(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 674 023 A1**

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **95102502.2**

(51) Int. Cl.[6]: **C23F 13/22**

(22) Date of filing: **22.02.95**

(30) Priority: **25.03.94 US 218508**

(43) Date of publication of application:
27.09.95 Bulletin 95/39

(84) Designated Contracting States:
CH DE FR GB LI

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(54) **Sacrificial anode and associate probe.**

(57) A sacrificial anode 10 suitable for a hot water heater or boiler comprises a probe 12 inserted within the anode such that when the anode 10 has been eroded electrolytically, the probe 12 is exposed, completing a circuit and activating an indicator light informing the user of the anode's need for replacement.

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This invention relates to an apparatus for detecting the depletion of a sacrificial anode used in a fluid storage tank such as a hot water heater or a boiler.

Conventional fluid storage tanks are comprised of a metal housing, typically steel. The interior is usually lined with a glass protective coating. Inevitably, there are scratches, faults, or breaks in this coating which expose metal to the fluid in the tank. These areas require protection against corrosion.

It is known to install, in the tank, a metal element which is electropositive with respect to the steel tank, known as a sacrificial anode. Suitable metals for the sacrificial anode include aluminum, magnesium, zinc and zinc alloys, or any metal that is more chemically active than the material of the tank. The steel tank acts as a cathode with respect to the sacrificial metal anode. The constant flow of electrons from the anode to the tank keeps the steel tank from degrading. In place, the sacrificial anode gradually oxidizes and generates products which settle to the bottom of the tank as a form of scale or are discharged with the fluid.

If the anode is totally depleted, the steel tank corrodes rapidly. This may cause the tank to fail prematurely.

It is therefore desirable to monitor the degradation of the anode so that it may be replaced before it is totally corroded or depleted to an unsatisfactory state. A visual inspection is usually not convenient, since the anode is fully enclosed in the tank and removal may be difficult. In addition, the temperatures and pressures in the tank are hazardous if the proper precautions are not taken.

An alternative method would be a regular replacement schedule for the sacrificial anode. However, replacement might be delinquent due to worker neglect. The removal is still difficult and, for a water heater, the need for replacement varies with changing water conditions and the amount of water used. This makes estimation uncertain.

Therefore, it is an object of this invention to detect depletion of the anode without removal to determine when the anode is in need of replacement.

In accordance with the present invention, there is provided a sacrificial anode comprising: a metallic anode member having disposed therein a probe for detecting depletion of said anode.

In accordance with a further embodiment of the present invention, a water storage tank is provided comprising a sacrificial anode, having a threaded connector for mounting the anode in the tank, a channel through the connector into the anode, a probe located within the channel for detecting depletion of the anode such that when the anode corrodes a predetermined amount, the probe is activated.

Brief Description of the Drawings

Fig. 1 is a fresh anode with an enclosed probe.

Fig. 2 is an used anode showing the probe protruding, indicating necessary replacement.

Description of the Preferred Embodiment

The present invention provides for a sacrificial anode having a detector to determine when it has been exhausted to the point where replacement Is necessary. The detector is in the form of a current carrying, electrically activated probe which will be described with reference to Fig. 1. The anode is generally indicated by the numeral 10. This anode includes a threaded connector 14 on sacrificial metal 18 for mounting to a storage tank in a conventional manner. A channel 16 is provided through the connector 14. The channel extends into the anode to a point at which depletion of the anode and infiltration of the channel by water in the tank will activate the probe. A probe 12 is enclosed within the channel 16. Channel 16 is, preferably, centrally located, and more preferably, positioned coaxially with, the anode 10. The position of the probe is determined to be at a point where there is just sufficient an amount of sacrificial metal 18 remaining to be depleted before failure of the tank or other object, which the anode is monitoring. The size and shape of the anode is not critical and can vary. One example is a sacrificial anode made of zinc alloy having a diameter of 1 inch and is 6 inches long. In this anode construction, the probe is located approximately 1/2 inch from the end point of connecter 14.

In addition, the sacrificial anode of this invention may be used in other applications in which sacrificial anodes are presently or may be used, including but not limited to, protecting the hull of a ship and protecting a plastic container having metal fittings from electrochemical corrosion.

In a preferred embodiment, the anode is a sacrificial anode to be used in a water heater or boiler. The probe comprises any variety of commercially available probes. One example of a useful probe is conventionally used to detect water levels in boilers and other equipment. One example of a commercially used probe is 3HIC003 available from Warrick Controls, Inc. The anode is placed in the water heater or boiler. When the anode has eroded to the point at which it will no longer act effectively to protect the metal tank, the enclosed probe 12 will become exposed as shown in Fig. 2 and the channel will be opened and infiltrated with water. Depending upon the nature of the probe, this event opens or closes an electric circuit. An indicator such as a light or light emitting diode (LED) may be activated. The user can then tell, by look-

ing at the indicator, whether the sacrificial anode is in need of replacement. If the light has not been lit, then no replacement is necessary.

By using the apparatus of the present invention, the anode does not need to be removed to determine the extent to which it has been depleted and the user can tell precisely when the anode should be replaced without having to estimate the lifetime of the anode, the mineral content in the water, or the rate at which the water is being used.

Having described the invention in detail and by reference to preferred embodiments thereof, it will be apparent that modifications and variations are possible without departing from the scope of the invention defined in the appended claims.

The features disclosed in the foregoing description, in the following claims and/or in the accompanying drawings may, both separately and in any combination thereof, be material for realising the invention in diverse forms thereof.

Claims

1. A sacrificial anode comprising:
a metallic anode member having disposed therein a probe for detecting depletion of said anode.

2. The sacrificial anode of claim 1 wherein said probe is electrically activated when the anode is depleted more than a predetermined amount.

3. The sacrificial anode of claim 2 wherein said probe generates an electrical signal when activated.

4. The sacrificial anode of claim 2 further comprising an electrical indicator circuit such that when said probe is activated, the circuit is opened or closed.

5. The sacrificial anode of claim 1 wherein said anode includes a channel and said probe is positioned within said channel.

6. The sacrificial anode of claim 1 wherein said probe is positioned coaxially within said anode and said anode is cylindrical.

7. The sacrificial anode of claim 1 further comprising an indicator.

8. The sacrificial anode of claim 1 wherein said anode comprises zinc or magnesium.

9. The sacrificial anode of claim 1 further comprising a threaded connector for mounting said anode to a storage tank and a channel through said connector into said anode for positioning said probe.

10. A water storage tank comprising a metallic tank and a sacrificial anode according to any of claims 1 to 9 mounted in said tank.

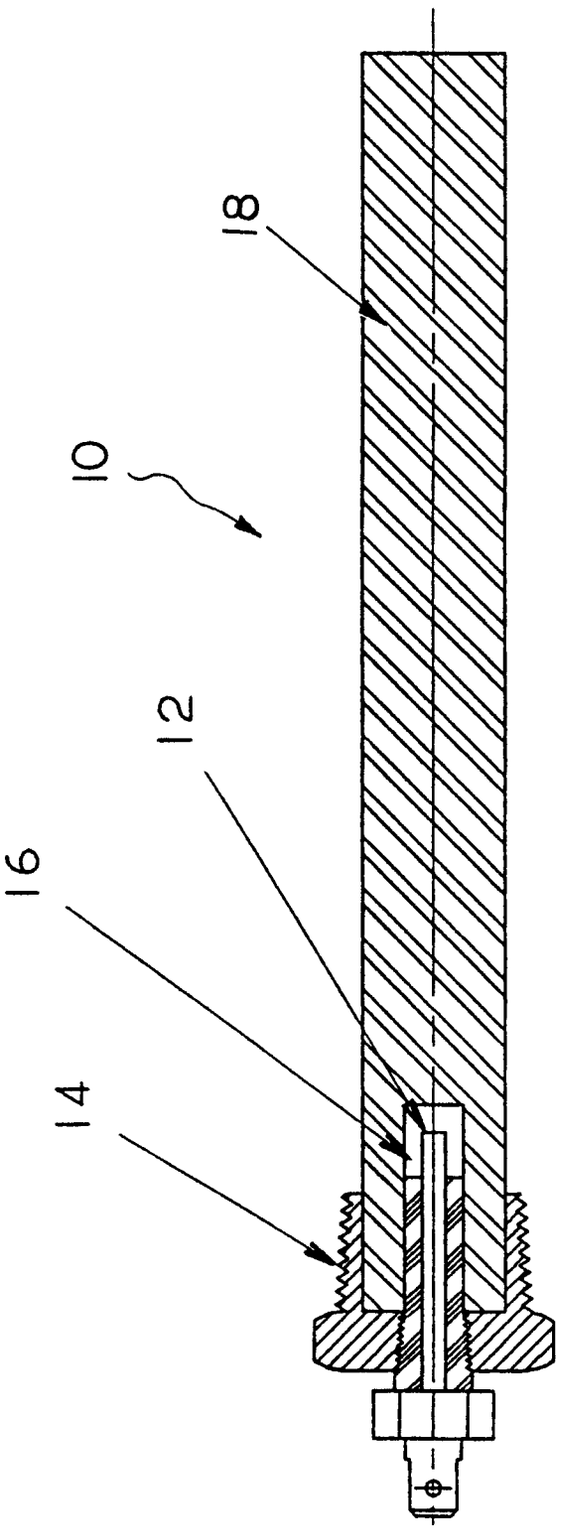

FIG. 1

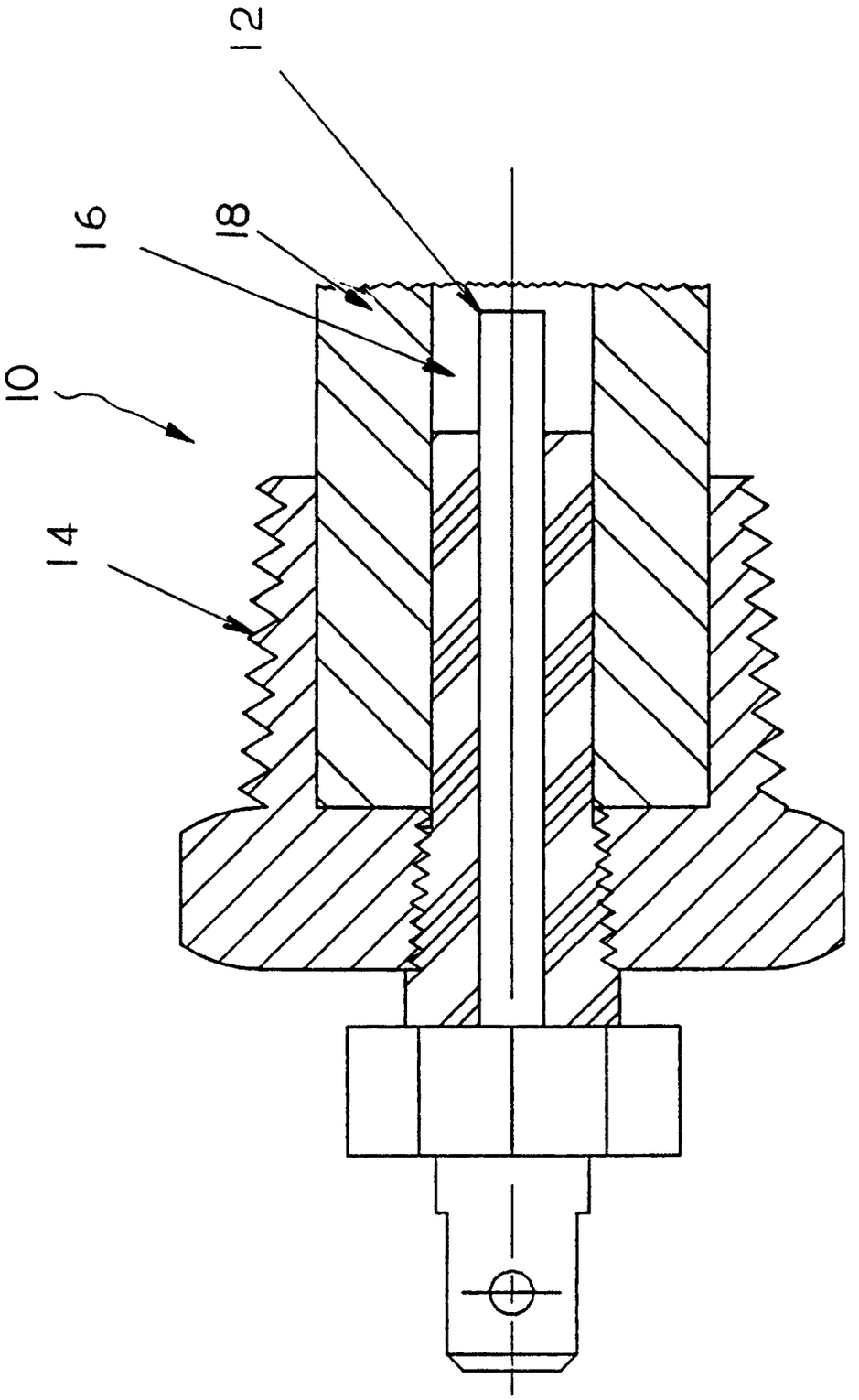

FIG. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 2502

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-A-31 10 736 (HÖSSLE W.) 7 October 1982 * page 5, line 3 - page 7, line 25 * * figures 1,2 *	1-4,7,9, 10	C23F13/22
X	DE-A-31 34 581 (STIEBEL ELTRON GMBH) 10 March 1983 * page 7, line 15 - page 8, line 4 * * page 8, line 18 - page 9, line 23 * * figures 2-4 *	1-7,10	
X	DE-A-37 26 090 (HÖSSLE S.) 16 February 1989 * column 3, line 2 - column 4, line 35 * * figures 1-4 *	1-3,5,6, 9,10	
X	EP-A-0 357 925 (HÖSSLE S.) 14 March 1990 * page 4 - page 5; claims 1-3 * * figures 1-3 *	1,5-7,9, 10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) C23F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	5 July 1995	Groseiller, P

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)