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[54] **IMPROVEMENTS IN METHODS OF PRODUCING ELECTROLYTIC ANODE ASSEMBLIES**

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** ..... **204/286**; 204/290 R

[51] **Int. Cl.**[2] **C25C 7/02**

[58] **Field of Search** ..... 204/252, 98, 128, 290 R, 204/286

[56] **References Cited**

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[57] **ABSTRACT**

Methods are provided of producing electrolytic diaphragm cells are provided comprising a plurality of vertical substantially flat and hollow anodes formed, as regards at least one of their two substantially parallel faces, by a sheet of a film-forming metal, said anodes being secured to the base of the cell by means of extended portions which pass through the base, characterized in that the extended portions comprise a core made of a metal which is a good electrical conductor, which core is covered by a sheath made of a film-forming metal, a good electrical contact being ensured between the sheath and the core.

2 Claims, 4 Drawing Figures

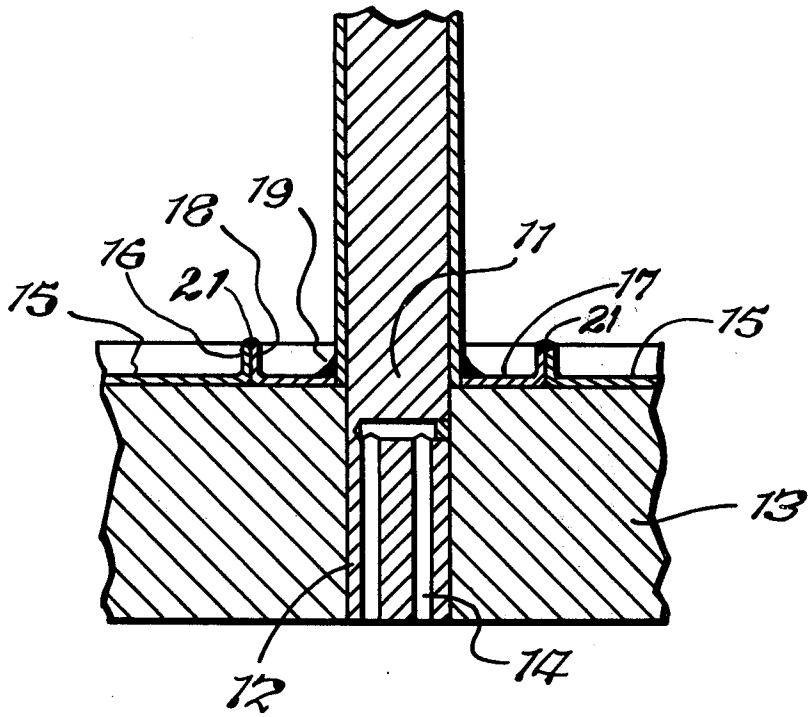


Fig. 1.

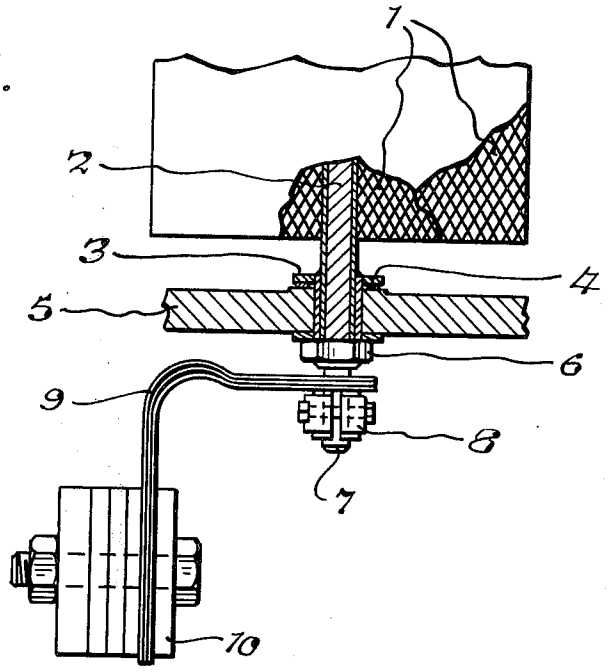


Fig. 2.

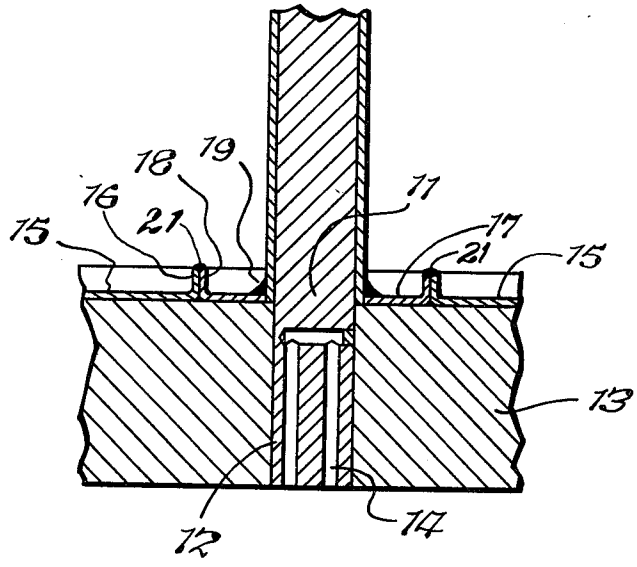


Fig. 3.

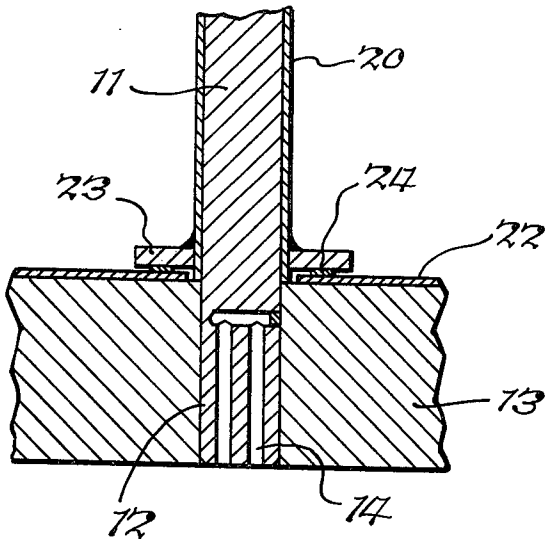
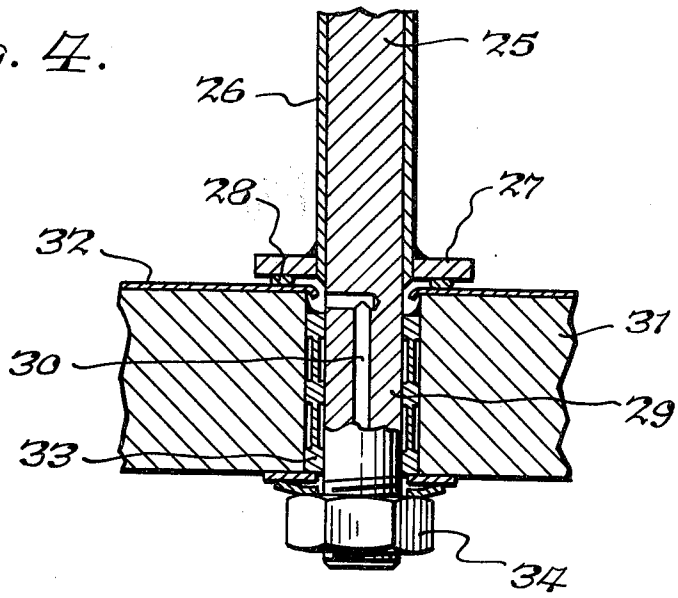


Fig. 4.



IMPROVEMENTS IN METHODS OF PRODUCING ELECTROLYTIC ANODE ASSEMBLIES

This application is a division of our copending application, Ser. No. 316,515, filed Dec. 19, 1972.

BACKGROUND OF THE INVENTION

The present invention relates to electrolytic diaphragm cells provided with flat and hollow metal anodes which are formed, at least as regards one of their two parallel faces, by an apertured sheet or a lattice made of titanium or a metal or alloy having similar anodic properties. The anodes are also provided with extended portions for the input of electric current and for fixing the anodes to the bases of the cells.

The advantages are known of using titanium or metals or alloys having similar properties instead of graphite anodes in electrolytic cells, with such anodes being covered with a conducting metal which is not attacked by the electrolytic solutions. In particular, French Pat. No. 1600249 describes constructions in which such metal anodes are extended by metal portions for securing them to the base of the cells, and for the input of the electrical current.

It is an object of the present invention to provide processes of producing electrolytic diaphragm cells having improved anodes.

It is also an object of the present invention to provide electrolytic diaphragm cells having anodes which permit a more favorable distribution of electrical current.

These and other objects will be apparent to those skilled in the art from the present description, taken in conjunction with the appended drawings, in which:

FIG. 1 is an elevational view of an anode of the invention.

FIG. 2 is an elevational view of the lower part of the anode of FIG. 1 having an extended portion fastened to the base of a cell.

FIG. 3 is an elevational view of another anode extended portion fastened to the base of a cell.

FIG. 4 is an elevational view of the lower part of an anode extended portion fastened to the base of the cell, with the electrical connection to the core portion shown.

GENERAL DESCRIPTION OF THE INVENTION

The improved constructions now described of the present invention use extended portions comprising a core made of a material which is a good electrical conductor, the core being covered with a sheath of titanium or other film-forming metal or alloy having similar anodic properties, so that a perfect electrical connection is ensured between the sheath and the core. The use of such extended portions makes it possible to achieve a reduction in the drops in potential, by supplying current directly to the core of the extended portions, the active parts which are the flat faces of the anodes themselves being welded to the sheath of the extended portions. Moreover, and advantageously, the extended portions can extend in space between the two parallel faces of the anodes, as far as their upper part, and can be welded to the faces of the anodes in such a way that the most favourable distribution of the electrical current is ensured at that point.

In practice, depending on the dimensions of the anodes and their electrical characteristics, one or more of such extended portions is used per anode, the use of a single extended portion enjoying the advantage, however, that it is not subjected to forces due to expansion of the elements of the anode. Extended portions of this nature are preferably made from jointly drawn members which are cylindrical in shape. It is easy to see that such a cylindrical shape permits various machining operations for ensuring a current feed to the extended portions.

A first way in which electrical current can be supplied comprises exposing the conducting core of the extended portion at its lower end which passes through the base of the cell. This permits securing to the core in various known manners the current supply leads. It also provides for a screw-thread on the sheath where it passes through the base, and securing thereto by welding above the screw-thread a washer of the same or a similar metal, and thus to tighten the extended portions to the cell base. Also provided is sealing by means of a sealing gasket, which is preferably toric or toroidal, interposed between the washer and the base. The current supply leads can be secured to the base of the cell and, if the base is metal, they can then act as a general current input for the anodes.

Another way in which the electrical current can be supplied to the extended portions of the anode in the case where the base of the cell is of metal, comprises gripping the conducting core of the extended portions of the anode, which is bared or exposed where it passes through the base of the cell, by the metal of which the base itself is made. This gripping effect can be achieved by simply making the core have a force or frictional fit in the base. However, it is preferably achieved by shrink-fitting, by establishing before assembly a sufficient temperature difference between the base and the extended portions of the anode, for example, by immersing the latter in liquid nitrogen before fitting. Upon expansion where returning to atmospheric or elevated temperature, a light fit is possible. Dismantling, if required, can be effected by various means which can be used in combination, and which can include (1) screw extractors, (2) by providing the various anchorages required, (3) conical machining of the core of the extended portions, (4) passages provided in the core so that a cooling fluid can be circulated therein, and (5) means for heating the base. In this second way of feeding the electrode with current, it is obvious that sealing can be effected in a similar manner to that described above, by squashing, when the anodes are assembled, a sealing gasket comprising a suitable elastomer, precisely by the amount required, between a washer secured to the extended portions and the base of the cell. Also, this may be accomplished by clamping the joint after assembly against the base by means of a washer which is screwed on to the sheath of the extended portions. It is also possible to effect sealing by welding on by means of their edges thin pieces of titanium or other film-forming metal, replacing the washers used hereinbefore, for protecting the base of the cell with titanium.

A third way in which the current supply can be provided, comprises using a conducting metal for making the base of the cell and making a connection between the base and the extended portions by means of resilient contacts arranged in an annular space provided between the conducting core of the extended portions, which core is bared where it passes through the base, and the aperture through which it passes through the base, sealing being effected in the same manner as

hereinbefore, by means of sealing gaskets.

SPECIFIC DESCRIPTION OF THE INVENTION

Embodiments of the present invention will be described by way of example hereinafter with reference to the accompanying drawings.

FIG. **1** shows an elevational view of an anode according to the invention comprising two expanded or apertured sheets **1** of titanium or other film-forming metal, such as tantalum, tungsten, zurconium, etc. These are welded along their vertical axes to the titanium sheath of a cylindrical jointly-drawn member **2** comprising copper and titanium. The titanium sheets **1** may be in the form of a lattice. Threaded on to and welded to the lower part of the member **2** is a washer **3** comprising titanium or other film-forming metal, which, by way of the toric sealing gasket **4,** provides for sealing with respect to the polyester base **5** of the electrolytic cell. The titanium sheath of the part of the member **2** which is located below the washer **3** is screw-threaded so that the anode can be tightened to the base of the cell by means of a nut **6.** The copper core **7** of the lower end of the member **2** is bared or exposed and carries a sleeve **8** connected by a bunch **9** of copper wires to the electric current supply rod **10.** The vertical edges of the titanium sheets **1** are connected by welding by means of members which are also made of expanded titanium sheets.

FIG. **2** shows an elevational view of the lower part of an anode according to the invention having its extended portion which is gripped in the base of the cell, the anode itself being made as described hereinbefore with reference to FIG. **1.** The extended portion **11** is a cylindrical jointly drawn member comprising copper and titanium. The copper core of the lower part of the copper-titanium member is exposed at **12** over a height corresponding to the thickness of the base of the cell, the base being preferably made of cast aluminium and indicated by reference **13.** A passage **14** in the copper core permits the temperature of the member to be reduced by circulating liquid nitrogen therein, so that assembly and dismantling can be effected by shrink-fitting as described hereinabove, the machining tolerances of the copper core and the bore of the corresponding hole in the base of the cell being gauged in consequence.

Protection from corrosion is effected in the following manner: the base **13** of the cell is covered by a titanium sheet **15** in which are provided circular apertures coaxial with the electrode extended portions. The edge of the apertures is relieved at **16;** a washer-shaped member **17** provided with a relieved edge **18** and made from a titanium sheet of the same thickness as the titanium sheet **15** is welded at **19** to the sheath **20** of the member **11,** and the edges **16** and **18** are welded at **21.** The welding can be ground off before dismantling the anode.

FIG. **3** also shows another mode of gripping an anode extended portion of an anode of the invention in the base of the cell. This Figure again shows the cylindrical copper-titanium member **11,** the sheath **20** of the member **11,** the copper core exposed at **12** at the lower end of the member **11,** and the cooling passage **14.** In this construction, the base **13** of the cell is covered with a titanium sheet **22** provided with circular apertures through which the extended portions pass. Welded to the sheath **20** is a titanium washer **23** for sealing to the base by means of a toric seal **24** which is crushed or flattened during assembly.

FIG. **4** shows an elevational view of the lower part of an anode extended portion, and the means for electrical connection between the core of the extended portion and the metal base of the cell. This Figure shows the copper-titanium jointly drawn member **25** covered with a sheath **26,** a washer **27** welded to the sheath **26,** and a toric seal **28.** The lower bared end **29** of the member **25** is here provided with an electrolyte leakage purge hole **30,** and terminated by a screw-thread. The copper base **31** of the cell has apertures through which pass the exposed ends of the jointly-drawn members, and is protected by a titanium sheet **32** having apertures with turned-down edges, corresponding to the apertures in the base **31.** The diameter of the apertures in the base is such that an annular space is provided, for positioning rings with multiple resilient contact means **33** for making an electrical connection between the extended portions and the base of the cell which serves in this construction as a general current input. The electrode extended portion is secured by clamping by means of a nut **34** which is screwed on to the screw-threaded end of the core.

In the foregoing embodiments, it is to be understood that where a titanium component is referred to, it may be substituted with a corresponding component fashioned of another film-forming metal or alloy thereof.

The terms and expressions which have been employed are used as terms of description and not of limitation, and there is no intention in the use of such terms and expressions of excluding any equivalents of the features shown and described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

What is claimed is:

1. A method of providing a replaceable anode assembly in an electrolytic diaphragm cell, said cell comprising a plurality of vertical substantially flat and hollow anodes formed, as regards at least one of their two substantially parallel faces, by a sheet of a film-forming metal, said anodes being secured to the base of the cell by means of extended portions which pass through the base, said extended portions comprising a core made of a metal which is a good electrical conductor, which core is covered by a sheath made of a film-forming metal, a good electrical contact being ensured between the sheath and the core, said base of the cell being of an electroconductive metal, which base is protected by a sheet of film-forming metal, said core of said extended portions is exposed where it passes through the base of said cell, characterized in that sealing between said anode and said base is effected by welding cup-shaped washers of film-forming metal affixed to said extended portions of said anodes and having a raised edge, to the film-forming metal sheet which protects the base of the cell, whereby said film-forming metal sheet which has a raised edge corresponding to the raised edge of said cup-shaped washers is welded at the raised edges of said cup-shaped washers to effect a seal.

2. A method in accordance to claim **1,** whereby the core of said extended portions of said anode where it passes through the base of said cell is gripped by the metal of said base by shrink-fitting by temperature difference.

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