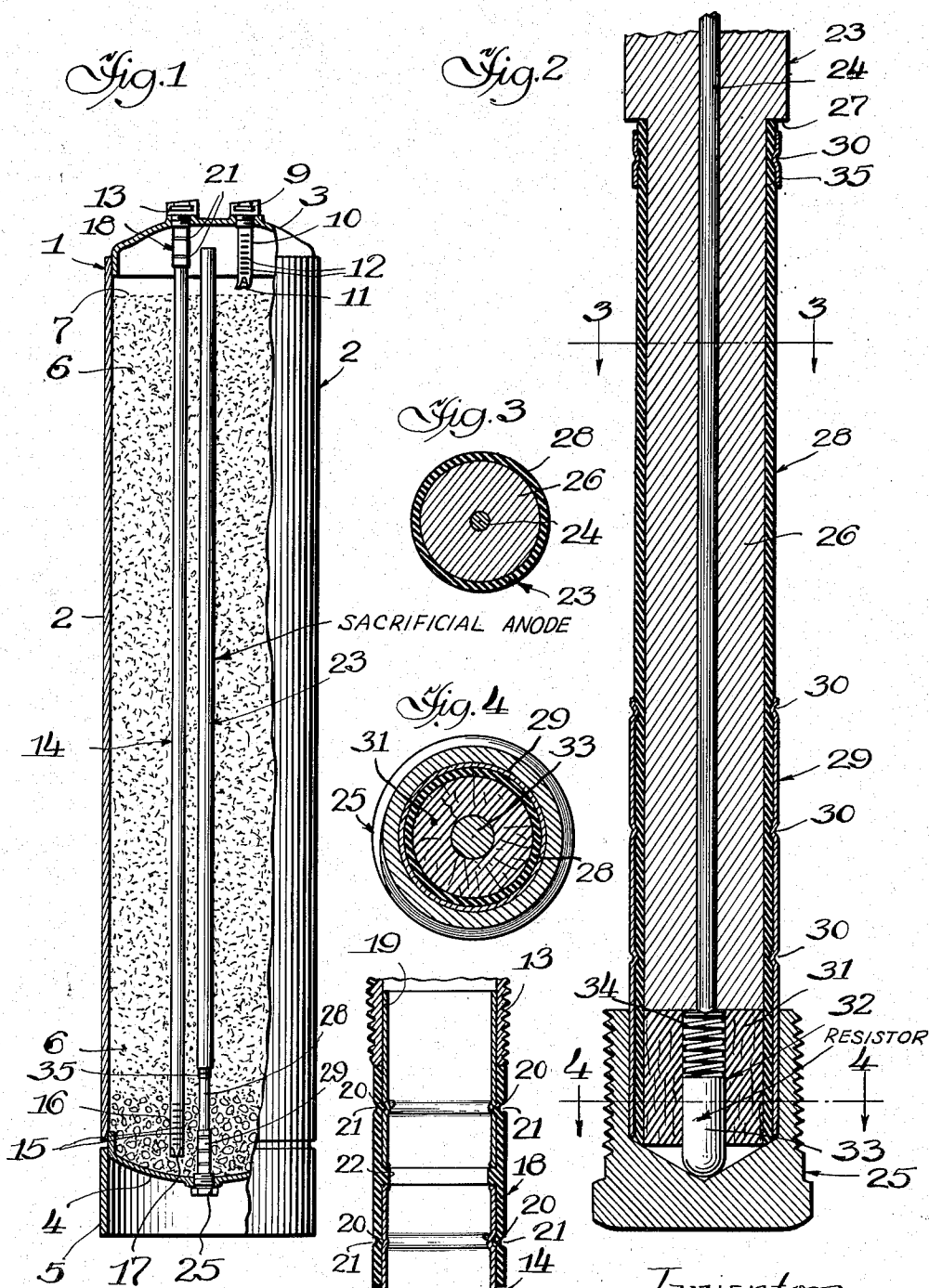
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ANODE CONSTRUCTION FOR USE IN CATHODIC PROTECTION
FOR WATER SOFTENERS AND FILTERS

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ANODE CONSTRUCTION FOR USE IN
CATHODIC PROTECTION FOR WATER
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The present invention relates to cathodic protection for water softeners and filters and more particularly to a novel anode construction for use in such cathodic protection.

Corrosion and subsequent failure in water heater and water storage tanks, and underground pipe lines, due to solution of the metal is well known. Such corrosion in an aqueous media is electro-chemical in nature in which galvanic cells are established through the use of dissimilar metals in their construction or fabrication, or due to the many anodes and cathodes of the metal used in their fabrication. The water in contact with the metal of the pipe lines or tanks acts as an electrolyte whereby positive electric current flows from the anode to the cathode and results in solution of the metal constituting the anodic areas. Such solution or corrosion weakens and causes subsequent failure of the tanks or pipe lines.

To prevent or substantially reduce such corrosion and failure resulting therefrom, an expendable or sacrificial anode has been employed in such water heater and storage tanks, and underground pipe lines, for neutralizing the local action currents and currents resulting from the use of dissimilar metals in the fabrication of the pipe lines or tanks. By providing such sacrificial anode in the system, the necessary current is produced without an external source of electric energy.

In the protection of water softener or filter tanks containing a bed of zeolite and/or other granular material through which the water must pass in its treatment, problems arise which are unlike those found in the protection of water heater and storage tanks, and underground pipe lines. In such water softener or filter tanks a suitable distributor or manifold must be provided to disperse the water at the inlet and to collect at the outlet so that the water after passing through the bed may be withdrawn without carrying along the granular material which is retained in the tank and prevented from leaving. Such distributors or manifolds are generally constructed of brass or other metal that is cathodic to the tank and when a sacrificial anode is employed the resulting calcareous coating from the anode collects upon the cathodic areas of not only the tank walls but also upon the distributors or manifolds and impedes or restricts the openings or passages therethrough unless these distributors or manifolds are insulated from the tank.

Sacrificial anodes such as magnesium rods

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have been successfully employed by me recently in water softener or filter tanks and especially where the distributors or manifolds have been insulated from the cathodic areas of the tank and of the inlet and outlet pipes or conduits for conducting the untreated water into the tank and for delivering the treated water therefrom, respectively, as set forth in my co-pending application Serial No. 49,163, filed September 14, 1948, now Patent Number 2,560,960, for "Cathodic Protection for Water Softeners and Filters." However, such anodes have been found to dissipate themselves more rapidly at or adjacent the portion or point at which they are attached or mounted in the tank than at any other area. This dissipation rapidly weakens the structure thereof so that the anode is no longer rigidly held and may disengage or disconnect from its mounting. This not only results in loss of protection but corrosion products form at the point of weakness or fracture, i. e. adjacent the point of contact between the anode and its mounting or support. In addition, change in the current flow may result therefrom.

It is, therefore, an object of the present invention to provide a novel sacrificial anode construction as well as a novel means and manner of mounting and supporting the novel anode in a water softener or filter tank.

The present invention further relates to a novel sacrificial anode construction and assembly that assures optimum cathodic protection for a water softener or filter tank. Such sacrificial anode comprises a reinforced magnesium rod so constructed, arranged and mounted in the base of the tank as to maintain the rod rigid and in fixed, upright position.

The invention further comprehends the provision of a novel means and manner of mounting and insulating the supporting end of a sacrificial anode whereby to control the sacrifice of the anode at this end and to assure substantially reduced sacrifice of the anode throughout its exposed or effective area.

Another important object and advantage of the present invention is the provision of a novel resistance unit or resistor for a sacrificial anode for controlling the current flow and sacrifice of the anode, as well as the formation of the calcareous coating upon the tank walls and other cathodic areas within the tank.

The present invention further comprehends a novel construction and arrangement of a resistor or resistance unit for the sacrificial anode of a water softener and filter tank and in the novel

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means and manner of mounting this resistor in the supporting end of the sacrificial anode and maintaining contact between the anode and the tank.

Further objects are to provide a construction of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

The invention further resides in the construction, combination and arrangement of parts illustrated in the accompanying drawing, and while there is shown therein a preferred embodiment, it is to be understood that the same is susceptible of modification and change, and comprehends other details, arrangements of parts, features and constructions without departing from the spirit of the invention.

In the drawing:

Figure 1 is a view, part in vertical cross section and part in side elevation, of a water softener tank provided with my novel construction of sacrificial anode assembly.

Fig. 2 is an enlarged fragmentary view in vertical cross section through the mounting or supporting end of the sacrificial anode assembly.

Fig. 3 is a view in horizontal cross section taken in a plane represented by the line 3-3 of Fig. 2.

Fig. 4 is a view in horizontal cross section taken in a plane represented by the line 4-4 of Fig. 2.

Fig. 5 is a fragmentary enlarged view of the adapter and insulating sleeve or coupling for insulating the outlet tube from the tank and fitting, with parts being broken away for a clear disclosure.

Referring more particularly to the disclosure in the drawing and to the embodiment therein selected to illustrate the novel invention, there is shown a water softener unit 1 including a metal tank 2 which is preferably rendered corrosion resistant by galvanizing or the like, the tank having a head or upper closure 3, a bottom closure 4 and a supporting base 5.

In the tank is provided a bed of zeolite or other water treating or filtering material 6 substantially filling the tank, the depth thereof being indicated at 7. The water entering the tank for treatment enters through a fitting or coupling 9 of brass or other suitable metal threaded into the head 3. The fitting carries a relatively short distributor or manifold 10 provided adjacent its lower closed end 11 with a plurality of narrow and spaced slots or ports 12 for the discharge of the entering untreated water which passes downwardly through this manifold and outwardly through the slots or ports into the upper end of the tank. To prevent these slots or ports from becoming clogged or restricted, this distributor or manifold is insulated or preferably formed of a plastic or insulating material.

A second fitting or coupling 13 of brass or other suitable metal is threadedly mounted in the head 3 and carries a depending pipe or tube 14 normally providing an outlet for the treated water or other liquid. This tube extends downwardly through the mass of zeolite or water treating particles 6 to slightly above the bottom 4 of the tank, whereby the treated liquid must pass downwardly through the zeolite or water treating particles 6 from the inlet manifold 10 before it enters the slots or ports 15 of a distributor or manifold 16 at the lower closed end 17 of the outlet tube 14. To prevent these slots

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or ports 15 from becoming clogged or restricted, the depending pipe or outlet tube 14 is spaced and insulated from the metallic fitting or coupling 13 and the metallic tank 2 by a plastic or insulating collar 18 (Figs. 1 and 5) secured to the lower end of an adapter tube 19 carried by the fitting or coupling 13 and to the upper spaced end of the pipe or tube 14.

To secure the insulating collar 18 against displacement on the adapter 19 and outlet tube 14, the adapter and outlet tube are circumferentially indented or grooved at 20 and the collar 18 is crimped thereon at 21. As an additional precaution against the passage of current therebetween, the adapter 19 and outlet tube 14 are maintained spaced apart or in spaced relation by an internal bead or ridge 22 formed or provided on the interior of the insulating collar 18.

Mounted in the bottom 4 of the tank 2 and projecting upwardly into the tank in spaced relation with the interior of the tank and also in spaced relation with the inlet and outlet manifolds 10 and 14 respectively, is a sacrificial anode 23 extending from the bottom to adjacent to, but spaced from, the underside of the head 3. This anode is preferably a magnesium rod of substantial thickness and reinforced by a steel core 24, and although I prefer to employ a magnesium rod, in some installations this rod may be of some other metal.

To support and maintain the sacrificial anode in upright and fixed position, the lower end thereof is mounted in a plug 25 removably and threadedly mounted in the bottom 4 of the tank. This anode is not connected to an external circuit or source of electrical energy, but produces the necessary current whereby the interior of the tank is protected against corrosion by superimposing, by means of this sacrificial anode, a current in the opposite direction of that between dissimilar metals and the anodic and cathodic areas in one metal. This current is of such intensity as to cancel the normal current flow causing such corrosion and to further protect against corrosion by the formation of a calcareous coating on these walls and on other cathodic areas within the tank. As the distributors or manifolds are normally cathodic to the tank, this calcareous coating produced by the rod would collect on the distributors or manifolds unless some provision is made against clogging of the slots or ports therein. These slots are normally of a size to permit the uninterrupted passage therethrough of the liquid but small enough to prevent passage therethrough of the granular material forming the bed 6 and through which must pass the liquid to be treated. Because of their size, these slots or ports would soon become clogged by such calcareous coating unless the manifolds or distributors are insulated from the tank.

As the sacrificial anode or magnesium rod when used in a water softener or filter tank dissipates itself more rapidly at the point at which it is attached or mounted in the tank because of the proximity of metal dissimilar to the anode, and as this dissipation weakens the magnesium anode at the point of connection to such an extent that the anode or rod is no longer rigidly held and may even disengage from the mounting member, the present invention provides for a novel means and manner of rigidly mounting the anode and affording it protection against such dissipation. This is accomplished by reducing the lower end 26 of the anode and cover-

ing this lower reduced end from the annular shoulder 27 to beyond the lower end thereof by an insulating covering or sleeve 28, whereby to increase the distance between the exposed portion of the anode at the shoulder 27 and the exposed portion of metal in contact with the tank but dissimilar to the anode, which is the metal collar 29 that encompasses the sleeve 28 at its lower end. Such rapid dissipation and/or disengagement if permitted at this point would result not only in loss of protection and the formation of corrosion products at the point of contact between the magnesium anode and the mounting, but also would be apt to result in a change in current flow.

The insulating sleeve 28 which encompasses and covers the reduced lower end 26 is preferably composed of natural or compounded synthetic rubber or other deformable plastic composition, and in turn encompassing the lower end of this insulating sleeve is the metal collar 29 preferably formed of brass or the like. This metal collar is crimped at 30 onto the insulating sleeve and in turn is press-fitted into the hollow and upwardly opening end of the brass plug 25.

At their lower end the insulating sleeve 28 and the metal collar 29 receive an insulating bushing 31 which may be of wood or other suitable composition centrally cored to receive a resistor or resistance unit 32. This resistor unit comprises a resistance 33 and a coil spring 34 of resistance wire which is connected to or is formed as an integral part of the resistance unit and is calculated in its total resistance. This resistance may be of any desired value depending upon the desired rate of dissipation of the anode, but excellent results have been secured by making the total resistance of the resistor 33 and coiled spring 34 twenty ohms.

Due to the expansibility of the spring 34 of the resistance unit, contact is assured and maintained between the lower end of the resistance 33 and the interior of the metal plug or fitting 25, and the upper end of the coiled resistance wire or spring 34 and the lower end of the sacrificial anode or rod 23. Thus the resistor is electrically connected between the brass plug 25 and the extreme lower end of the magnesium rod 23, and provides the only direct electrical contact between the tank and the rod.

As the reduced lower end 26 of the magnesium rod is completely covered and insulated by the insulating sleeve 28, and the lower end of this sleeve is sealed against leakage by the metal collar 29 and the upper end is sealed against leakage by an encompassing metal collar or ring 35 disposed adjacent the shoulder 27 and crimped at 30 to cause the resilient or deformable material of the sleeve 28 to tightly seal against the magnesium rod, there is no danger of the liquid in the tank leaking between the reduced lower end of the magnesium rod and the enclosing insulating sleeve 28. By protecting the lower end of the rod or anode in this manner there is no excessive or unusual dissipation or sacrifice of the rod due to proximity of a dissimilar metal.

The novel resistance unit reduces the current flow through the circuit established by the magnesium rod whereby the current is regulated in such manner as to prevent excessive dissipation of the magnesium rod and greatly prolong its life. The control of this current flow will also inhibit the formation of extremely heavy layers of calcareous coating on the interior side walls of the tank, although a thin layer of this cal-

careous coating is intended to be formed upon the interior side walls of the tank upon dissipation of the magnesium rod. This coating forms a protective covering which protects the tank walls against corrosion over and above the protection afforded by the cathodic means in the reversal of current established by the magnesium anode.

From the above description and the disclosure in the drawing, it will be fully appreciated that the present invention comprehends the provision of a novel sacrificial anode unit or assembly and also a novel means and manner of protecting the supported end of the anode. The present invention further comprehends a novel construction and arrangement of resistor or resistance unit for the sacrificial anode. This novel resistor greatly facilitates the assembly and fabrication of the novel sacrificial anode unit or assembly. By reason of the spring forming part of the resistor, contact between the parts is assured even though there may be some variation in the spacing of the end of the magnesium rod with respect to the contacting surface in the plug for supporting the rod.

Having thus disclosed the invention, I claim:

1. Means for the cathodic protection of a metal tank containing a deep stratified bed of loosely packed solid particles including cation exchange materials by reversal of current flow and by formation of a calcareous coating on the interior thereof, comprising a sacrificial galvanic anode projecting lengthwise in the tank and through the solid particles in the tank and spaced equidistant from the encompassing interior side walls of the tank, a metal plug mounted in the base of the tank for receiving and supporting the lower end of the anode and maintaining the anode in the tank, a metal sleeve having its lower end anchored in the plug and its other end projecting above and a substantial distance beyond the end of the plug, an abrasive-resistant insulating sleeve tightly encompassing the supported end of the anode between the anode and the metal sleeve for insulating the anode from this metal sleeve, said insulating sleeve extending for a substantial distance beyond the upper end of the plug and beyond the upper end of the metal sleeve whereby to prevent the passage of current from the exterior surface of the anode to the metal sleeve and plug, a metal collar tightly encompassing the upper end of the insulating sleeve whereby this sleeve is maintained tightly sealed about the exterior of the anode to prevent the leakage of water between it and the outer surface of the anode, a metal core in said anode, and means for electrically connecting the plug and tank to the anode.

2. A sacrificial galvanic anode for the protection of a metal tank containing a deep stratified bed of loosely packed solid particles including cation exchange materials, comprising a magnesium rod having a metal core and projecting through the particles of the bed, a hollow metal plug detachably mounted in an end of the tank and supporting the rod, a sealing and abrasive-resistant insulating sleeve and a metal collar encompassing the sleeve with the sleeve and collar embracing an end of the anode and anchored at one end in the hollow plug, said sleeve sealing the adjacent end of the anode and insulating the anode for a substantial distance from the adjacent end of the plug and metal collar, a second metal collar clamped about and sealing the other end of the insulating sleeve and spaced from the

first mentioned collar, and an expansible resistance unit mounted in the hollow of the plug with one end having contact with the end of the rod and the other end having contact with the interior of the plug.

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