June 14, 1955 A. F. CRAVER 2,710,833

ELECTRODE AND WATER OUTLET ASSEMBLY FOR HOT WATER TANKS

Original Filed Sept. 6, 1946

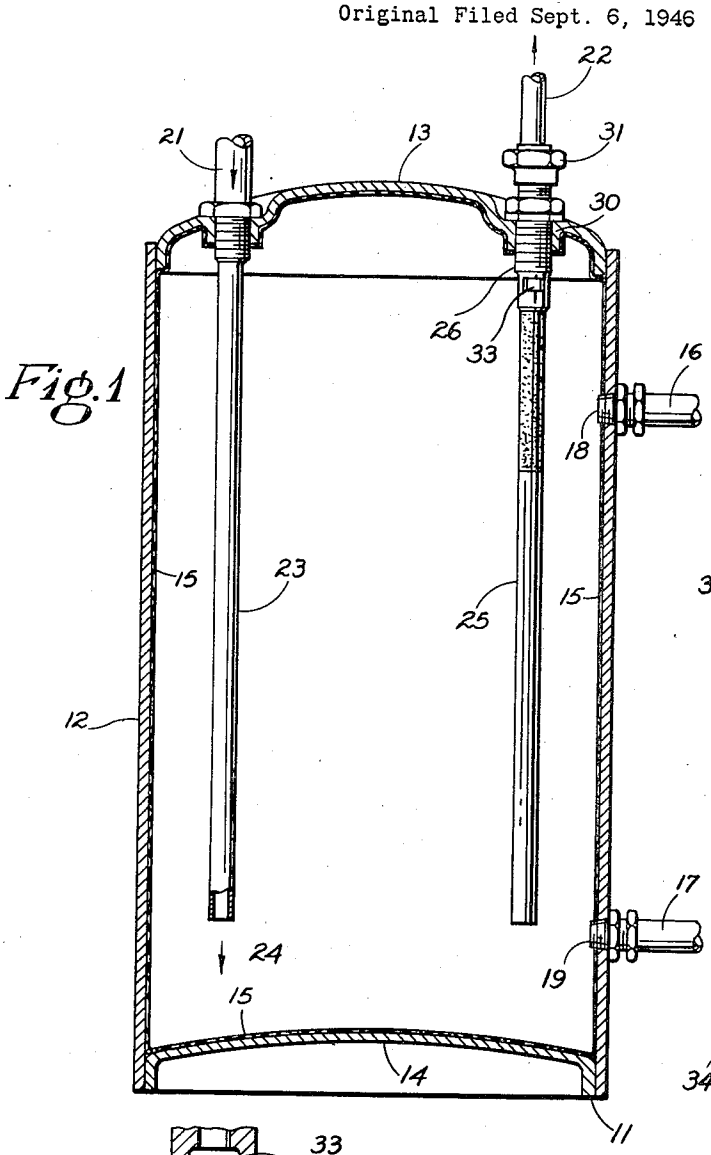


Fig. 1

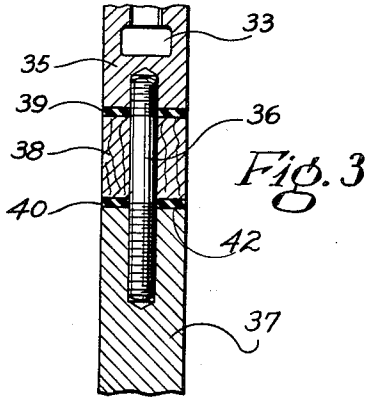


Fig. 3

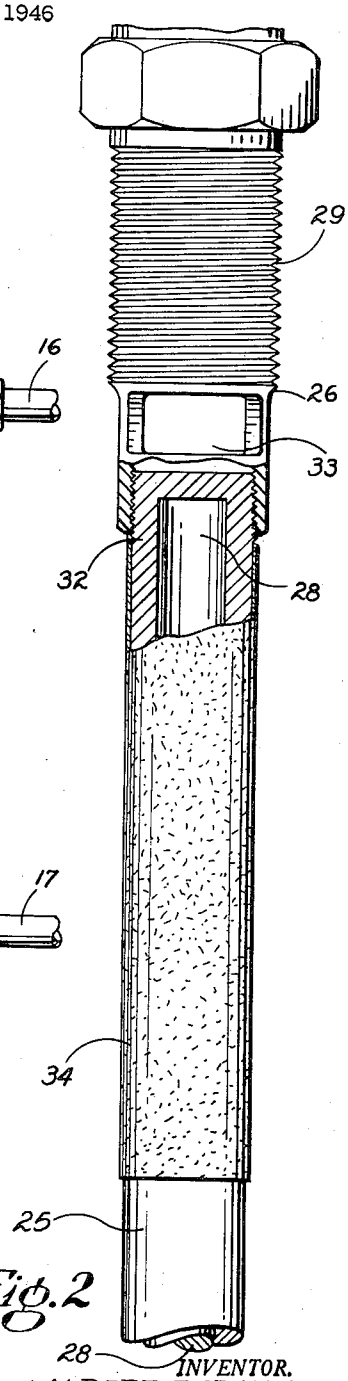


Fig. 2

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United States Patent Office 2,710,833
Patented June 14, 1955

2,710,833

ELECTRODE AND WATER OUTLET ASSEMBLY FOR HOT WATER TANKS

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Application May 21, 1948, Serial No. 28,385

5 Claims. (Cl. 204—197)

This application is a division of my copending application, Serial No. 695,220 filed September 6, 1946 (now abandoned).

This invention relates to avoiding corrosion in metallic structures or vessels exposed to fluid which may attack the metal and concerns particularly the protection of hot water storage vessels from excessive corrosion.

A specific object of the invention is to control corrosion of a fluid-containing vessel anodically.

An additional object of the invention is to provide an improved anode mounting arrangement.

Still another object of the invention is to provide a combination liquid outlet fitting and anode support which makes a direct electrical connection between the anode and the tank to be protected.

Other and further objects, features and advantages of the invention will become apparent as the description proceeds.

In order to facilitate the installation of such anodes in standard tanks or in existing tanks which have already been installed without providing extra opening therein or mounting extra fittings thereon, I preferably provide a hot water outlet fitting with means for supporting the anode.

A better understanding of the invention will be afforded by the following detailed description considered in conjunction with the accompanying drawing, in which:

Fig. 1 is a vertical, medial section of a storage water tank having anodic protection in accordance with an embodiment of the present invention;

Fig. 2 is an enlarged detailed view partially in longitudinal section of a portion of the corrosion preventive anode and the mounting therefor employed in the arrangement of Fig. 1; and

Fig. 3 is a detailed fragmentary view of a protective anode and mounting illustrating another method for providing surface insulation at the supported end of the anode.

Like reference characters are utilized throughout the drawing to designate like parts.

The arrangement shown by way of illustration in Fig. 1 of the drawing comprises a fluid storage vessel such as a domestic hot water tank 11, for example, which has been formed from sheet metal with hollow, cylindrical longitudinal sheet metal walls 12 and end walls or caps 13 and 14, forming the top and bottom walls, respectively, in the case of a tank mounted with a vertical cylindrical axis. The walls 12, 13 and 14 of the tank are customarily composed of rolled steel. The end walls or covers 13 and 14 are secured to the cylindrical portion 12 in any suitable manner as by means of riveting or welding, as will be well understood by those skilled in the art. Black iron sheet may be employed, but it has been customary to coat the sheet metal with another metal more readily attacked than the main metal or steel, for example, to coat the steel with zinc or galvanize it by the hot dip process. The hot dip process has been considered the most practicable from commercial standpoint; but, difficulty is sometimes encountered in obtaining an adequately uniform thickness of coating and complete freedom from pin holes or other flaws. In the event of the presence of any such flaws, local action which tends to begin may cause rapid corrosion by reason of electrochemical relationship between the dinc and the iron. The removal of zinc by local action results in eventual corrosion of the iron, production of red water and ultimate perforation of the tank. Ordinarily the zinc coating is formed on both the interior and exterior surfaces of the tank 11; but, for the sake of simplicity in the drawing, only the interior surface coating 15 has been illustrated, the thickness being shown in an exaggerated scale for the sake of clarity in the drawing.

It will be understood that such tanks are customarily employed for the storage of hot water which has been heated by a suitable source of heat, such as an automatic gas water heater, for example. The automatic gas water heater or the like is not shown in the drawing since such a heater forms no part of the invention. Connection to the gas heater such as the fragmentarily represented pipes 16 and 17 with the corresponding fittings 18 and 19, respectively, are provided. Inlet and outlet water connections, such as the cold water inlet pipe 21 and the hot water outlet pipe 22, are also provided, being joined to the tank by suitable means such as spuds or other fittings well known to those skilled in the art. Where the tank is mounted with its axis vertical, preferably the cold water inlet tube 21 has an extension referred to as a dip tube 23 with an outlet or mouth 24 in the lower portion of the tank 11. This causes the cold water from the central municipal water system to enter at the lower end of the tank as hot water is drawn from the upper end of the tank through the pipe 22 and avoids cooling the latter.

The dip tube 23 and the pipes 16, 17, 21 and 22 and any fittings which may be exposed to the interior of the tank 11 may also be composed of iron and, in some cases, may be composed of copper or other metals relatively noble with respect to iron with regard to their position in the electrochemical or electromotive force series. In the case of iron pipe, even if the piping for the most part is galvanized or covered with a zinc protective coating, the end surfaces are liable to be uncoated iron so that even with a perfect galvanizing of the main surface of the tank 12 there is some tendency for corrosive action due to the presence of the two different metals in the tank exposed to the fluid such as water which is seldom absolutely pure and may contain sufficient ions for intensive local action and corrosion.

In order to control such corrosion and inhibit it to the desired extent, means are provided for introducing a length of metal into the interior of the tank 11 which is less noble with respect to position in the electromotive force series than either the iron or steel of which the main portion of the tank is composed or the protective coating 15 which is zinc in the case of the galvanized steel tank. Such corrosion-preventing or protecting metal is mounted in the tank and provided with electrical connection to the tank wall. In the arrangement illustrated in Fig. 1, such a corrosion-controlling or -inhibiting metal takes the form of a bar or rod 25 composed of magnesium or preferably a magnesium alloy, electrically and mechanically connected to a fitting 26 by which the hot water outlet pipe 22 is connected to the tank. Although the corrosion preventive alloy rod 25 may, if desired, be in the form of a tube, it is preferably a solid bar or a bar of corrosion preventive material supported by a stud bolt or core 28 in the hot water outlet fitting 26. If a core 28 is used it may be composed of iron, aluminum or other suitable metals.

The fitting 26, which may be composed of cuprous material such as brass, is in tubular form, having a

shank with suitable fastening or securing means such as an external thread **29** fitting in a spud **30**. It is provided with suitable means such as a ground joint and flange nut **31** for making a connection with the hot water pipe **22**. A threaded socket **32** is provided at the lower end of the hot-water outlet fitting **26** to receive the corrosion controlling bar **25**. Threads on the bar cooperate with threads in the socket **32** for electrically and mechanically connecting the bar **25** to the fitting **26**. Suitable lateral or side openings **33** are provided in the fitting **26** for egress of hot water from the tank **11**, through the outlet pipe **22**.

In order to avoid rapid consumption of the supported end of the corrosion controlling bar or anode **25**, the surface **34** thereof adjacent the fitting **26** may be insulated.

The use of a hot-water outlet fitting to support the anode has the great advantage that it is thereby rendered unnecessary to tap an additional hole into the tank for mounting a corrosion controlling anode; furthermore, it is not necessary to utilize a special tank construction with an additional spud. In accordance with my invention, corrosion control may be applied to a standard tank construction as carried in stock by distributors and plumbers or even to tanks already installed on the premises of users. My hot-water fitting is merely substituted for the existing outlet fitting or for the hot-water connection previously employed. The rod **25** (threaded to the fitting **26**) is inserted through the hot-water outlet opening already provided.

In the arrangement of Fig. 3 there is a hot-water outlet fitting **35**, similar to the fitting **26** shown in Fig. 2, except that the fitting **35** has a smaller lower-end threaded opening on socket receiving a stud bolt **36**. The bolt **36**, in turn, carries a corrosion-controlling bar or anode **37** like the bar **25** of Fig. 1 except for the details of connection to the stud bolt **36**. A spacer **38** and preferably also a pair of insulating washers **39** and **40** are provided for separating the surface of the anode **37** from the fitting **35**. The fitting **26** or **35** makes electrical contact in its threads **29** to the tank and at the lower end makes electrical contact with the anode **25**, or the core **36** of the anode **37**, thus providing a direct electrical connection between tank and anode maintaining them at substantially the same electrical potential. No external source of electromotive force is provided and the generated electromotive force in the outlet fitting is manifestly zero.

The lower end of the stud bolt **36** may be mated with a tapped socket in the bar **37** or may be provided with lugs, ribs or the like, in which case the magnesium alloy bar **37** may be cast around the stud **36**. If a cored anode is desired, the stud **36** is made of sufficient length to serve as a core and extends to the bottom of the bar or rod **37**. The core may also take the form of a wire secured to the stud bolt **36** or to the fitting **35** or **26**. The use of cuprous material such as brass in the composition of the fitting **35** or **26** has a twofold advantage. In the first place, brass facilitates the soldering of the core wire insert for a permanent low resistance electrical connection. Galvanized steel fittings can, in some cases, also be soldered. Since the anodes are of the sacrificial type they will eventually have to be replaced and it is advantageous to employ a fitting which facilitates the removal and replacement of anodes. The brass fitting is not nearly as apt to freeze as a steel or malleable iron fitting and, consequently, it is much easier to remove in a tank when a new anode is needed.

Certain features disclosed herein but not claimed are claimed in my copending application Serial No. 695,220 filed September 6, 1946, or copending application Serial No. 696,064 filed September 10, 1946 (now Patent No. 2,459,123).

Certain embodiments of the invention and certain methods of operation embraced therein have been shown

and particularly described for the purpose of explaining the principle of operation of the invention and showing its application, but it will be obvious to those skilled in the art that many modifications and variations are possible, and it is intended therefore, to cover all such modifications and variations as fall within the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a hot water heating apparatus, an anti-corrosion electrode assembly consisting of a metal outlet pipe fitting and an elongated anti-corrosion electrode electrically connected to and supported by the fitting: the fitting having an axial passage leading from a first or outer end of the fitting inwardly and having a lateral opening connecting with the passage and leading to the surface of the fitting adjacent its second or inner end; connecting means at the outer end of the fitting for connection of the fitting with piping; external threads around the fitting inwardly from said connecting means, for connection of the assembly in a threaded opening; attaching means between the fitting and the electrode, said attaching means being inwardly of the lateral opening in the fitting; the assembly having means closing the axial passage below the lateral opening in the tubular member; and the parts of the assembly inwardly of the external threads on the fitting being no larger in overall diameter than the said threaded portion of the fitting whereby the assembly as a unit may be inserted through an opening in a wall, threadedly attached and electrically connected to the wall.

2. In a hot water heating apparatus, an anti-corrosion electrode assembly consisting of a metal outlet pipe fitting and an elongated anti-corrosion electrode electrically connected to and supported by the fitting; the fitting having an axial passage leading from a first or outer end of the fitting inwardly and having a lateral opening connecting with the passage and leading to the surface of the fitting adjacent its second or inner end; connecting means at the outer end of the fitting for connection of the fitting with piping; external threads around the fitting inwardly from said connecting means, for connection of the assembly in a threaded opening; a partition across the lower part of the fitting inwardly of the lateral opening, the inner end of the fitting having a socket extending thereinto, coaxial with the axial opening, the electrode having an upper end shaped to fit tightly into the socket for keeping the fitting and electrode together as a rigid unit; and the parts of the fitting and the electrode inwardly of the external threads on the fitting being no larger than the said external threads whereby the said parts may be inserted through an opening in a wall, threadedly attached and electrically connected to the wall.

3. In an anodically protected hot water heater system of the class wherein a metal hot water tank acts as a cathode and a metal anode is projected into the tank and electrically connected to the tank; the combination with the anode of a metal, water outlet fitting for supporting the anode and electrically connecting it with the tank, the fitting having an axial water passage therethrough, connecting means at the outer end of the fitting for connecting it with piping, external threads around the fitting inwardly of the connecting means, for supporting the fitting on the tank and electrically connecting the fitting and tank, the fitting having a lateral opening inwardly of the external threads, leading from the axial passage through the surface of the fitting, and means mounting the anode on the fitting, said means being below the lateral opening in the fitting and the parts of the assembly inwardly of the external threads on the fitting being no larger in overall diameter than the said threaded portion of the fitting whereby the assembly as a unit may be inserted through an opening in the end of the hot water tank and threadedly attached and electrically connected thereto.

4. An anti-corrosion unit for protecting the interior of

ferrous metal domestic hot water tanks comprising a metal outlet pipe fitting and an elongated sacrificial magnesium metal anode electrically connected to and adapted to be supported by the fitting within a hot water tank, the fitting having an axial water passage leading from a first or outer end of the fitting inwardly and having a lateral water delivery opening connecting with the passage and leading through the side surface of the fitting and located inwardly of the outer end of the fitting, connecting means at the outer end of the fitting for connection of the fitting with piping, external threads around the fitting inwardly from said connecting means, for connection of the unit in a threaded wall opening of a hot water tank, attaching means connecting one end of the anode to the fitting, said attaching means being inwardly of the lateral opening in the fitting, means closing the axial passage below the lateral opening in the tubular member, and the parts of the unit inwardly of the external threads on the fitting being no larger in overall diameter than the said threaded portion of the fitting whereby the unit may be inserted through a threaded wall opening of a hot water tank, threadedly attached and electrically connected to the wall.

5. An anti-corrosion unit for protecting the interior of ferrous metal domestic hot water tanks comprising a metal outlet pipe fitting and an elongated sacrificial magnesium metal anode electrically connected to and adapted to be supported by the fitting within a hot water tank, the fitting having an axial water passage leading from a first

or outer end of the fitting inwardly and having a lateral water delivery opening connecting with the passage and leading through the side surface of the fitting and located inwardly of the outer end of the fitting, connecting means at the outer end of the fitting for connection of the fitting with piping, external threads around the fitting inwardly from said connecting means, for connection of the unit in a threaded wall opening of a hot water tank, a partition across the fitting inwardly of the lateral opening, the inner end of the fitting having a socket extending thereinto, coaxial with the axial passage, the anode having an upper end located in the socket and means securing the anode tightly and rigidly in the socket, and the parts of the fitting and the anode inwardly of the external threads on the fitting being no larger than the said external threads whereby the said parts may be inserted through a threaded wall opening of a hot water tank, threadedly attached and electrically connected to the wall.

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