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METHOD FOR STARTING MULTICELLULAR PRESSURE ELECTROLYZERS

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My invention relates to a method of starting pressure-operated multicell electrolytic apparatus having a plurality of individual pressure-resistant cells each containing a diaphragm so as to form therein an anode chamber and a cathode chamber, and having two systems of gas channels, one for connecting the gas-spaces of said anode chambers to a first receptacle and the other for connecting the gas-spaces of said cathode chambers to a second receptacle. Structures of this type are well-known for use under normal atmospheric pressure and may be used for producing hydrogen and oxygen or hydrogen and chlorine or the like. The use of such structures under pressure has, until now, been very dangerous.

The starting of such apparatus requires particular care because when the gas evolution commences, considerable quantities of the produced hydrogen go into solution or are held occluded on the electrodes. The evolution of oxygen (or chlorine) consequently predominates in the initial stage and pressure differences may occur between the anode and the cathode chambers which may endanger the diaphragms. The apparatus must therefore be started with a very gradually uniformly increasing current loading. This is particularly so with apparatus operated at pressures above atmospheric pressure in view of the fact that, since the volume of the generated gas decreases in such apparatus with increasing pressure, this volume is very small in the normal working condition and the electrolyte spaces and gas escape passages are of correspondingly small dimensions. Consequently, upon starting the operation the pressure in the cells has not yet built up, and these spaces and passages are inadequate, and unless the current intensity is increased very gradually and carefully during the starting, considerable turbulence is set up within the individual cells endangering the diaphragms and causing pressure differences in the narrow gas and electrolyte passages. These conditions may lead to the formation of a detonable oxy-hydrogen gas mixture.

The invention permits the starting of such electrolyzers without danger of destroying its diaphragms and without any danger of explosion. The method according to the invention is very simple and enables anyone skilled in the art, to start such structures rapidly and safely.

According to the invention the gas spaces of the electrolyzer are initially filled with an inert or neutral gas such as nitrogen at a gauge pressure of not less than 2 atmospheres (abs.) and

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the current is connected only under such pressure. The first gas bubbles are in this manner generated under pressure and their volume remains small, thus avoiding the occurrence of destructive turbulence in the electrolyte. Furthermore, the proportional influence of the hydrogen volume initially trapped by the solution and by occlusion, on the total pressures in the individual gas spaces, is appreciably reduced and even the restricted, transient formation of a gas mixture is rendered innocuous, by the admixture of inert gas, thus suppressing the danger of explosion. All these effects are of course enhanced with increasing pressure of the introduced inert gas and it is therefore in practice advisable to apply a starting pressure of not less than 10 to 20 percent of the ultimate working pressure, amounting in accordance with indivdual structures to 10 to 50 atmospheres or more.

Expressions such as "inert" or "neutral" are used herein in the customary sense, to designate a gas which does not produce a chemical reaction in the system. Nitrogen is given as an example of such a gas. It is inert or neutral in the sense that it does not produce an explosive mixture either with oxygen or with hydrogen or with chlorine.

It has been found even more advantageous to increase the pressure of the inert gas charge to the full value of the intended final working pressure. The apparatus can in such case be started with the correct final setting of all regulating and safety valves which previously had to be adjusted progressively in accordance with the gradually increasing gas pressures so as to ensure their correct functioning at all times.

If the current is, as mentioned above, switched on at the time when the full working pressure is attained, it is not only permissible but in fact particularly advantageous to increase the current intensity immediately to the full working value, because irregularities in the starting operation will then be contained within the time interval during which the inert gas filling is predominantly present which suppresses the decisive danger factors by its detonation-damping effect.

It may be mentioned in conclusion that it has been suggested to scavenge electrolyzers with nitrogen before starting in order to expel atmospheric oxygen from the spaces provided for receiving the generated hydrogen. Such previously proposed scavenging is in practice ineffective for and does not in any way benefit the starting operation because the danger of explosion, which has been eliminated by the scavenging, immedi-

ately reappears during the starting due to the inevitable formation of an oxy-hydrogen gas mixture the formation of which cannot be prevented by the small partial pressure of the residual nitrogen remaining in the apparatus after the scavenging.

I claim:

1. In the operation of electrolytic apparatus having a plurality of pressure-resistant cells each containing an individual diaphragm which subdivides its associated cell into an anode and a cathode chamber and having two gas collecting systems, one for the gas spaces of all anode chambers and the other for the gas spaces of all cathode chambers, the method of starting the operation of such apparatus which consists of the following steps, namely, (1) filling all gas spaces of both of said collecting systems with nitrogen at an equal pressure of at least two atmospheres abs.; and (2) thereafter switching on the current to commence electrolysis.

2. In the operation of multicell pressure electrolyzers having a plurality of cells each containing an individual diaphragm for subdividing its associated cell into an anode and a cathode chamber and having two gas collecting systems, one for the gas spaces of all anode chambers and the other for the gas spaces of all cathode chambers, the method of starting the operation of such apparatus which consists of the following steps, namely, (1) filling all gas spaces of both of said collecting systems with nitrogen at an equal pressure of at least 10 atmospheres abs.; and (2) thereafter switching on the current to commence electrolysis.

3. In the operation of multicell pressure electrolyzers having a plurality of cells each containing an individual diaphragm for subdividing its associated cell into an anode and a cathode chamber and having two gas collecting systems, one for the gas spaces of all anode chambers and the other for the gas spaces of all cathode chambers, the method of starting the operation of such apparatus which consists of the following steps, namely, (1) filling all gas spaces of both of said collecting systems with nitrogen at a pressure of at least 10 atmospheres abs.; and (2) thereafter switching on the current required for electrolysis at a magnitude which corresponds to full working conditions.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,581,944	Hausmeister	Apr. 20, 1926
1,983,296	Lacher	Dec. 4, 1934