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Fletcher et al.

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[54] **ELECTROLYTIC CELL STRUCTURE**

[76] Inventors: **James C. Fletcher,** Administrator of the National Aeronautics and Space Administration, with respect to an invention of **David F. Putnam,** Myrtle Creek, Oreg.; **Richard L. Vaughan,** Long Beach, Calif.

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[52] **U.S. Cl.** ..... **204/267;** 204/242; 204/279; 204/286; 204/290 R

[51] **Int. Cl.** **B01k 3/00**

[58] **Field of Search** ..... 204/267, 269, 279, 286, 204/290 R, 242

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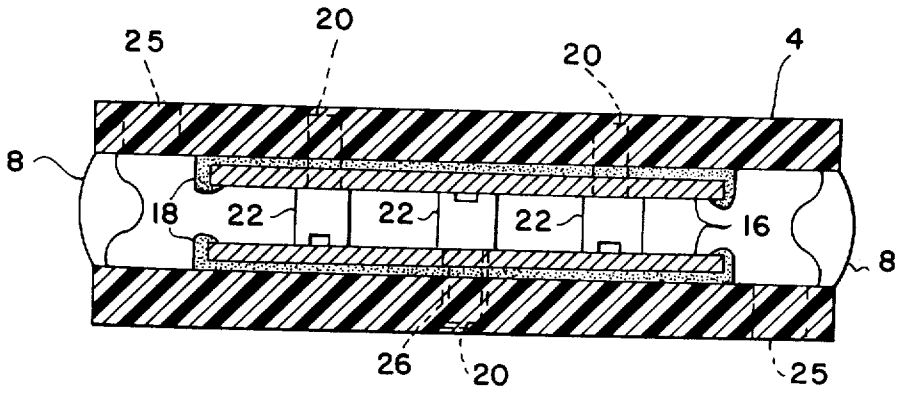
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Primary Examiner—John H. Mack
Assistant Examiner—W. I. Solomon
Attorney, Agent, or Firm—Howard J. Osborn; John R. Manning

[57] **ABSTRACT**

An electrolytic cell is made up of a stack of polysulfone plates faced with sheets of platinum bonded thereto by silicone rubber and mechanically secured to their plates by Teflon screws having heads serving as spacers between opposed platinum sheets.

5 Claims, 3 Drawing Figures



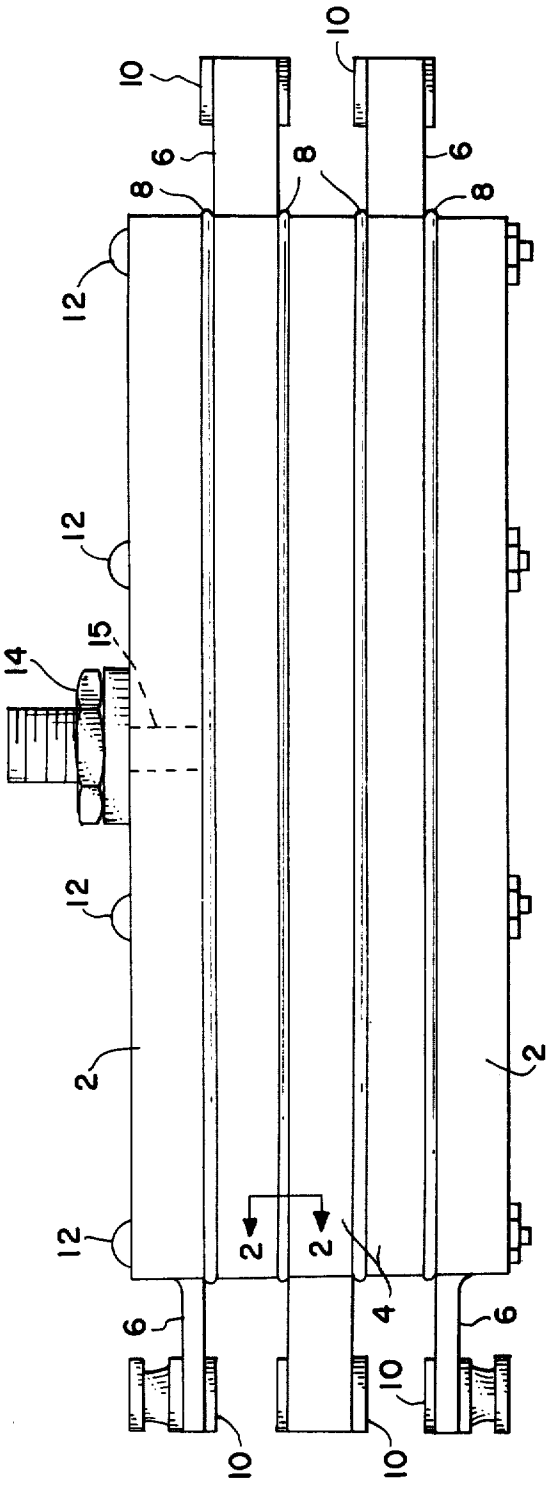


FIG. 1

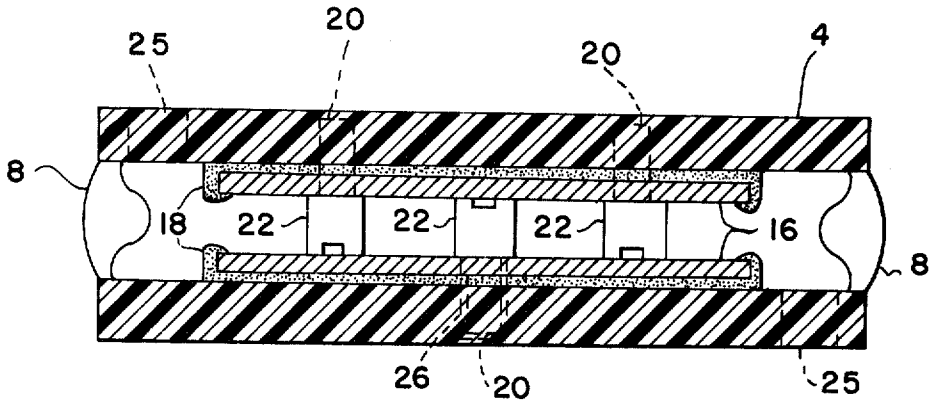


FIG. 2

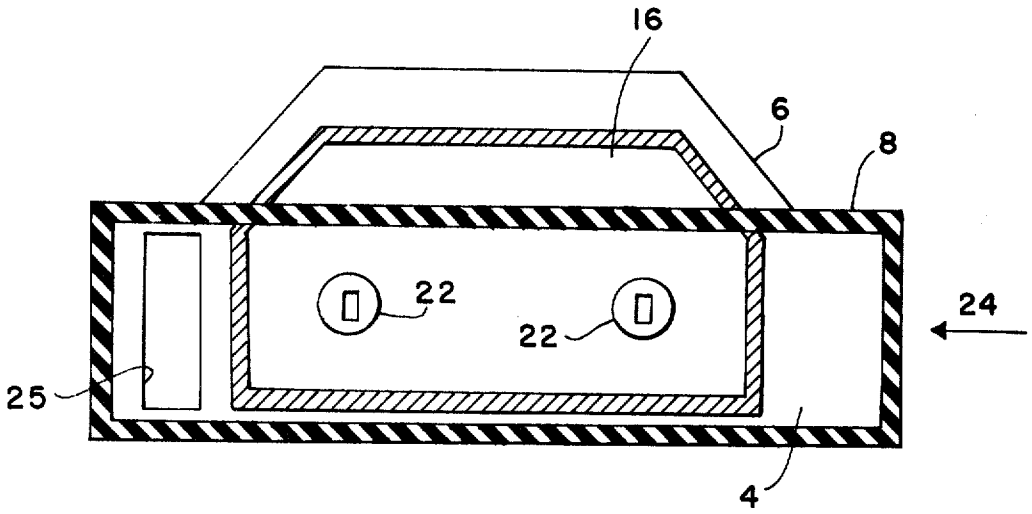


FIG. 3

ELECTROLYTIC CELL STRUCTURE

The invention described herein was made in the performance of work under a NASA contract and is subject to the provisions of Section 305 of the National Aeronautics and Space Act of 1958, Public Law 85-568 (72 Stat. 435; 42 USC 2457).

BACKGROUND OF THE INVENTION

This invention is in the field of electrolytic cells and particularly to the construction of elements thereof.

Electrolytic cells are known wherein spaced sheets of insulating material define liquid flow paths therebetween and wherein each sheet is provided with a conductive face exposed to the flow path. Such prior devices, however, have been subject to disadvantages in that the conductive or metallic faces have been in the form of sheets that could separate from their supporting plate during operation and buckle into electrical contact with an opposed sheet, thus rendering the cell inoperative. Furthermore, it is necessary to protect the edges of the conductive sheets from corrosive attack and it has heretofore been proposed to employ accurately machined recesses in the supporting plates to encompass and seal against the edges of the conducting sheets.

SUMMARY OF THE INVENTION

The present invention seeks to eliminate the foregoing objections by bonding and clamping the conductive sheets to the faces of their supporting plates and renders construction of such cells considerably simpler by providing clamping screws for the metallic sheets, which screws are of insulating material and further serve as spacers predetermining the transverse dimensions of the flow paths through the cell.

It is, therefore, an object of this invention to provide a simple electrolytic cell assembly wherein insulating screws serve the functions of holding conductive sheets to their supporting plates and also function as spacers between adjacent conductive plates.

It is a further object of this invention to provide an electrolytic cell as set forth wherein the conductive sheets are bonded and edge sealed to their supporting plates without the necessity of special machining operations.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an end view of an electrolytic cell constructed in accordance with the present invention;

FIG. 2 is an enlarged sectional view taken on the line 2—2 of FIG. 1; and

FIG. 3 is a bottom view of upper electrode assembly shown in FIG. 2.

DESCRIPTION OF A PREFERRED EMBODIMENT

As shown in FIG. 1, the electrolytic cell of the present invention comprises a pair of outer support plates 2 and a plurality of intermediate plates 4. Each of the plates is provided with a laterally extending ear 6 for a purpose to be described. An assembly of the plates is stacked as shown and rubber or silicone rubber gaskets 8 extend at least around the peripheries of adjacent plates to seal the spaces therebetween with the plates in spaced parallel relationship to thereby define flow paths between the plates for flow of liquids to be treated. The inner faces of plates 2 and both faces of plates 4 are covered with a sheet of conductive metal

which extends outwardly therefrom on the ears 6 to where they are connected to suitable terminal connectors 10 whereby the conductive sheets may be suitably connected to a source of electrical power. The features thus far described are more or less conventional and will not be described in further detail except to point out that the stack of plates is held in assembled relation by suitable through bolts 12 and the cell is provided with an inlet fitting 14 and an outlet fitting (not shown). The inlet fitting communicates with a passageway 15 leading to one end of the flow path between the plates and suitable ports 25 through the plates 4 provide for connecting the flow paths between adjacent plates in series or parallel relationship.

Referring now to FIG. 2, the plates 4 are shown as being of insulating plastic material, preferably polysulfone suitable for many specialized uses for the cell. Each of the conductive metal sheets referred to is identified by numeral 16 and each is preferably a sheet of platinum of about 2 mil thickness. Each of the sheets 16 is bonded to its support plate 4 by a layer of silicone rubber material 18. The silicone rubber is preferably spread onto the surfaces of plates 2 and 4 while wet and the platinum sheet 16 is then placed thereon and held clamped in position until the rubber material sets, thus effecting a bond between the platinum sheet and plate 2 or 4, which bond conforms precisely to the surfaces of each. As shown in FIG. 2, the silicone rubber material 18 extends to the outer edges of the sheets 16 and effects a complete seal in that region to protect the edges of the platinum sheets against electrolytic attack.

In addition to the bonding effect of the silicone rubber 18, the platinum sheets 16 are further mechanically clamped to their supporting plates 4 by headed screws 20 made of insulating material immune to attack by the liquids being processed. The screws 20 are preferably made of tetrafluoroethylene, commonly known as Teflon. The screws 20 are provided with enlarged heads 22 overlying the platinum sheets 16 and all heads 22 are of the same axial length whereby they may extend toward and into contact with an adjacent platinum sheet 16 to thus maintain proper spacing between those plates to predetermine the transverse dimension of the flow path between plates 16, identified by numeral 24. Preferably, the screws 20 extend threadedly into corresponding threaded openings 26 in plates 2 and 4. As evident from FIG. 2, the screws 20 in adjacent plates 4 are laterally offset whereby the screw heads from both plates extend into and across the same flow path 24 without interference from each other.

It is to be understood that essentially the same construction described with reference to FIG. 2 is provided between plates 2 and 4. Thus, all of the plates 4 may be of identical construction and the same is true of all of the plates 2. The silicone rubber gaskets 8 previously referred to extend at least around the periphery of the plates 2 and 4 with the screws 20 being inwardly therefrom. The screws 20 may be dispersed as desired throughout the areas of the platinum sheets 16 and function not only to maintain adhesion between sheets 16 and bonding layer 18 but also serve to prevent any buckling or warping of the sheets 16 away from their supporting plates. It is to be understood that the gaskets 8 may be suitably configured or additional internal gaskets may be provided to establish any desired shape of flow path between plates. After assembly of the entire stack of plates, as shown in FIG. 1, the assembly is held

in clamped relationship by the through bolts **12** which preferably extend through the stack of plates, through enlarged openings in platinum sheets **16** and through the peripheral gaskets **8** whereby the screws **12** are completely insulated from the electrical circuits of the cell. On the other hand, the through bolts **12** may be of nonconductive or insulating material.

While a single specific embodiment of the invention has been shown and described, it is to be understood that the same is merely illustrative of the principles of the invention and other forms may be resorted to within the scope of the appended claims.

We claim:

1. In an electrolytic cell assembly comprising a plurality of spaced parallel insulating plates, with adjacent plates defining flow paths therebetween, said plates having electrically conductive sheets secured thereto, the improvement comprising:

adhesive means for securing said conductive sheets to said plates and for sealing edges of said conductive sheets thereby protecting said conductive sheets from electrolytic attack;

headed screw means of insulating material for securing each of said conductive sheets to its respective plate and for preventing buckling of said conductive sheet by maintaining adhesion between said conductive sheet, said adhesive means and said insulating plate and for maintaining a predetermined spacing between said plates; and resilient gasket means between said adjacent plates defining predetermined flow paths therebetween.

2. An electrolytic cell assembly as defined in claim **1** wherein said adhesive means comprises a layer of silicone rubber of sufficient thickness to insure sealing of said conductive sheet edges upon compression.

3. An electrolytic cell as defined in claim **1** wherein said plates are of polysulfone and said conductive sheets are of platinum.

4. An electrolytic cell assembly as defined in claim **3** wherein said headed screws are of tetrafluoroethylene.

5. An electrode assembly for an electrolytic cell comprising:

a plate of insulating material;

a thin sheet of platinum overlying at least one face of said plate and secured thereto by a layer of silicone rubber;

screw means of insulating material for securing said sheet to said plate and for preventing buckling of said thin sheet by maintaining adhesion between said thin sheet, plate, and layer of silicone; said screw means having a head extending outward from said thin sheet a predetermined distance and engaging an adjacent metal sheet to maintain a predetermined spacing between said adjacent plates;

said layer of silicone rubber extending to the edges of said sheet for bonding said sheet to said plate and for sealing the edges of said sheet against electrolytic attack.

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