

May 16, 1950

L. W. KAUFMAN
ELECTRODE CONSTRUCTION

2,508,171

Filed Aug. 19, 1948

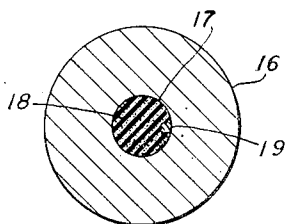
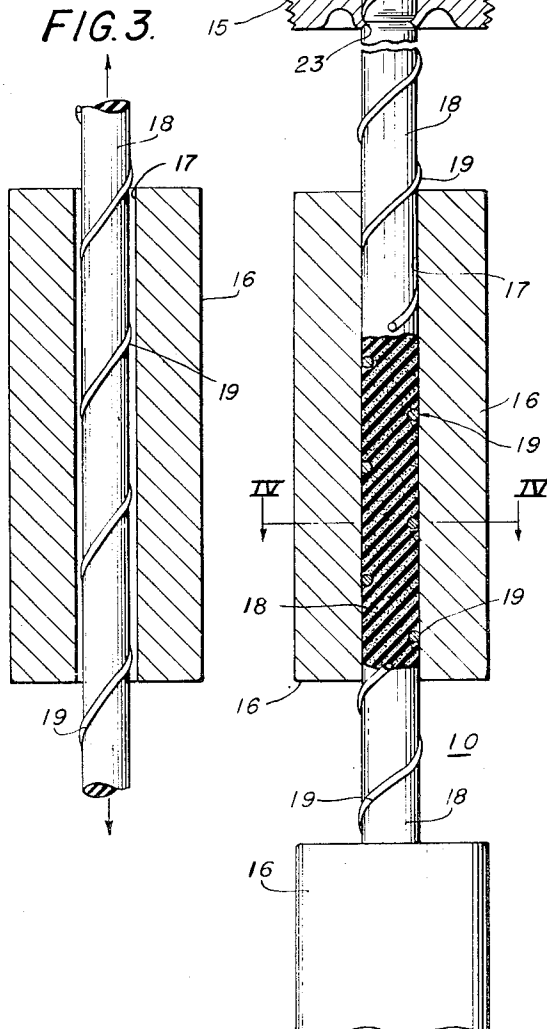
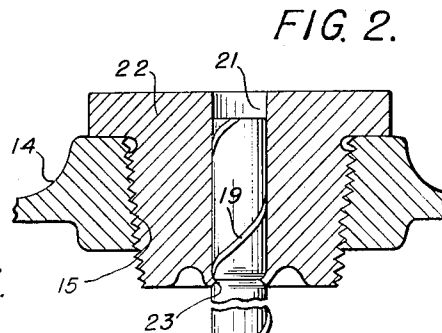
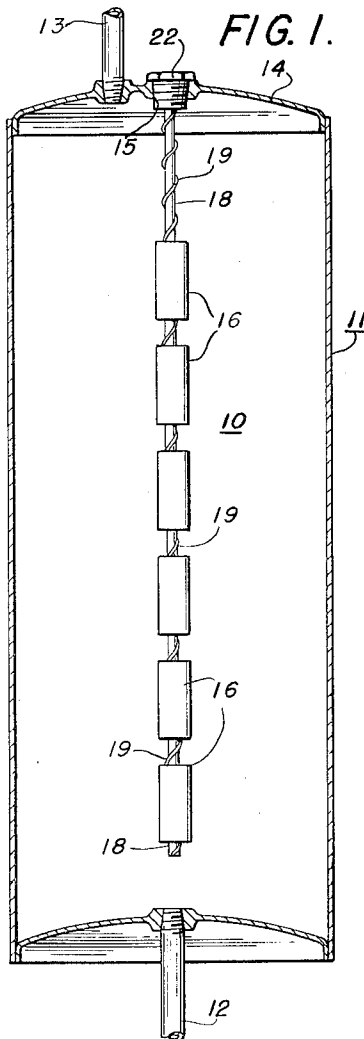


FIG. 4.

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2,508,171

ELECTRODE CONSTRUCTION

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Application August 19, 1948, Serial No. 45,077

2 Claims. (Cl. 204—286)

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My invention relates to electrode constructions applicable to water storage tanks for preventing corrosion thereof and has for an object to provide improved apparatus of this kind.

A further object of the invention is to provide an electrode of this kind which may be readily applied to a tank installed in a room having low head room.

A still further object of the invention is to provide an improved electrode of the type set forth which may be readily manufactured.

These and other objects are effected by the invention as will be apparent from the following description and claims taken in connection with the accompanying drawing, forming a part of this application, in which:

Fig. 1 is a vertical, sectional view taken through a domestic hot water storage tank having an electrode applied thereto which is constructed and arranged in accordance with my invention;

Fig. 2 is a longitudinal, sectional view taken through the electrode construction shown in Fig. 1;

Fig. 3 is a sectional view taken through an anode element during assembly thereof to the supporting core; and

Fig. 4 is a transverse section taken along the line IV—IV of Fig. 2.

As is well understood, corrosion of the walls of water tanks is due primarily to electrolysis. Impurities in the metal forming the tank or the use of dissimilar metals produces a multitude of anodic and cathodic regions so that a number of galvanic currents are produced. Corrosion occurs at the anodic areas and, after a period of time, the tank is rendered unfit for use. The employment of an electrode formed of metal anodic with respect to the tank structure has been known for many years for providing a galvanic current which neutralizes the galvanic currents produced by impurities in the metal forming the tank. A rod of magnesium having one end electrically connected to the tank is usually employed for this purpose, as magnesium is anodic with respect to all metals usually found in a tank structure. For the protection of domestic hot water tanks, a rod approximately one inch in diameter and of the order of fifty inches in length extends into the water centrally of the tank side walls. During operation, the anodic sacrificial rod is corroded by the galvanic current and requires periodic replacement.

Due to low head room usually prevailing in rooms housing the tank, the replacing of the rod usually involves the disconnection of the tank from the piping in the house so that the tank

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may be tilted for the insertion of the rod. It has been proposed to form the rod in short lengths which may be screwed together as they are individually inserted in the tank. However, corrosion at the threaded connections rapidly occurs and the resistance to current flow at these oxidized junctions may reduce the galvanic current produced to a value insufficient for protection of the tank.

In accordance with the present invention, I propose to use a plurality of blocks of magnesium or other suitable metals which are carried by and longitudinally spaced upon an elongated resilient member formed, for example, of synthetic rubber. A current conducting wire is helically wound on the surface of the core and the blocks or anodes have cylindrical openings therein for receiving the core. The outside diameter of the core and wire helix is slightly greater than the openings in the anodes when the resilient core is free and slightly less than said diameter of the openings when the core is longitudinally stretched. With the core stretched, the anodes may be readily threaded on the core and over the wire helix in proper spaced relation during assembly of the electrode and, when the tension on the core and wire helix is removed, they expand and the helical wire is forced into contact with the surface of the openings in the anodes. Accordingly, all anodes are electrically connected together by the wire. The wire is also electrically connected to the plug which closes the opening in the water tank and which serves to support the electrode in the tank. This construction permits the bending of the electrode structure so that it may be inserted in a tank even though the head room available is short. Since the electrode construction may be assembled at the factory where all electrical connections are properly made, the proper flow of protective current is assured and the difficulties set forth heretofore in connection with the assembly of various rod sections during installation are obviated.

Referring now to the drawing, I have shown my improved electrode construction, generally indicated at 10, applied to a conventional domestic hot water storage tank 11, the latter including respective conduits 12 and 13 for the admission of cold water and for the discharge of hot water. The top wall of the tank indicated at 14 is provided with a threaded opening 15 through which the electrode construction 10 is inserted in the tank. The means for heating the water has not been shown since it forms no part of the present invention.

The electrode construction 10 includes a plu-

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ality of spaced anodes 16 formed of a material, for example, magnesium which is anodic to the material from which the tank is fabricated. The anodes 16 are each provided with generally cylindrical openings 17 for receiving a resilient core 18, the anodes 16 being longitudinally spaced on the core 18 as shown in Fig. 1. A current conducting wire 19 formed of any suitable metal is helically wound on the resilient core 18 and serves to electrically connect all of the anodes 16 together.

The upper end of the core 18 and the helical wire closely fit within an opening 21 formed in a plug 22 which is threaded in the opening 15 of the tank wall 14. The upper end of the helical wire 19 is forced by the resilient core 18 firmly into engagement with the surface of the opening 21 so that the wire 19 is electrically connected or grounded to the plug 22. In order to prevent displacement of the core 18 from the plug 22, the latter may be crimped, as shown at 23, to firmly grip the resilient core 18.

In order to facilitate the manufacture or assembly of the anodes 16 and the core 18, the openings 17 have a diameter which is slightly less than the over-all diameter of the core 18 and helical wire 19 when the core 18 is free, but, when the core 18 and wire 19 are stretched longitudinally, the diameter of the wire helix 19 and the core 18 is reduced to a value slightly less than the diameter of the opening 17. Accordingly, when the core 18 is stretched the anodes 16 may be readily moved along the core and helix 19 to their proper positions after which the tension is removed from the core. The removal of tension from the core 18 permits expansion of the core 18 and the helical wire 19 so that the latter is firmly forced into contact with the surfaces of the openings 17. Accordingly, all of the anodes 16 and the plug 22 are electrically connected by the wire 19.

During operation of the electrode 10 when installed in a water tank, protective currents flow from the various anodes 16 through the water to all regions of the tank walls and thence through the plug 22 and the conductor 19 to the anodes 16. As is well understood, these galvanic protective currents neutralize the currents flowing from the numerous anodic areas of the tank walls and prevent corrosion at these areas. The anodes 16 are spaced apart to uniformly distribute the protective current to all regions of the tank walls. Preferably, the uppermost anode 16 is so spaced below the plug 22 that the protective current flowing from this anode 16 to the top wall 14 approximates the current flowing to all of the regions of the tank walls. Accordingly, rapid corrosion of the upper anode 16 is avoided.

The spacing of the anodes 16 on the resilient core 18 permits bending of the electrode construction 10 when applied to a tank having low head room. The electrode construction 10 may be sharply bent as it is threaded through the opening 15 to its operating position.

From the foregoing description, it will be noted that the core 18 is slightly compressed in the anodes 16 and prevents the admission of water to the opening 17 in the anodes. Accordingly, corrosion of the anode surfaces defining this opening is prevented. The flow of current from the anodes is from the surfaces in contact with the water. In this connection, it will also be noted that corrosion of the wire 19 does not occur

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since the material forming this wire is cathodic with respect to the anode and, therefore, a protective current will always flow from the anodes to the portions of the wire 19 which are exposed to the water.

From the foregoing description, it will be apparent that I have provided an improved electrode for cathodically protecting a water storage tank against corrosion, which electrode, being flexible, may be bent to facilitate the installation thereof in a tank where the available head room is limited. Since the electrode may be completely fabricated as a unit at the factory, it may be readily and economically installed without adjustments or the completion of electrical connections at the time of installation. Furthermore, the completion of the electrode at the factory as a unit assures uniform potential between the various electrodes 16 and the tank and, therefore, uniform distribution of the protective current to all surfaces of the tank walls.

While the invention has been shown in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications without departing from the spirit thereof.

What I claim is:

1. In an electrode construction of the character described, the combination of a supporting plug, an elongated resilient core carried by the plug, a wire helically wound on the exterior of the core and a plurality of anodic members spaced longitudinally on the core, said members having generally cylindrical openings extending therethrough for receiving the resilient core and the wire wound thereon, said resilient core and helical wire having a free diameter slightly greater than the diameter of said openings and, when longitudinally stretched, a diameter slightly less than the diameter of the openings, the construction and arrangement being such that the anodic members may be moved longitudinally on the core when the latter is stretched and are gripped by the core when free, the helical wire being forced outwardly by the core into engagement with the surfaces of the openings and electrically connecting the anodic members together.

2. In an electrode construction for a water storage tank having an aperture in a wall thereof, the combination of a plug adapted for closing the aperture in the tank, an elongated resilient core fixed to said plug and adapted to extend within the tank, an electrical current conducting wire helically wound on the outer surface of said core and electrically connected to said plug and a plurality of anodes spaced apart longitudinally of said core, said anodes having respective openings therein for receiving the core and the helical wire wound thereon and said core resiliently urging said wire into engagement with the surfaces of said openings for electrically connecting the wire and the various anodes.

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