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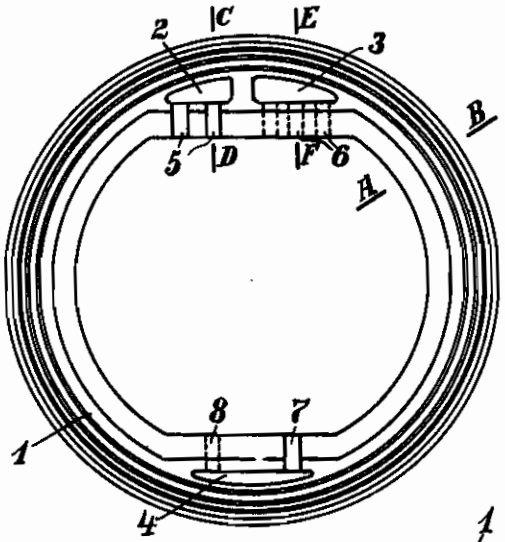
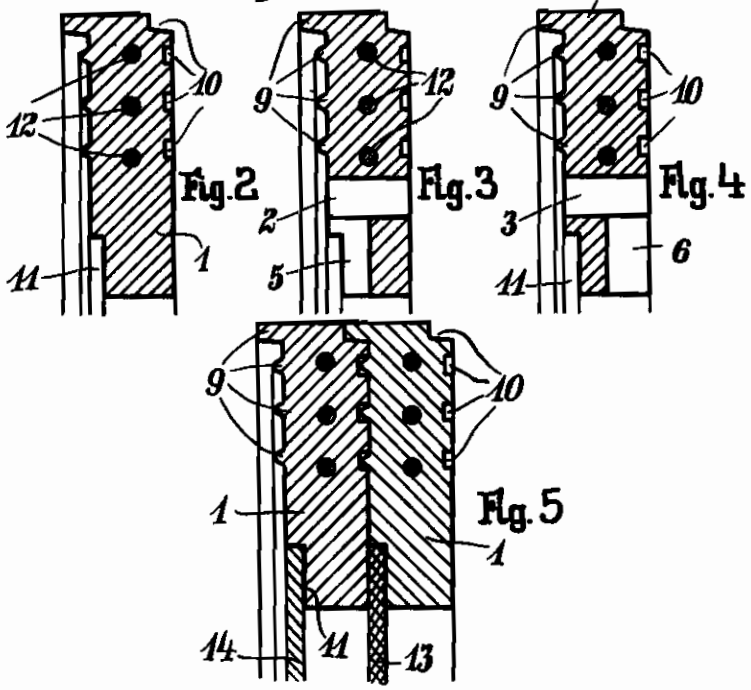


Fig. 1



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ALIEN PROPERTY CUSTODIAN

MANUFACTURE OF ELECTROLYSER CELL FRAMES

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Various methods have been proposed for producing cell frames for electrolysers of the kind comprising a plurality of cell frames assembled to a unitary structure after the fashion of a filter press.

Some of these methods involve casting the individual frames of cement or cement mixture. Such frames are not sufficiently dense and moreover are not sufficiently strong. If the frames are bounded with metal, a certain stiffening results in addition to imperviousness outwardly, but the absolutely necessary tensional and compressional strength is not increased. Further, the frame must be packed and insulated towards the electrolyte by means of interposed layers of rubber. Owing to lack of sufficient strength these frames are not used in practice.

It has also been proposed to produce the frames of impervious and insulating materials, particularly lacquer solutions and to add thereto filling substances, including cement. The purpose of the filling substances is to give the materials, which are liable to soften under heat, a certain stiffness even at higher temperatures. Forming is effected in heated moulds under pressure, but previously the solvent has to be evaporated and the mass has to be disintegrated in disintegrating machines. The moulding itself is effected progressively in a plurality of operations, drying being effected between the operations. This method enables insulating bodies of sufficient compressional strength to be produced, but it is expensive and complicated and can only be employed in connection with thermoplastic mixtures.

Objects of the present invention are, firstly to provide an improved and simplified method of manufacturing electrolyser cell frames, and secondly, to obtain by this method cell frames all of one and the same profile such that the frames can be simply pressed or held together to constitute the cells under assurance that their juxtaposed surfaces make sealing engagement.

The method comprises mixing a cement-asbestos mass with the addition of water, or water with other binding and densifying liquids, and pressing it under high pressure and at normal temperature into a profile mould, insertions of metal or other suitable material being incorporated in the moulded mass for increasing its strength.

The moulded mass is insulating- and heat- and lye-resistant.

Experiments have shown that the addition of bitumen to the mass also gives good results.

Conveniently the method is carried into effect as follows:

The materials are mixed directly prior to the moulding operation with the addition of water or some other setting and densifying liquid. The mass is prepared in a quantity just sufficient for the moulding of one frame. In order to obtain a homogeneous mixture it is convenient to effect the mixing with an excess of water. Shortly before the moulding operation the excess water is removed and half of the mass is uniformly distributed in a profile mould. The strength-increasing insertion is then introduced and the rest of the mass placed in position. Then the mass in the mould is subjected to high pressure in a press to complete the moulding operation whereafter the moulded mass or cell frame is ejected from the mould and is placed temporarily into a separate setting frame to ensure perfect setting without warping and deformation. During setting the moulded frames are frequently watered, or they may be allowed to set under water.

A mixture of 10–50% of asbestos, 10–35% of limestone and 50–80% of cement has proved satisfactory.

The high moulding pressure results in such density of the structure that packing of the frames outwardly or towards the electrolyte is unnecessary. Frames made in this manner are very dense and are of great tensional and compressional strength.

Metal wires welded to rings or formed into spirals, metal strips, wire netting or profiled sections and the like may be employed as insertions, but if it is desired to avoid metal, insertions of asbestos fabric or asbestos string or similar material may be employed.

The invention embraces electrolyser cell frames produced by the aforesaid method and each having the same profile, namely projections on one side surface and aligned, corresponding grooves or recesses in the other side surface, enabling two frames to be assembled in self-sealing juxtaposition to constitute a cell.

A ledge-forming recess for the reception of a diaphragm or an electrode is preferably formed in the surface presenting the aforesaid projections, whereby all fixing means for the diaphragm or electrode and the hand labour otherwise necessary for the fixing are avoided.

In spite of each cell being formed by two frames, a separate packing can be dispensed with altogether owing to the novel frame profile, i. e. to the adoption of projections and recesses. It

is sufficient simply to apply a coating of paint-like composition and to press the frames together to obtain an absolutely reliable gas- and liquid-tight seal. For this coating a mass of bitumen or a mixture of bitumen with other filling substances, such as asbestos, cement or talcum, has proved eminently satisfactory.

Since the two frames necessary for one cell and referred to as anode and cathode frames, are perfectly alike, with the exception of the gas outlets hereinafter referred to, production costs are considerably reduced. Further, since the insertion and fastening of the electrodes and of the diaphragms is very simple and can be effected without tools owing to the aforesaid ledge-forming recesses, considerable saving in the cost of assembly can be made having regard to the great number of individual cells necessary for a battery. However, the main advantage is the saving of at least two packing surfaces as compared with the known cell construction with divided cell frame of profiled iron and the saving of special packing.

A form of cell and the frames thereof made according to the invention are illustrated by way of example on the accompanying drawing, whereon:—

Fig. 1 shows the cell in front elevation;

Fig. 2 represents a fragmentary section, on the line A—B of Fig. 1, through only one of the two frames of the cell:

Fig. 3 represents a fragmentary section, on the line C—D of Fig. 1, through only one of the two frames, namely the anode frame;

Fig. 4 represents a fragmentary section, on the line E—F of Fig. 1, through only the other of the two frames, namely the cathode frame; and

Fig. 5 shows in section the assembly of the two frames.

Each cell is formed by two identically profiled frames 1 provided with two gas outlet channels 2,3 and with an electrolyte channel 4 extending therethrough. The two frames differ only in that in one, the anode frame, connection from the interior of the cell is established to the channels 2 and 4 by ducts 5 and 7 respectively, whereas in the other, the cathode frame, connection from the interior of the cell is established to the channels 3 and 4 by ducts 6 and 6 respectively. The connecting ducts 5 and 7 to the gas collector channel 2 and the electrolyte channel 4 are disposed at the front side of the pertaining frame (see Fig. 3) while in the other frame (see Fig. 4) the connecting ducts 6 and 8 to the gas collector channel 3 and the electrolyte channel 4 are disposed at the rear side. The number of the connecting ducts is immaterial. It will be understood that when a number of frames are juxtaposed to form a battery of cells the individual channels 2,3,4 are aligned to constitute three through channels.

Each frame is profiled to present on one side surface projections and packing ledges denoted 9 and in the other side surface aligned and conforming recesses or grooves 10. Four such projections and recesses are shown. 11 is an inner ledge-forming recess into which alternatively a diaphragm 13 or an electrode 14 (Fig. 5) may be inserted. The uppermost projection 9 and the uppermost groove 10 are deeper than the rest to facilitate the assembly of the cell frames and to render relative displacement of the frames impossible. 12 indicates the iron rings which serve as insertions for the press-moulded frame.

Fig. 5 shows clearly how the projections 9 and grooves 10 interengage and how the tightness of the cell is ensured by coating with a sealing substance as hereinbefore mentioned. It will also be seen how displacement is prevented by making the upper groove 10 and projection 9 deeper than the rest.

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