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P. C. KERK

1,970,804

ELECTRODE FOR ELECTROLYTIC BATHS

Filed Dec. 24, 1932

Fig. 1.

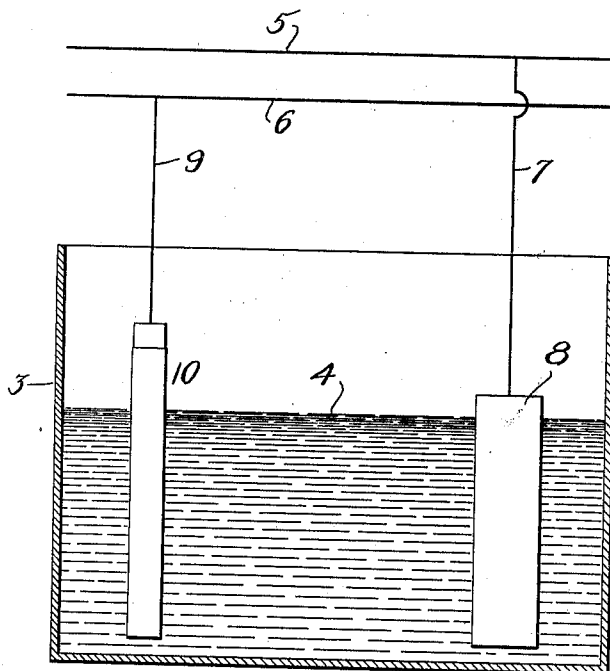
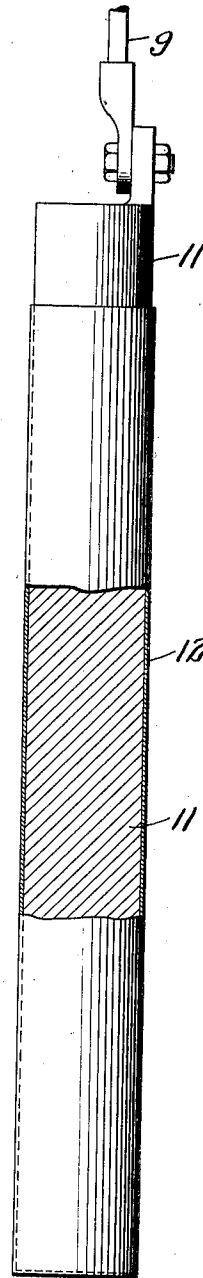


Fig. 2.



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ELECTRODE FOR ELECTROLYTIC BATHS

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Application December 24, 1932, Serial No. 648,785

6 Claims. (Cl. 204—4)

This invention has reference to electrodes for use in electrolytic baths and is especially useful in connection with anodes adapted for use in a bath for producing gases such as chlorine.

For purposes such as the foregoing, it has been common to employ carbon or some other material for anodes in view of the fact that metals which were commercially available for the purpose had a certain characteristic or quality known as "valve action" which normally prevented their use as anodes. At this point it might be noted that metals which have the characteristic referred to includes tantalum, columbium, aluminum, magnesium, bismuth, tungsten and others. The valve action apparently is caused by the formation of an oxide film on the surface of the metal when used as an anode in an electrolytic bath, the film offering high resistance to the flow of electric current.

It is the primary object of the present invention to overcome the valve action or current rectification referred to and to make metals such as the above available for use as anodes.

The manner in which the foregoing and other objects and advantages are obtained will be discussed more fully after a consideration of the accompanying drawing, in which—

Figure 1 is a diagrammatic showing of an electrolytic bath and associated elements, with an anode constructed in accordance with the present invention immersed in the bath; and

Figure 2 is a considerably enlarged view of the anode itself, a portion thereof being broken out and shown in section.

In Figure 1 the reference numeral 3 identifies a suitable vessel or receptacle adapted to receive an electrolyte 4. At 5—6 I have indicated a source of alternating current one side of which has a connection 7 extended to a cathode diagrammatically shown at 8, the cathode, of course, being at least partially immersed in the electrolyte 4. The other side of the current source is connected as by the wire 9 with the anode generally indicated at 10.

Referring now to Figure 2 it will be seen that the present illustrative embodiment of the anode includes a core or base structure 11 and a sheath or covering 12. The base 11 may be formed of any suitable metal such, for example, as copper, and the sheath or covering is formed of one of the metals above referred to, preferably tantalum, which, when used by itself in an electrolytic bath, normally has a valve action.

Attention is now called to three structural features of the anode. In the first place, the base 11

is completely shielded from the action of the electrolyte in the bath. In the present embodiment, this shielding is effected by completely surrounding the immersed portions of the core with the sheath or covering 12. Secondly, the electrical connection 9 is preferably extended to the core. Thirdly, the sheath and the base or core structure are in intimate physical contact with each other, and with regard to this matter it should be noted that the thickness of the sheath, as shown in Figure 2, is considerably exaggerated over that which would actually be necessary. The intimate contact of the covering and base may conveniently be produced by welding, brazing, casting, soldering, plating, spraying, or by drawing a cylinder of tantalum and swedging it over a core.

I have proven in practice that when one of the metals referred to above, for example, tantalum, is placed in intimate contact with a base composed of another metal such, for example, as copper, the valve action which this metal would normally have when used by itself as an anode in an electrolytic bath, is eliminated. This is apparently due to the fact that an oxide film does not form to prevent the electrons passing from the solution to the anode. Under these circumstances, the high resistance formerly encountered to the flow of current from the electrode to the electrolyte is overcome and the compound assembly of metals can therefore be used as an anode in an electrolytic bath.

It might further be observed that I have found that when the intimate adhesion or contact between the base of the anode and the covering thereof which is exposed to the action of the bath is destroyed, the oxide film immediately develops and the valve action then returns.

An anode constructed in accordance with the foregoing has great life, requires extremely low current, and secures better gas, when used, for example, in the production of chlorine, with more rapid evolution and without deterioration.

In conclusion, it should be noted that the invention is not limited to any specific form of anode, so long as intimate contact between the metals is provided and so long as the two metals are arranged in the anode structure in such manner that the base is shielded from the action of the electrolyte, provision being made in this way for the passage of the current from the base or its equivalent, through the tantalum or other similar metal to the electrolyte.

The present application is in the nature of a substitute for my application filed October 29th, 1930, Serial No. 491,917.

I claim:

1. An anode for use in an electrolytic bath, said anode including a metallic base or core structure to which an electrical connection is adapted to be made, and an additional metallic part in intimate physical contact with the base or core, said part being composed of a metal which, when used by itself as an anode in an electrolytic bath would normally have a valve action, the said part further being adapted to be exposed to the bath during operation and the said base being shielded from the bath, whereby, in use, the valve action which the metal of said part would normally have when used by itself is substantially eliminated.

2. A bi-metallic anode for use in an electrolytic bath in which the two metallic parts thereof are in intimate physical contact with each other, one of said metallic parts being composed of tantalum and being exposed to the action of the bath and the other part being shielded from the bath, together with an electrical connection extended to the said other part, whereby, in use, the valve action which the metal of said one part would normally have when used by itself, is substantially eliminated.

3. An anode for use in an electrolytic bath, said anode including two metallic parts one of which is composed of copper and the other of which is composed of tantalum and the two parts being in intimate physical contact with each other and so arranged that the tantalum is adapted to be exposed to the action of an electrolytic bath and that the copper is adapted to be shielded from the action of the bath, whereby, in use, the valve action which the tantalum would normally have when used by itself, is substantially eliminated.

4. An anode for use in an electrolytic bath,

said anode being composed of two metallic parts in intimate contact with each other, one of said parts being formed of a metal which when used by itself in an electrolytic bath has a valve action, the said one part being exposed to the bath and being arranged to shield the other metallic part from the bath, whereby, in use, the valve action which the metal of said one part would normally have when used by itself is substantially eliminated.

5. An anode for use in an electrolytic bath, said anode including a metallic core to which an electrical connection is adapted to be made, and an additional metallic part composed of a metal which when used by itself in an electrolytic bath normally has a valve action, said additional part being arranged to surround the core and shield at least that portion of the core which is adapted to be immersed in the bath, and the core and said part being in intimate physical contact with each other, whereby the valve action which would normally result from use of the metal of which the said additional part is composed is substantially eliminated.

6. An anode for use in an electrolytic bath, said anode including two metallic parts in intimate physical contact with each other, one of said parts being adapted to have an electrical connection coupled therewith and further being shielded from the electrolyte in the bath, and the other part being composed of a metal which when used by itself in an electrolytic bath normally has a valve action, the said other part being exposed to the electrolyte in the bath, whereby the valve action which would normally result from use of the metal of which said other part is composed is substantially eliminated.

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