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C. G. STROBACH ET AL

3,558,463

WATER HEATER TANK ANODE CONSTRUCTION

Filed Feb. 7, 1968

FIG. 1.

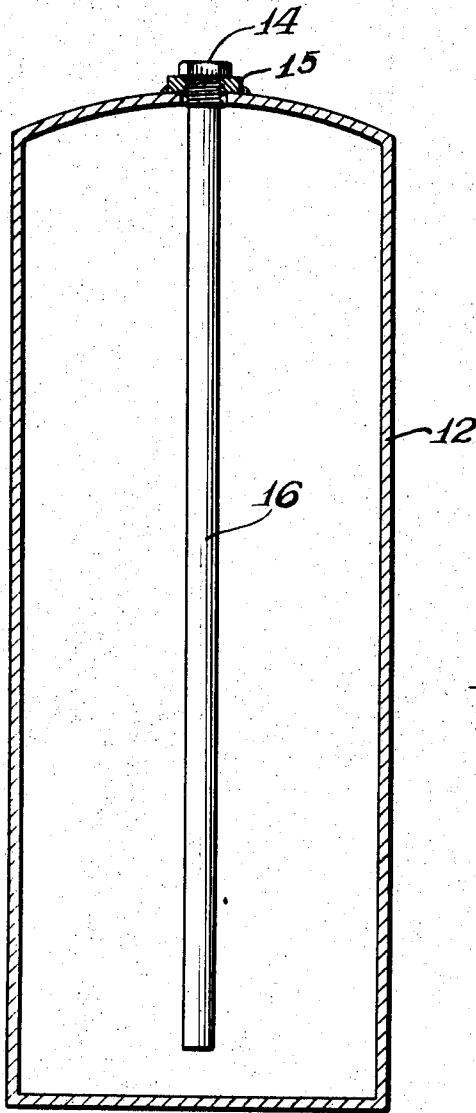


FIG. 2.

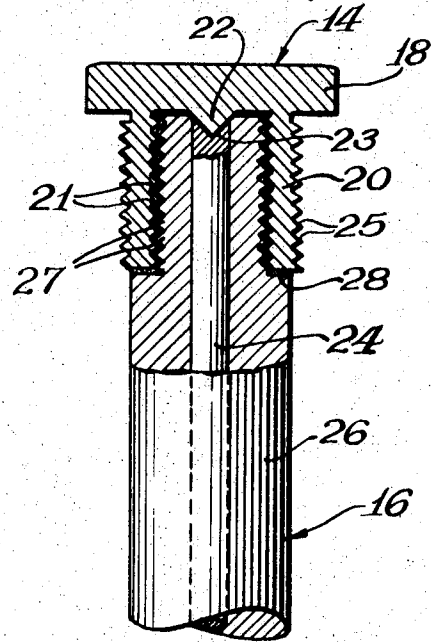
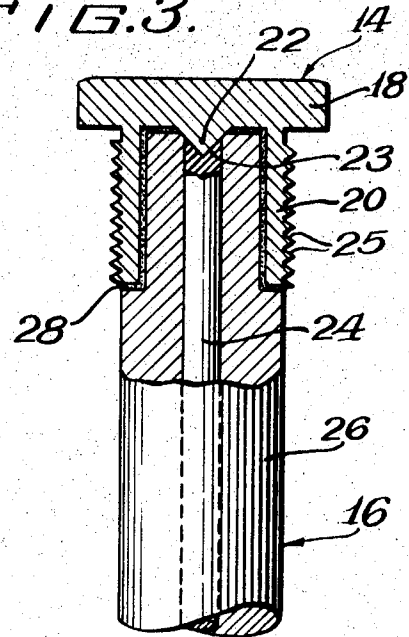


FIG. 3.



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WATER HEATER TANK ANODE CONSTRUCTION
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Rheem International, Inc., a corporation of Delaware
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Int. Cl. C23f 13/00

U.S. Cl. 204—197

4 Claims

ABSTRACT OF THE DISCLOSURE

A water tank anode assembly is connected to a coupling in a water tank wall to provide a secure mechanical and electrical connection between the tank and the anode assembly. The anode assembly includes an anode and a cap. The cap has a threaded outer cylindrical portion screwed into the tank coupling. A conical projection on the interior of the anode cap is imbedded in a center conducting rod of the anode to provide electrical contact between the cap and anode. The anode material surrounding the rod is mechanically and electrically connected with the interior of the cylindrical section of the cap by threads and a conductive adhesive material. Alternatively the conductive adhesive alone insures the interconnection of the cap and anode.

BACKGROUND OF THE INVENTION

This invention relates to the construction of an anode assembly for a water heater tank.

It is customary, in water heater storage tanks made of ferrous materials used for heating and storing water for residential or commercial purposes, to install an anode within the tank. This anode protects the tank against the corrosive effects of water and thus increases the service life of the water heater.

Usually the anode is fabricated from a 1/2 inch to 1 inch diameter magnesium alloy rod extending substantially the full length of the tank. Anodes may be fabricated of different material or of different configurations, but in all cases they must be in electrical contact with the tank at a minimum of one point in order to function properly.

A conventional method of making an anode is to extrude or cast the magnesium alloy around a core wire made of ferrous material. The core wire is then attached to the tank wall in some manner to provide permanent contact between the anode and the tank.

One manner of securing contact between a ferrous wire-magnesium alloy anode and a water tank is by screwing an anode assembly, comprised of the anode having a threaded cap attached at one end, through a threaded coupling that provides an opening in the tank wall. More specifically, the anode assembly includes an anode with threads at one end adapted to mate with a cap that has internal threads so that the cap may be screwed over the anode.

Since the anode material is expandable and will sacrificially corrode as part of its normal protective function, the magnesium alloy is consumed. This destroys the threads on the anode and the anode drops away from the cap breaking electrical contact and rendering the anode ineffective. Thus the anode threads alone, provide a very unsatisfactory basis of electrical contact between the cap and the anode.

To overcome this problem it has been the practice to machine a portion of the anode away so that the core wire is exposed. The cap is then machined to provide a hole through which the exposed core wire may be extended and welded or brazed to the cap. This provides good electrical contact between the core wire and the

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cap regardless of the condition of threads on the anode.

However, since the anode must be machined down to expose the core wire, some anode material is wasted and the expense of a machining operation is required. In addition, an expensive weld must be effected and tested to assure that the cap remains leakproof. The presently claimed invention seeks to overcome these prior art disadvantages.

SUMMARY OF THE INVENTION

In a principal aspect the present invention comprises an improved anode construction for attaching an anode assembly to a water tank to assure a leakproof, secure mechanical and electrical connection. The anode assembly includes an anode and a threaded, hollowed cap attached to one end of the anode. This assembly is screwed through an opening in the wall of the hot water tank. A conical projection extends from the center of the hollowed cap with the tip of the projection toward the inside of the tank. The anode is adhered to the hollowed interior of the cap so that the conical projection is imbedded in a central core wire of the anode. A conductive adhesive may be utilized to create a strong adhesive and electrical bond between the anode and the cap. The adhesive also serves to protect the assembly and the core wire from contact with corrosive water.

It is thus an object of the present invention to provide an improved anode construction.

It is a further object of the present invention to provide an anode construction which provides secure mechanical and electrical contact between the anode and the hot water heater tank.

Still another object of the present invention is to provide an inexpensive and durable anode construction.

These and other objects, advantages and features of the present invention will be more fully set forth in the detailed description which follows.

BRIEF DESCRIPTION OF THE DRAWING

In the description which follows, reference will be made to the drawing comprised of the following figures:

FIG. 1 is a partial cross sectional view of a typical water tank inclusive of the anti-corrosive anode construction or assembly of the present invention;

FIG. 2 is a cross sectional view illustrating a first preferred embodiment of the anode construction of the present invention; and

FIG. 3 is a cross sectional view of a second preferred embodiment of the anode construction of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. 1 illustrates a typical water heater tank 12 which is fabricated from a ferrous material such as sheet steel. The tank includes an opening through the top, for example, with a pretapped coupling 15 welded thereto. The coupling 15 is in mechanical and electrical contact with an anode. The anode assembly includes a cap 14 and anode 16. The anode 16 is fabricated from a magnesium alloy, for example, and includes an axially disposed wire running the length of the anode 16. Such an anode 16 may be fabricated by extrusion methods or by casting methods. The anode assembly is positioned in the tank 12 by threading the cap 14 through the coupling 15.

FIG. 2 illustrates, in a first preferred embodiment of the invention, the construction of the connection between the anode 16 and cap 14. The cap 14 includes a hexagonally shaped, flat top 18 with a threaded cylindrical section 20 integrally fabricated therewith. The top 18 is hexagonally shaped to facilitate insertion or removal of the anode assembly with a wrench. The cylindrical

section 20 includes both internal and external threads 21 and 25 respectively. The external threads 25 of the cap 14 mate with the appropriately threaded coupling 15 in the water tank 12 as illustrated in FIG. 1. Integrally incorporated as part of the top 18 and extending downwardly into the interior of the cylindrical section 20 is a conical projection 22. Projection 22 is substantially coincident with the axis of rotation of cylindrical section 20.

Anode 16 includes a central core wire 24 which is fabricated from a strong, yet conductive material such as a ferrous material. Anode 16 also includes anode material 26, such as magnesium alloy of the type well known in the art, about the circumference of wire 24. The upper end of the anode 16 includes threads 27 adapted to mate with the internal threads 21 of the cylindrical section 20.

The central core wire 24 initially terminates as a flat surface continuous with the top of the anode 16. When cap 14 is screwed onto the top end of anode 16, the projection 22 imbeds in core wire 24. In this manner projection 22 defines an indentation 23 in wire 24. In practice projection 22 is partially flattened also. Projection 22 is slightly wider at its base to insure that even if the core wire 24 is off center, the projection 22 will wedge against the wire 24 and make secure electrical contact therewith. It has been found that about 70 foot pounds of pressure are exerted by the projection 22 on the wire 24 when cap 14 is threaded on the anode 16. This also insures secure electrical contact between the wire 24 and projection 22.

An adhesive material 28, such as an epoxy bonding material, is mixed with a metallic powder and is included between the plug 14 and anode 16 to insure electrical and mechanical connection between the plug 14 and anode 16. An epoxy bonding material which has been found suitable is manufactured by Minnesota Mining and Manufacturing and is identified as No. 1838 B/A. The "A" part of this formulation is an accelerator which is mixed with an equal "B" part, the epoxy resin. The adhesive is then combined with 50% by weight nickel powder and is included between the plug 14 and anode 16. A nickel powder which has been found advantageous is provided by International Nickel Company and is identified as Type 128. This adhesive mixture, i.e. 100 parts of "A" accelerator, 100 parts of "B" epoxy, and 200 parts of nickel powder, has been found most preferable, although there are numerous possible adhesive mixtures, obvious to those skilled in the art, which may be used as conductive adhesives for the practice of the invention.

In the second or alternative embodiment of the invention, illustrated in FIG. 3, the internal threads 21 of the cylindrical section 20 as well as the external threads 27 on the anode 16 are omitted. The adhesive and electrically conductive powder alone insure secure adhesion and electrical contact. The conical projection 22 is again imbedded in the core wire 24 to provide an indentation 23 and direct contact between the tank 12, through the plug 14 to the wire 24.

There are many advantages to the presently claimed construction. First, the metal powder-adhesive bond pro-

tests the anode against corrosion and also maintains excellent and lasting electrical and mechanical contact between the anode and the tank. Secondly, the construction is much less expensive than prior art methods with better, more consistent results. Third, the construction eliminates a source of leaks as well as a lead testing operation while at the same time insuring substantially permanent contact between the anode and the water tank.

While in the foregoing there has been set forth a detailed description of the preferred embodiments, it is to be understood that all those embodiments obvious to persons skilled in the art and all those embodiments equivalent to the claimed subject matter are to be included within the scope of the appended claims.

What is claimed is:

1. In a water heater tank having an anode assembly of the type having an anode with anode material surrounding a single, solid center conducting wire core and a threaded cap over one end of said anode, said center wire being in direct electrical contact with said cap, said anode assembly being in electrical and mechanical contact with said tank, the improvement comprising connection means between said anode and said cap, said cap including a top with a hollow cylindrical section extending toward the inside of said tank, said cap also including an integral conical projection extending from the center of said top inside said hollow cylindrical section, said conical projection imbedded in said conducting wire core and defining an indentation in the end of said wire when said cap is over said anode, said anode being electrically and mechanically secured with said cylindrical section of said cap.

2. The improvement of claim 1 wherein said integral conical projection has a base with a greater diameter than the diameter of said wire.

3. The improvement of claim 2 wherein said adhesive and metal powder comprises an epoxy bonding material combined with 50% by weight nickel powder.

4. The improvement of claim 1 including a water resistant adhesive and conductive metal powder mixture between said cap and said anode for insuring mechanical and electrical connection between said cap and anode.

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TA-HSUNG TUNG, Primary Examiner

U.S. Cl. X.R.,

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**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3, 558,463

Dated January 26, 1973

Inventor(s) C. G. Strobach et al

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 37, "2" should read -- 4 --.

Assignee should read:

-- Rheem Manufacturing Company --.

Signed and Sealed this
Seventeenth Day of May 197

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademark