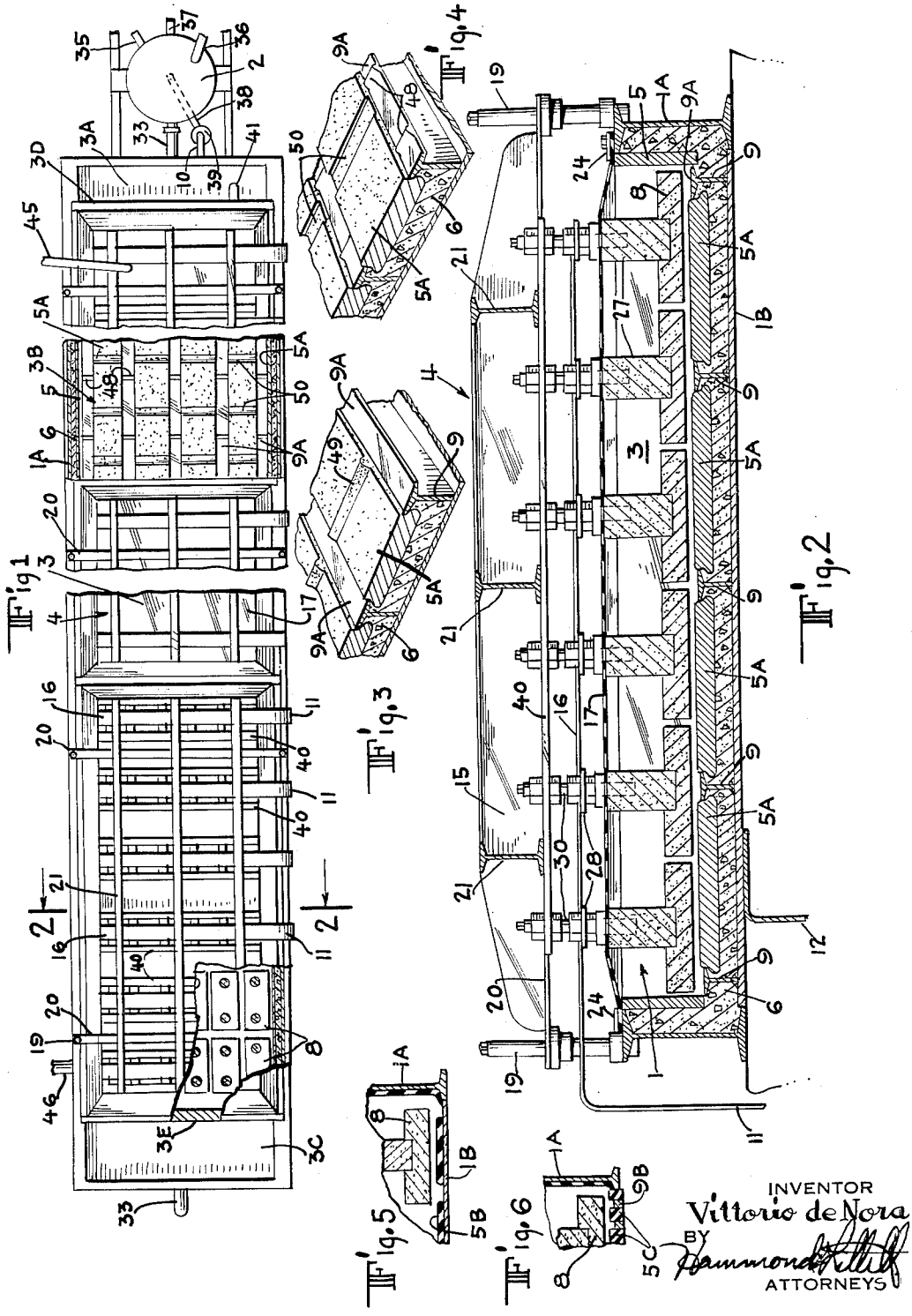
July 3, 1962 V. DE NORA 3,042,602

HORIZONTAL ELECTROLYTIC CELL

Filed Oct. 25, 1960



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United States Patent Office 3,042,602 Patented July 3, 1962

3,042,602

HORIZONTAL ELECTROLYTIC CELL

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Filed Oct. 25, 1960, Ser. No. 66,378
9 Claims. (Cl. 204—220)

This invention relates to electrolytic cells for the electrolysis of electrolytes in the form of fused salts or as solutions. The invention particularly relates to a novel construction for such a cell wherein the capacity of the cell is more than doubled relative to prior art cells and the cell is safe to operate by semi-skilled workers without automatic expensive short-circuiting switches or warning devices. The invention will be described as applied to a horizontal mercury cell and it will be obvious that the principles of the invention can be applied to all types of electrolysis cells of the mercury or other types in which the cathode is a fluid body of mercury flowing over the cell bottom or base or another metal which is fluid at the temperature of the electrolytic operation.

Examples of cells of this type, used in the prior art, are described in U.S. Patent No. 2,544,138, granted March 6, 1951; in Industrial and Engineering Chemistry, 1953 (vol. 45 No. 6), pages 1162–1172; and in Chemical Engineering Progress, September 1957 (vol. 53, No. 9), pages 409–417. The use of the cell base structure, such as herein described, on other cells of similar construction is also included within the scope of this invention. These cells, generally designated as horizontal mercury cells, consist of an enclosed elongated trough sloping slightly towards one end. The cathode is a flowing layer of mercury which is introduced at the higher end of the cell and flows along the bottom of the cell toward the lower end. The anodes are generally composed of flat rectangular plates of graphite suspended from graphite or copper rods in such a manner that their flat surface is spaced a short distance above the flowing mercury cathode. The body and sides of the trough are generally steel. The sides of the trough in contact with the electrolytic solution are lined with a resistant substance, for example, hard rubber, resins, natural stone set in concrete, or other suitable nonconducting material.

In the operation of this type of cell the electrolytic fluid, which may be an aqueous solution of any electrolyte compound or a fused salt which upon electrolytic decomposition will give the products desired, is usually introduced at the upper end of the cell and flows toward the lower end of the cell. For example, a solution of sodium chloride may be electrolyzed in such a cell. Electric current passes through the solution between the anodes and the mercury cathode. When sodium chloride is the electrolyte, chlorine is formed at the anode and passes to the top of the cell and out through an opening in the cell cover which is provided for this purpose. Sodium is formed at the cathode and amalgamates with the mercury cathode. The sodium amalgam is withdrawn at the lower end of the cell, cycled to a decomposer, packed with graphite where it is contacted with water to form sodium hydroxide, hydrogen and mercury. The mercury is recycled to the cell for reuse as the cathode. It will be understood that other electrolytes, such as potassium chloride, lithium chloride, barium chloride, sodium sulfate, as well as fused salts and the like, may be electrolyzed in such a cell.

In cells of this type the base of the cell is generally made of steel and is in contact with the negative bus bar. The mercury layer (for example) flows over the steel and actually constitutes the cathode in contact with the electrolyte. As mercury is relatively expensive the amount of mercury in circulation is kept as low as possible and the mercury cathode layer is kept relatively thin. Consequently, there has always been the problem of obtaining even distribution of the mercury over the base of the cell. This has made it necessary to use great care in the machining of the steel bottom interior of the cell to assure that it has an even substantially level surface.

It has not been possible to build cells of high current density such as 80,000 or 120,000 amp. because the capacity of the cells is determined by the length and width of the cell. The capacity of the cells could not be increased by extending the length of the cell since, as in the case of sodium chloride solutions, too much sodium in the amalgam makes the amalgam viscous and difficult to handle.

In the past it has been necessary to keep the cells relatively narrow in width because of the extreme difficulty of providing an absolutely level surface for the base of a wide cell from side to side thereof. When the base is not absolutely level, the thin layer of mercury is not evenly distributed over the base and various portions or "islands" of the base will be exposed. These exposed "islands" result in contact of the electrolyte solution with the steel base and present operating difficulties. When the cell is operating, a different reaction may take place because the steel and not the mercury is acting as the cathode. If aqueous salt solutions are used, hydrogen will be evolved which is a hazard since mixture of chlorine gas and hydrogen gas are frequently explosive. During periods when the cell is not operating, the exposure of the base to the electrolyte or gases will result in corrosion where the "islands" have formed because of accumulation of dirt and formation of local cell areas.

Another problem with the prior art cells has been the danger of destruction of the cell with possible injury to the operating personnel in the cell room due to the hydrogen and chlorine gas mixtures formed in the cell exploding with sufficient force to blow the cell apart. The prior art cells have rigid stone or similar covers which are usually tightly sealed to the rigid base and which are destroyed in an explosion. Therefore, elaborate warning systems and/or automatic short-circuit switches are necessary in order to short-circuit the cell when there is a reduction or interruption in the flow of mercury across the cell bottom. These add considerably to the installation costs of the cell and complicate the operation and up-keep of the cell.

Various attempts have been made to solve the problem of obtaining even distribution of the mercury on the cell base and to prevent exposure of the base. For example, the base has been made of a non-conductive material having conductive materials placed therein. The conductive materials consisted either of steel strips extending crosswise of the cell and spaced at intervals along the length of the cell or of circular metallic disks spaced over the bottom of the cell. However, neither of these methods has made it possible to increase the width of the cell since there is still the danger of exposure of portions of the conductive steel strips when the cell width is increased, and mercury and current distribution is not good in either of these alternatives.

Another attempt to solve this problem is described in Swiss Patent No. 297,829 published June 16, 1954, in which the cathode or cell base on which the mercury flows is divided into a plurality of individual troughs by the use of chlorine resistant separating strips secured to the conductive cell bottom and extending above the mercury level. In this type of cell construction large areas of the conductive cell base on which the mercury flows may still become exposed to the electrolyte in the event unevenness of the cell base or reduced mercury flow leaves exposed surfaces of the cathode between pools of

mercury and the wider the individual troughs constituting the cell the greater this danger.

It is an object of this invention to provide a horizontal mercury cell having improved mercury distribution over the base of the cell.

It is a further object of this invention to provide a horizontal mercury cell which prevents exposure of the cathode conductive surfaces underlying the mercury to the electrolyte and gases.

Another object of this invention is to provide a cell which will continue to operate safely with a substantially reduced mercury flow.

Another object is to provide a horizontal mercury cell having improved current distribution through the cathode.

Another object is to provide a horizontal mercury cell having greater width and increased capacity than previous horizontal mercury cells.

A further object of this invention is to provide an electrolytic cell which allows dissipation of explosive forces within the cell without serious damage to the electrolytic cell.

A further object of this invention is to provide a cell which will continue to operate safely without expensive short-circuit systems for each cell even when the mercury does not cover the entire base of the cell.

Various other objects and advantages of the invention will become apparent as this description proceeds.

These objects are accomplished and the disadvantages of the prior art structures are overcome by the use of a cell comprised of a flexible stretchable, plastic cell cover and a cell base of alternate strips of non-conductive and conductive material running the length of the cell. The conductive strips are narrower than the non-conductive strips and have their top surface below the level of the surface of the non-conductvie strips. Thus in effect the space above each conductive strip and between the two adjacent non-conductive strips forms a narrow and shallow channel extending the entire length of the cell. The conductive strips are preferably steel and the non-conductive strips may be made of hard rubber, resin, concrete, natural stone, and the like. The number and relative width of the conductive and non-conductive strips may vary as desired. In this way the conductive strips may be covered with less mercury and still not become exposed to the electrolyte or to gases even during periods of reduced mercury flow. As an alternative the base may consist of sheet steel which has been coated with strips of a resinous material or non-conductive paint over portions of its area so as to leave lengthwise strips of the conductive steel base exposed between the non-conducting strips.

The flexible, stretchable plastic cell cover comprises adjustably supporting the anodes from a rigid spider-shaped metal frame structure supported on the cell trough or on a support structure outside the trough, and providing a flexible stretchable plastic cell cover to close the space between the anode frames and the cell trough. The metal framework consists of support members extending transversely of the cell and provided with means at their outer ends for fitting the frame upon vertical posts which rest upon or are attached to the trough of the electrolytic cell. The anodes are attached to and suspended from these rigid transverse frame members and the position of each anode can be adjusted independently. The height of the metal frame above the cell may be adjusted by suitable adjusting nuts located on said posts on which the transverse members of the frame are attached. By adjustment of the height of the frame, the distance between the anodes and the inside bottom or cathode of the cell is also adjusted. A cell cover of this type is more completely described in my co-pending application Serial No. 704,982 filed December 24, 1957 (now Patent 2,958,635).

The top of the cell is closed by providing a cover of flexible material, such as rubber, polyvinyl chloride, or other sheet plastic, or the like, which is fastened to the sides of the cell either by bolting or by a suitable clamping means. Holes are provided in the flexible cover through which the anode connections protrude, and means are provided for sealing between the cover and the anode connections. By this construction the height or distance of all the anodes from the cathode may be adjusted simultaneously by adjusting the nuts which determine the height of the supporting frame above the cell trough. The supporting frame has sufficient flexibility to allow lowering of one section of the frame while the rest of the adjusting screws have not yet been adjusted. The lowering of the frame is usually less than 1/16" at a given adjustment. Because of the flexibility of the rubber or plastic cover, it has sufficient give to allow adjustment of the anodes without disturbing the cover or destroying the seal between the cover and the cell trough or between the cover and the anodes.

With this type of cell it is possible to greatly increase the width of the cell and thereby the capacity of the cell without the hazards of possible destruction of the cell by mixtures of explosive gases. Since the conductive surfaces are relatively narrow with respect to the total width of the cell, there is no problem of unevenness. Moreover, since the conductive surfaces are at a lower level, the remainder of the cell base surfaces of non-conducting material may have "islands" formed with little likelihood that the conductive surfaces will be exposed. In addition, should the flow of mercury be substantially reduced for any reason, the mercury will flow preferentially in the narrow channels formed over the conductive surfaces preventing their exposure to the electrolyte, and the cell will continue to operate although at reduced efficiency and with a higher voltage requirement.

If there should be an exposure of the conductive surfaces by an interruption in the flow of mercury so that a mixture of explosive gases is formed, there is no danger of the cell being seriously damaged by an explosion as in prior art cells. In the event of an explosion, the flexible cover merely expands similar to a balloon under the pressure of these gases, and if the expansion is continued, it merely results in the rupture of a small area of the cover, thereby letting the expanded gases escape harmlessly without any disturbance of the remainder of the structure of the cell or the dangers ordinarily accompanying an explosion. Repair or replacement of the cover is readily accomplished by replacing the torn cover section or by merely sealing, patching, or vulcanizing the ruptured section.

Since the cell itself will not be destroyed by an explosion as in prior art cells, the margin of safety is much greater than before possible. The expensive and complex automatic short-circuiting switches which are required in many present electrolytic cells can be eliminated without material danger to the cell or to the operating personnel in the cell room. Manual current shut-off switches may be used.

The distribution of the mercury over the base of the cell may be further improved by providing cross channels, depressions or ridges in the non-conductive surfaces at intervals throughout the length of the cell. Such channels are not, however, as deep as the level of the conductive surfaces and operate to direct the mercury flow onto the conductive surfaces in the event the mercury is not sufficient to cover the entire cell bottom. Thus, it may be seen that the chances of exposure of the conductive surfaces of the base are greatly reduced regardless of the width of the cell as long as some mercury is flowing. By placing riffles or other lateral holdback means at intervals along the length of the conductive strips, which will maintain a layer of mercury on the strips throughout the entire length, it is possible to completely eliminate the possibility of exposure of the conductive strips to the electrolyte solution or gases even after the flow of mercury has stopped.

The invention may be more readily understood by re-

ferring to the drawings which illustrate a preferred embodiment of the invention.

FIG. 1 is a top view of a cell and decomposer with parts broken away to show anode placement and parts broken away to show the cell base construction.

FIG. 2 is a cross-sectional view of the cell taken along the lines 2—2 of FIG. 1.

FIGS. 3 and 4 illustrate modifications of the base to improve mercury distribution and also holdback means for the mercury on the conductive strips.

FIGS. 5 and 6 illustrate modifications of the cell base structure.

Referring to the drawings, the main components of the electrolytic apparatus are the cell 1 and decomposer 2. Cell 1 is made up mainly of the trough 3, cover frame 4 and anodes 8. The trough 3 consists of sides 1A, bottom 1B, and end compartments 3A and 3C. The cell cover consists of flexible sheet plastic covering 17, such as rubber, polyvinyl chloride or the like, bolted to the sides of the trough 3 by strips 24 to prevent escape of gases, other means of securing the plastic cell cover to the base are illustrated in said copending application Serial No. 704,982. The anodes 8 preferably comprise flat horizontal graphite plates attached to vertical cylindrical graphite anode rods 27, which in turn are provided with metallic conductor bolts 30 for attachment to the anode supporting frame 15 forming part of the cover frame 4. Holes are provided in cover 17 for bolts 30 and these holes are sealed against the escape of gas by nuts on bolts 30 pressing the cover 17 against the top of the anode rods 27. An outlet 45 for the withdrawal of chlorine is located at the high end of the cell.

As shown in FIGS. 1 and 2, the anode supporting frame 15 comprises longitudinal members 21 to which are welded transverse bars 20 which rest upon adjustable posts 19 resting on the sides 1A of trough 3. Anode rods 27 are supported from the transverse bars 40, which are welded to members 21 at spaced intervals, by the conductor bolts 30. By this construction the entire anode frame with the anodes attached thereto may be removed from the cell by first loosening the flexible covering 17 by removing the strips 24 and lifting the anode frame with the anodes attached thereto by a crane or the like to expose the interior of the cell trough 3 for inspection or repair. A more complete description of this cell cover construction will be found in my copending application Serial No. 704,982, filed December 24, 1957.

The cell trough 3 comprises end compartments 3A and 3C and center compartment 3B which may be divided into a plurality of sections covered by separate cover frame members 15 as more fully described in said copending application.

Compartment 3A is open at the top and is the inlet for mercury, and is separated from compartment 3B by a weir 3D, under which the mercury flows, this forming a gas tight seal. Compartment 3B which is much longer than compartments 3A and 3C is the electrolysis compartment and compartment 3C is the amalgam separation compartment. Compartment 3C is separated from compartment 3B by weir 3E under which amalgam flows. The trough 3 is preferably formed of steel I beams 1A and steel bottom 1B. The cover 17 is indicated as broken away at the lower left end of FIG. 1 to show the position of the anodes 8 in the cell and adjacent the numeral 3B the cover and anodes have been removed to show the cell bottom construction.

The inside of the steel bottom comprises a surface of alternating longitudinal conductive and non-conductive surface strips, the conductive surfaces being lower than the non-conductive surfaces. In the embodiment of FIGS. 1, 2, 3 and 4, the trough 3 is lined with concrete 6 into which stone slabs 5 are set on the sides of the cell trough. In the base of the cell, the non-conductive surfaces are also natural stone slabs 5A. The conductive surfaces are steel T bars 9 which are embedded in concrete 6 between the slabs 5A in such a way that the upper surface of the T's which come into contact with the mercury is slightly below the surface of slabs 5A. Thus, channels running the entire length of the compartment 3B are formed with the top of the T bars 9, indicated as conductive strips 9A, as the bottom of these channels. The lower ends of T's 9 are electrically connected to steel base 1B as by welding or the like.

Such a construction provides a rigid flat base substantially free from warpage and assures that the mercury will always cover the conductive surfaces of the base even when the quantity of flow is substantially reduced. When there is insufficient mercury to cover the entire bottom surface of the cell, the mercury will continue to flow in the narrow channels over the conductive strips 9A and to cover the conductive surfaces. Moreover, since there can be no lateral flow from one channel to another, and the conductive surfaces are narrow relative to the width of the cell, the cell may be made wide without the usual risk of exposure of areas of the conductive surface to electrolyte in the event of unevenness of the cell bottom. Thus, the cell will continue to operate even with a reduced flow of mercury, although at reduced efficiency and with a higher voltage requirement.

Holdback riffles 48, such as shown in exaggerated form in FIG. 4, and in the cut-away section of FIG. 1 showing the cell bottom, may be provided at intervals along the conductive strips if desired to maintain mercury on the entire length of the conductive strips in spite of the slope of the cell so that the mercury flow may stop altogether and the conductive surfaces will still be covered with mercury. It is possible, therefore, to build a cell of greatly increased capacity and greater safety and to achieve considerable economy in cell construction.

In order to improve the circulation of the mercury over the cell base, lateral means may be provided on the non-conductive surfaces to direct the flowing mercury preferentially to the mercury channels formed by the top of strips 9A. These lateral directive means may be either ridges 49 or grooves 50 in the non-conductive surfaces, as shown also in somewhat exaggerated form in FIGS. 3 and 4. However, these lateral means if ridges should not be higher than the normal thickness of the layer of mercury which flows on the cell base, which is about ⅛ inch, or if grooves, should not be as low as the conductive surfaces formed by the conductive strips 9A so as to permit flow of the mercury laterally from one channel to another.

Copper bus bars 12 provide electric connections for the cathode through the bottom of plate 1B and through metal T beams 9 which are embedded in the lining of the cell and which come into contact with the mercury flowing along the bottom of the cell. Electric connection 28 is provided to the anodes 8 through bus bars 11 which are further attached to the connectors 16 which are secured to the bolts 30 connected to each of the posts 27 of each anode.

In the operation of a cell of the type shown in FIGS. 1 and 2 for the electrolysis of sodium chloride, for example, a sodium chloride solution is introduced into the compartment 3B of the cell through inlet 41 in weir 3D. Mercury is introduced into compartment 3A from conduit 10 and flows under weir 3D into compartment 3B. The mercury and brine in compartment 3B flow towards the opposite end of the cell during which the brine is electrolyzed, forming chlorine gas and an amalgam of sodium with the mercury. Chlorine is withdrawn through the chlorine outlet 45 at the high end of the cell and depleted brine is withdrawn at the lower end of the cell by outlet 45. The sodium-amalgam passes under weir 3E into compartment 3C and is withdrawn by conduit 33 which extends under the trough 3 to decomposer 2. In the decomposer, the sodium-mercury amalgam is reacted with water to form sodium hydroxide and hydrogen, and the mercury is returned to the cell by pump 39. Water is

fed to the decomposer through inlet 35. Hydrogen is withdrawn from outlet 36 and sodium hydroxide through outlet 37. Mercury flows out of the decomposer through conduit 38 and is recycled to the cell by pump 39 via conduit 10.

If the quantity of mercury flowing is substantially reduced for any reason, the remaining mercury will tend to flow in the channels formed between the stone slabs 5A on steel surfaces 9A of T's 9. The ridges 49 or channels 50 will aid in directing the flow of mercury to these channels. If the quantity is low enough to cause the formation of "islands" on surfaces 5A, or the complete exposure of these surfaces, it is of no serious consequence as long as surfaces 9A are covered.

When the flow of mercury is completely stopped, the layer of mercury on the conductive surfaces 9A may be maintained by providing holdback riffles 48, such as illustrated in FIG. 4, at suitable intervals along the length of conductor strips 9A or in any other suitable way.

Thus, a cell of the type described is almost completely protected from the possibility of the contact of the steel cathode conductive surface with the electrolytic solution or with gases, however if there should be an exposure of the conductive surfaces by an interruption of the mercury flow so that a mixture of explosive gases is formed, there is no danger of the cell being seriously damaged by an explosion, because in the event of an explosion, the flexible plastic cell cover 17 expands or blows up similar to a balloon and if the expansion continues it ruptures a small area in the cover, letting the expanded gases escape harmlessly, and the ruptured section can be sealed by patching or vulcanizing the cover at this point, or the cover may be replaced without material expense or delay in the operation of the cell.

The base of the cell can also be constructed in a different manner as illustrated in FIGS. 5 and 6. For example, the non-conductive surfaces may be formed by coating a flat steel base 1B with strips or strips of a resinous or other non-conductive material 5B, leaving strips of the steel base uncoated or exposed to form the conductive surface channels such as shown in FIG. 5 or the base may be formed by fastening together alternate strips of non-conductive material 5C and conductive materials 9B side by side with the conductive strips 9B being lower than the non-conductive strips 5C, as shown in FIG. 6. It is only necessary that the base comprise alternate non-conductive and conductive surfaces, with the conductive surfaces being lower than the non-conductive surfaces.

The present application is a continuation-in-part application of my copending applications Serial No. 704,982 filed December 24, 1957 now Patent No. 2,958,635 and Serial No. 706,375, filed December 31, 1957, now abandoned.

While I have set forth preferred embodiments of my invention to enable those skilled in the art to understand and practice my invention, it will be understood that the invention is not limited thereto and that various modifications may be made without departing from the spirit thereof and the scope of the following claims.

I claim:

1. An apparatus for conducting the electrolysis of electrolytes which comprises an elongated inclined trough, a metal frame comprising transverse and longitudinal members, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said trough, openings in said cover through which said anodes protrude, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces whereby during periods of reduced mercury flow the conductive surfaces remain covered with mercury, and means for imposing an electrical current on said anodes and said cathode.

2. An apparatus for conducting the electrolysis of electrolytes which comprises an elongated inclined trough, a metal frame comprising transverse and longitudinal members, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said trough and forming a gas tight enclosure for said cell, openings in said cover through which said anodes protrude, said openings forming a gas tight seal around said anodes, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces whereby during periods of reduced mercury flow the conductive surfaces remain covered with mercury, and means for imposing an elecrtical current on said anodes and said cathode.

3. An apparatus for conducting the electrolysis of electrolytes which comprises an elongated inclined trough, a metal frame above said trough comprising transverse and longitudinal member, adjustable means to maintain said transverse members at a specified height above said trough, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said cell and forming a gas tight enclosure for said cell, openings in said cover through which said anodes protrude, said openings forming a gas tight seal around said anodes, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surface whereby during periods of reduced mercury flow the conductive surfaces remain covered with mercury, and means for imposing an electrical current on said anodes and said cathode.

4. An apparatus for conducting the electrolysis of electrolytes which comprises an elongated inclined trough, a metal frame above said trough comprising transverse and longitudinal members, adjustable means to maintain said transverse members at a specified height above said trough, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said cell and forming a gas tight enclosure for said cell, openings in said cover through which said anodes protrude, said openings forming a gas tight seal around said anodes, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surface whereby during periods of reduced mercury flow the conductive surfaces remain covered with mercury, and lateral means on said non-conductive surface to direct the flow of mercury to said conductive surfaces, means for imposing an electrical current on said anodes and said cathode.

5. An apparatus for conducting the electrolysis of electrolytes which comprises an elongated inclined trough, a metal frame above said trough comprising transverse and longitudinal members, adjustable means to maintain said transverse members at a specified height above said trough, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said cell and forming a gas tight enclosure for said cell, openings in said cover through which said anodes protrude, said openings forming a gas tight seal around said anodes, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surface and holdback riffles on said conductive surfaces whereby during periods of interrupted mercury flow the conductive surfaces remain covered with mercury, and

means for imposing an electrical current on said anodes and said cathode.

6. A horizontal electrolysis cell for the electrolysis of electrolytes which comprises an elongated, inclined trough, a metal frame above said trough comprising transverse and longitudinal members, anodes suspended from said transverse members of said frame, a flexible, rupturable, plastic sheet cover attached to the sides of said trough, openings in said cover through which said anodes protrude, a mercury cathode flowing along the base of said trough, a cathode contact surface in said trough base comprising a sheet steel base covered with a non-conductive material, steel strips inserted into said non-conductive material and making contact with said sheet steel base, said strips being inserted so as to form a contact surface for the mercury cathode of alternate longitudinal conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces.

7. A horizontal mercury electrolysis cell for the electrolysis of electrolytes comprising an elongated trough, cover means, anode means, and a base surface over which the mercury flows comprising alternate longitudinal, flat conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces, the relative elevation of said conductive and non-conductive surfaces being such that said mercury cathode flows over the entire base surface during normal flow of said mercury and preferentially on the conductive surfaces during reduced and interrupted flow of said mercury, and lateral holdback riffles on said conductive surfaces.

8. A horizontal mercury electrolysis cell for the electrolysis of electrolytes comprising an elongated trough, cover means, anode means, and a base surface over which the mercury flows comprising alternate longitudinal, flat steel conductive and corrosion-resistant, non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces, the relative elevation of said conductive and non-conductive surfaces being such that said mercury cathode flows over the entire base surface during normal flow of said mercury and preferentially on the conductive surfaces during reduced and interrupted flow of said mercury, lateral holdback riffles on said conductive surfaces and lateral means on said non-conductive surfaces to direct the flow of mercury preferentially to said conductive surfaces during reduced and interrupted flow of mercury.

9. A horizontal mercury electrolysis cell for the electrolysis of electrolytes comprising an elongated trough, a flexible sheet cover means, anode means, and a base surface over which the mercury flows comprising alternate longitudinal, flat conductive and non-conductive surfaces, said conductive surfaces being lower and narrower than said non-conductive surfaces, the relative elevation of said conductive and non-conductive surfaces being such that said mercury cathode flows over the entire base surface during normal flow of said mercury and preferentially on the conductive surfaces during reduced and interrupted flow of said mercury.

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