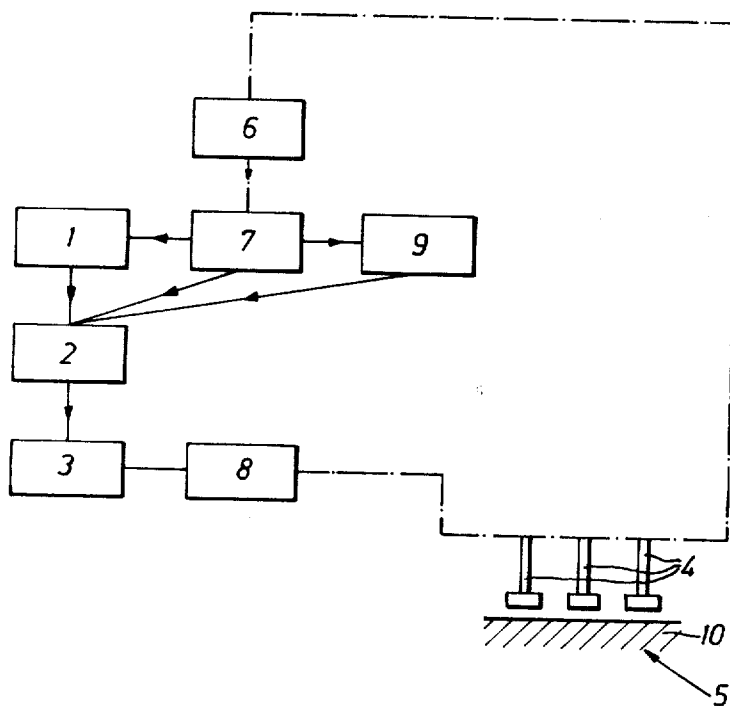


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CONTROL OF ANODE SPACING IN ALKALI METAL
CHLORIDE ELECTROLYTIC CELLS
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CONTROL OF ANODE SPACING IN ALKALI METAL CHLORIDE ELECTROLYTIC CELLS

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Continuation-in-part of abandoned application Ser. No. 720,376, Apr. 10, 1968. This application Aug. 13, 1970, Ser. No. 63,455

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6 Claims

ABSTRACT OF THE DISCLOSURE

In an alkali metal chloride electrolytic cell, the spacing between the anode and the mercury cathode is controlled by:

- (1) at certain predetermined time intervals, driving the anode towards the cathode until a short circuit occurs
- (2) immediately withdrawing after the short circuit the anode a predetermined distance from the cathode (e.g., by withdrawing the anode at a fixed rate for a predetermined length of time, a_1)
- (3) then advancing the anode a distance less than the distance withdrawn (e.g., by advancing the anode at the same rate as in step (2), for a predetermined length of time a_2 less than time a_1). A time delay can be interposed between the withdrawal step (2) and the advancement step (3), if desired, to permit removal of anode pieces from the cathode.

RELATED APPLICATION

This application is a continuation-in-part of "Process for the Automatic Adjustment of the Distance between the Anodes and the Mercury Cathode in Alkali Metal Chloride Cells," Ser. No. 720,376, filed Apr. 10, 1968, by the present inventors and now abandoned.

PREAMBLE

It is known to automatically adjust the distance between the anodes and the mercury cathode in alkali metal chloride cells using a common drive for the anodes. Numerous different constructions have been proposed in which all the anodes of one cell are fixed on a common support so that they can be adjusted as a single unit with respect to their distance from the mercury cathode. The anode support is usually adapted to be actuated by a drive so that it may be moved up or down by means of mechanical or hydraulic adjustment devices. Control of this drive and hence control of the position of the anodes has hitherto been carried out by hand, preferably after calculations and observations of operating conditions in the cell when they deviate from the nominal value. These operating conditions include, for example, deviations in the voltage or current, or thermal or magnetic deviations such as occur as a result of short circuits occurring or when there is a change in the distance between the electrodes.

THIS INVENTION

This invention provides a method by means of which adjustment of the anodes is effected automatically in the event of a short circuit or regularly at predetermined time intervals in the case of anodes which burn away.

According to this invention, the movement of the anodes is controlled through impulses of one or more time relays. The anodes thereby carry out certain pre-

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termined movements at a constant predetermined rate of speed towards or away from the mercury cathode in response to the impulses. One or more time relays can be used depending on the construction of the device. Any commercially available time relay may be used.

Thus, the invention provides a process for automatic adjustment of the distance of the anodes of the mercury cathode of an alkaline metal chloride cell which comprises adjusting the position of all the anodes of said cell on a common drive support by controlling the movement of said anodes with impulses from relays as follows. First, the anodes are driven toward the cathode until short circuiting occurs between the two. Then, reversing the direction of travel of the anodes and moving the anodes at a selected rate for a selected time and thus a predetermined distance in said reverse direction, thereby interrupting the short circuit. Thereafter, the anodes are again moved towards the cathode at a selected rate for a selected time interval for returning the anodes a selected lesser distance than said predetermined distance, to position the anodes separated from the cathode by a distance greater than the short circuit distance for said automatic adjustment.

According to one embodiment of the invention, the anodes are moved at predetermined time intervals towards the mercury cathode until short circuiting takes place. They are then moved at a uniform speed away from the mercury cathode for an adjustable, smaller length of time, a_1 , and then are again advanced at the same rate of movement for a shorter predetermined period of time, a_2 . Continuous readjustment of the position of the electrodes thereby becomes possible, special importance being attached to a suitable choice of the difference between the times $a_1 - a_2$, which corresponds to the distance between the electrodes and therefore determines the optimum efficiency of the cell.

A time relay adjusted to operate over a long time interval imparts to the drive for the anode support the impulse required to move the group of anodes towards the mercury cathode. Depending upon the conditions in the cell, a second time relay is brought into action at the moment of short circuiting, the impulse of this second relay causing the anodes to be moved back during the length of time a_1 . When this process has been completed, a third time relay is switched on, causing the anodes to be lowered again for the length of time a_2 , so that an electrode separation corresponding to the difference between the length of time $a_1 - a_2$ is established.

The process according to the invention can be used in the same way in cases where short circuits automatically occur. Readjustment of the anodes takes place according to the same sequence of steps as were carried out after the above described artificially produced short circuit had been established.

According to the invention, readjustment of the position of the anodes can also be carried out to compensate for the amount of the anode which has burnt off when anodes are used which burn away. In this case, the anodes are moved towards the mercury cathode at predetermined time intervals a_3 for the length of time a_4 , a_4 being the quotient of the length of anode which is burnt off during the time a_3 and the speed of movement of the anodes. According to one embodiment, the first time relay imparts an impulse to the drive for the anode support after a predetermined length of time, e.g. after 6, 12 or 24 hours and the impulse imparted to the support causes the position of the anodes to be readjusted by a certain distance which corresponds to the length of the anodes which has been burnt away and is predetermined by a second relay as a length of time over which movement takes place.

Thus, burning away of the anodes is compensated for by periodically moving the anodes toward the cathode a

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distance equal to the length of anode burnt away during the time interval of the period.

According to another preferred embodiment of the invention, a time interval is interposed between the movement of the anodes away from the mercury cathode and their return movement towards the cathode. This interval may be determined by a third relay and is advantageous, for example in the case of carbon anodes in which short circuits frequently occur owing to small lumps of carbon breaking off the anodes. These lumps must first be flushed away from the mercury cathodes in order that a subsequent short circuit does not occur when the anodes are readjusted.

THE DRAWING

The drawing schematically illustrates the process of this invention.

In the drawing, a time relay 1, designed to operate at predetermined relatively long intervals of time, gives an impulse to a control device 2 (e.g., a switch on a motor 3) which causes it to rotate in a direction to impart a gradual downward movement via gear drive 8 of anodes 4 of an electrolysis cell 5 towards the mercury cathode 10 thereof. A short circuit-control-device 6 indicates by suitable measurement made at the electrolysis cell 5, when a short circuit occurs and then gives an impulse to a second time relay 7. This relay 7 reverses without delay the downward movement of anodes 4 and causes an upward movement to be imparted to the anodes 4, via control device 2, motor 3 and gear-drive 8.

After a predetermined time interval (a_1) has passed, the upward movement of the anodes 4 is stopped by relay 7 and a third time relay 9 is given an impulse to operate. During its working time (a_2) the anodes 4 are moved downwardly. The time-difference-interval ($a_1 - a_2$) ensures a defined distance of movement of the electrodes, starting from the movement of the short circuit between the anodes 4 and the mercury cathode 10.

We claim:

1. A process for automatic adjustment of the distance of the anodes from the mercury cathode of an alkali metal chloride cell which comprises adjusting the position of all the anodes of said cell on a common drive support by controlling the movement of said anodes with impulses from relays as follows:

- first driving said anodes towards said cathode until short circuiting occurs between the two;
- then reversing the direction of travel of said anodes and moving said anodes at a selected rate for a selected time and thus a predetermined distance in said reverse direction, thereby interrupting the short circuit;
- and thereafter again moving said anodes towards said cathode at a selected rate for a selected time

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interval for returning the anodes a selected lesser distance than said predetermined distance to position the anodes separated from the cathode by a distance greater than the short circuit distance, for said automatic adjustment.

2. The process of claim 1, comprising periodically moving said anodes toward said cathode at predetermined time intervals, a distance equal to the length of anode burnt off during said predetermined time interval.

3. The process of claim 1, which comprises interposing a time delay between the movement of said anodes away from said cathode and the return movement of said anodes towards said cathode.

4. A process for automatic adjustment of the spacing of the anodes from the mercury cathode of an alkali metal chloride cell after a short circuit, which comprises removing said anodes a predetermined distance away from said cathode to interrupt the short circuit and then moving said anodes towards said cathode a distance of advancement less than said predetermined distance to position the anodes separated from the cathode by a distance greater than the short circuit distance, for said automatic adjustment.

5. Process according to claim 4, which comprises interposing a time delay between the movement of said anodes away from said cathode and the return movement of said anodes towards said cathode.

6. A process for automatic adjustment of the distance of the anodes from the mercury cathode of an alkali metal chloride cell which comprises driving all the anodes in a direction normal to the cathode on a common drive support to provide the spacing of the anodes from the cathode, and controlling the movement of said anodes with impulses from relays to periodically, at a predetermined time interval, move said anodes toward said cathode, a distance equal to the length of anode which is burnt off during said predetermined time interval.

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