COMMONWEALTH OF AUSTRALIA
Patents Act 1952-1969

CONVENTION APPLICATION FOR A PATENT

CONVENTION APPLICATION FOR A PATENT

K
(1) Here insert (up to
five lines) names of
Applicant or
Applicants, followed by
their address (s).

HOECHST AKTIENGESELLSCHAFT,
We of 45 Bruningstrasse, D-6230 Frankfurt/Main 80,
Federal Republic of Germany

(2) Here insert Title
-of Invention.

hereby apply for the grant of a Patent for an invention entitled:
ELECTROLYSIS CELL WITH HORIZONTALLY DISPOSED
ELECTRODES

which is described in the accompanying complete specification. This application is a
Convention application and is based on the application numbered (3)
P3425862.0
for a patent or similar protection made in (4) Federal Republic of Germany
on 13th July 1984

(5) Here insert number(s)
of basic application(s)

(6) Here insert Name
of basic Country or
countries, and basic
date or dates

(7) Our address for service is Messrs. Edwd. Waters & Sons, Patent
Attorneys, 50 Queen Street, Melbourne, Victoria, Australia.

DATED this 11th day of July 1985

(8) Here insert signature of Applicant or
Applicants, and seal of Company if one is
affixed to this document.

HOECHST AKTIENGESELLSCHAFT

James Murray
Registered Patent Attorney

To: THE COMMISSIONER OF PATENTS.
COMMONWEALTH OF AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION UNDER PART XVI.
FOR A PATENT.

In support of the Convention application made under Part XVI. of the Patents Act 1952 by HOECHST AKTIENGESELLSCHAFT of 45, Brüningstrasse, D-6230 Frankfurt/Main 80, Federal Republic of Germany for a patent for an invention entitled:
"ELECTROLYSIS CELL WITH HORIZONTALLY DISPOSED ELECTRODES"

We, Johann-Heinrich Reuter, 4 Bodenheimer Straße, D-6500 Mainz,
Franz Lapice, 2 Sandweg, D-6233 Kelkheim (Taunus);
Federal Republic of Germany

do solemnly and sincerely declare as follows:

1. We are authorized by HOECHST AKTIENGESELLSCHAFT the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was made in the Federal Republic of Germany under No. P 34 25 862.0 on July 13, 1984 by HOECHST AKTIENGESELLSCHAFT.

3. Rudolf Staab, 56 Am Flachsland, D-6233 Kelkheim (Taunus)
Federal Republic of Germany

is/are the actual inventor(s) of the invention and the facts upon which HOECHST AKTIENGESELLSCHAFT is entitled to make the application are as follows:

The said HOECHST AKTIENGESELLSCHAFT is the assignee of the said Rudolf Staab.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

DECLARED at Frankfurt/Main, Federal Republic of Germany this 14th day of May 1985

To the Commissioner of Patents

Hoechst
Aktiengesellschaft

(ppa.Reuter) (i.V.Lapice)

PAT 510
Claim

1. Trough-like electrolysis cell with horizontally disposed electrodes for manufacturing chlorine from alkali chloride solution by the membrane process, in which the anodes are attached to the cell cover so that their height can be adjusted, wherein a gas diffusion cathode rests on a grating supported above the bottom of the cell, and a spacer is disposed between the membrane and the gas-diffusion cathode.

2. An electrolysis cell as claimed in claim 1, wherein the membrane is clamped between the cell cover and the cell trough;
   the cell cover incorporates devices for supplying and removing brine and chlorine; and
   the cell trough incorporates devices for supplying oxygen-containing gas.
ELECTROLYSIS CELL WITH HORIZONTALLY DISPOSED ELECTRODES
The subject of the invention is a trough-like electrolysis cell with horizontally disposed electrodes for manufacturing chlorine from alkali chloride solution by the diaphragm process, in which cell the anodes are attached to the cell cover so that their height can be adjusted.

About 50% of the world electrolysis capacity for manufacturing chlorine consists of electrolysis cells which employ the amalgamation process. The theoretical decomposition voltage for the mercury cell is approximately 3.15 to 3.20 volts. On the other hand, a theoretical decomposition voltage of approximately 2.2 volts is obtained if the alkali chloride electrolysis is carried out in a diaphragm cell with a hydrogen-producing cathode. Consequently, approximately 1 volt can theoretically be saved in cell voltage by the introduction of the diaphragm process, which is of considerable economic importance in times of rising energy costs. In addition to the energy saving, the membrane process offers the advantage of an ecologically harmless process, since no mercury is emitted, and even the lye produced is not contaminated with mercury.

The membrane cell consists of two electrolysis chambers which each have a gas-generating electrode and are separated by a cation-selective membrane. If such a membrane cell were disposed horizontally, a gas cushion consisting of chlorine or hydrogen depending on the arrangement would form underneath the membrane and the resistance of the electrolyte would cancel out the cell voltage advantage.

The object was therefore to create a membrane cell with horizontally disposed electrodes out of the mercury cell, in which membrane cell gas cushions which could affect the electrolyte resistance do not occur.

The present invention achieves the object in that a gas-diffusion cathode rests on a grating with supporting legs for supporting it on the bottom of the cell and a spacer is disposed between membrane and gas-diffusion cathode.
The membrane may be clamped between cell cover and cell trough. The cell cover may incorporate devices for supplying and removing brine and chlorine and the cell trough devices for supplying oxygen-containing gas.

The advantage of the invention is mainly to be seen in the fact that it is possible to convert mercury cells at low cost into membrane cells with their advantages as cited above.

The invention will be explained in more detail below with reference to a drawing which depicts only one method of embodiment. The figure shows a cross-section through the electrolysis cell.

The electrolysis cell consists of the cell trough 1 which is connected to the negative pole of the power supply. This trough is provided with supporting legs 2 which stand on the bottom of the cell and support the gas-diffusion cathode 3. At the same time they provide the current supply to the gas-diffusion cathode 3. The supporting legs 2 consist of a metallic material, preferably of the same material as the cell trough, in order to guarantee the best possible connection, eg. by welding the supporting legs, to the cell trough. The supporting legs 2 may be provided with a grating 4, on which the gas-diffusion cathode 3 rests. The gas-diffusion cathode 3 is itself a wire mesh or expanded metal coated with an electrochemically active catalyst, and is rendered water-repellent by means of a plastic, preferably polytetrafluoroethylene, in order to prevent the caustic soda solution percolating through. In this way a gas space I is created, via which the gas-diffusion cathode 3 is supplied with oxygen or an oxygen-containing gas, eg. air. The gas space is provided with devices for feeding in oxygen or air (not shown in the figure), and, if necessary, with devices for removing excess oxygen or air depleted of oxygen (not shown in the figure).

The cation-exchanging membrane is clamped between the cell lid 5 and the cell trough 1. It separates the cathode space II, in which the caustic soda circulates,
from the anode space III in which the conversion of the chloride ions into elemental chlorine takes place at a titanium or graphite anode 7. To ensure that the spacing between the cation-exchanging membrane and the cathode 3 is well defined and uniform, there is a spacer 8 in the cathode space II. This may take the form of a gauze consisting of a lye-resistant plastic or metal. For circulating the catholyte an inlet and outlet (not shown) provided in the cell trough 1 may be used.

The cell cover 5 is provided with devices (not shown) through which the anode space III can be supplied with brine and the depleted brine and the chlorine formed can be removed. Graphite anodes or activated titanium anodes are used as anodes to keep the chlorine overvoltage low. The anodes 7 are attached to the cell cover in a known way so that their height can be adjusted. It is especially advantageous if the membrane is in contact with the titanium anodes, and this can be achieved by means of the device for adjusting the electrode spacing.

The invention makes it possible to convert existing amalgamating plants to the membrane process using a considerable portion of the parts of the plant. If a gas-diffusion cathode is used, there is a further advantage in an additional cell voltage saving compared with membrane cells having a hydrogen-producing cathode, since the potential for oxygen reduction is approximately 1.2 volts more positive than the potential for hydrogen production.
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Trough-like electrolysis cell with horizontally disposed electrodes for manufacturing chlorine from alkali chloride solution by the membrane process, in which cells the anodes are attached to the cell cover so that their height can be adjusted, wherein a gas diffusion cathode rests on a grating supported above the bottom of the cell, and a spacer is disposed between the membrane and the gas-diffusion cathode.

2. An electrolysis cell as claimed in claim 1, wherein the membrane is clamped between the cell cover and the cell trough;
   the cell cover incorporates devices for supplying and removing brine and chlorine; and
   the cell trough incorporates devices for supplying oxygen-containing gas.

DATED this 11th day of July 1985.
HOECHST AKTIENGESELLSCHAFT

EDWD. WATERS & SONS
PATENT ATTORNEYS
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