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Sitges

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[54] **HYDRAULIC APPARATUS FOR REMOVING THE ZINC DEPOSITED ON ZINC ELECTROLYSIS CATHODES**

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Related U.S. Application Data

[62] Division of Ser. No. 83,810, Oct. 26, 1970, Pat. No. 3,724,471.

[30] **Foreign Application Priority Data**

Oct. 25, 1969 Spain 372,891

[52] **U.S. Cl.** **134/144,** 134/165, 134/172, 134/199, 204/281

[51] **Int. Cl.** **B08b 3/02**

[58] **Field of Search** 134/82, 144, 151, 165, 134/172, 83, 122, 199; 204/12, 281

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Primary Examiner—Robert L. Bleutge

[57] **ABSTRACT**

An apparatus for removing zinc deposited on zinc electrolysis cathodes utilizes a high pressure stream of water applied to the cathodes progressively between the line of demarcation between the aluminum sheet and deposited zinc; including a frame supporting a series of parallel high pressure water lines to apply the streams of water progressively over the surfaces of the cathodes which, in turn are supported in spaced relation on a carriage which is movable to expose successive cathodes to the water streams.

3 Claims, 9 Drawing Figures

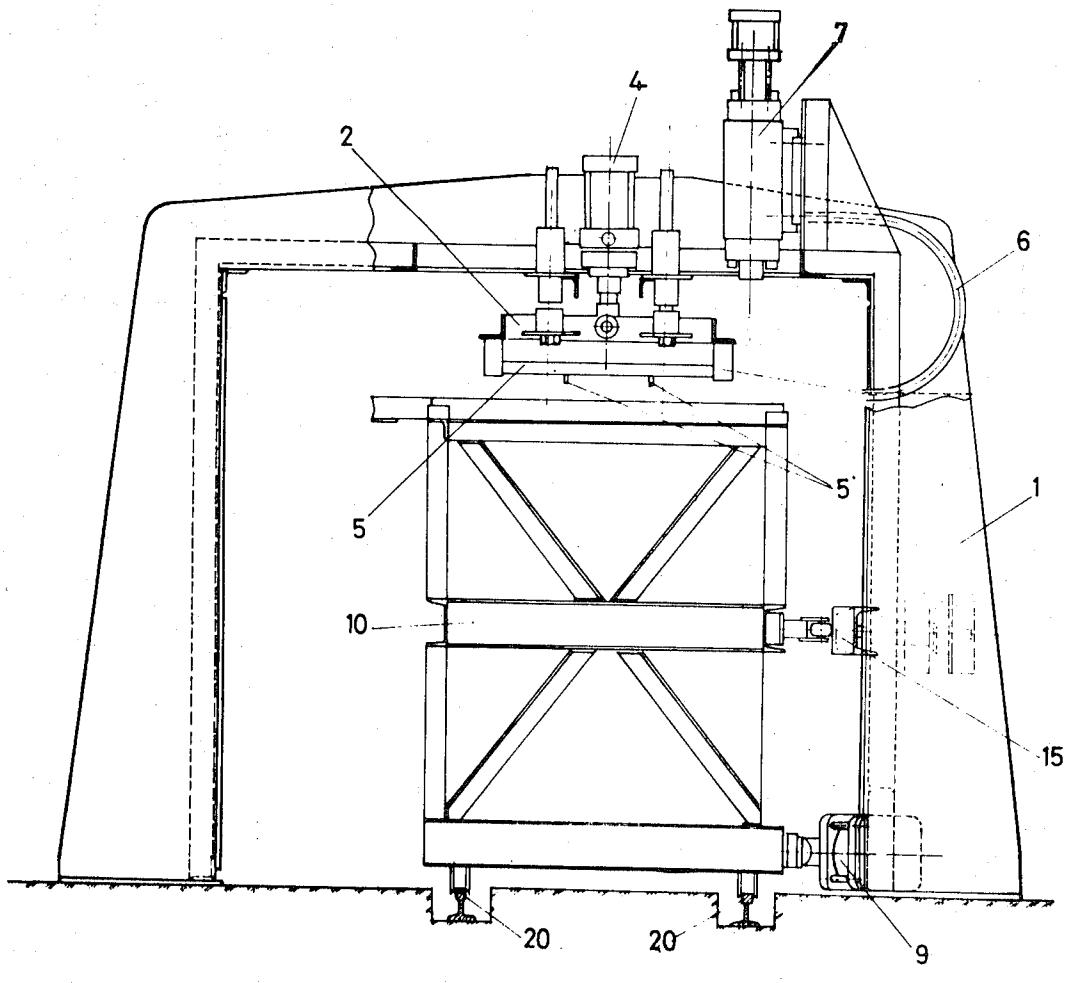


FIG. 1

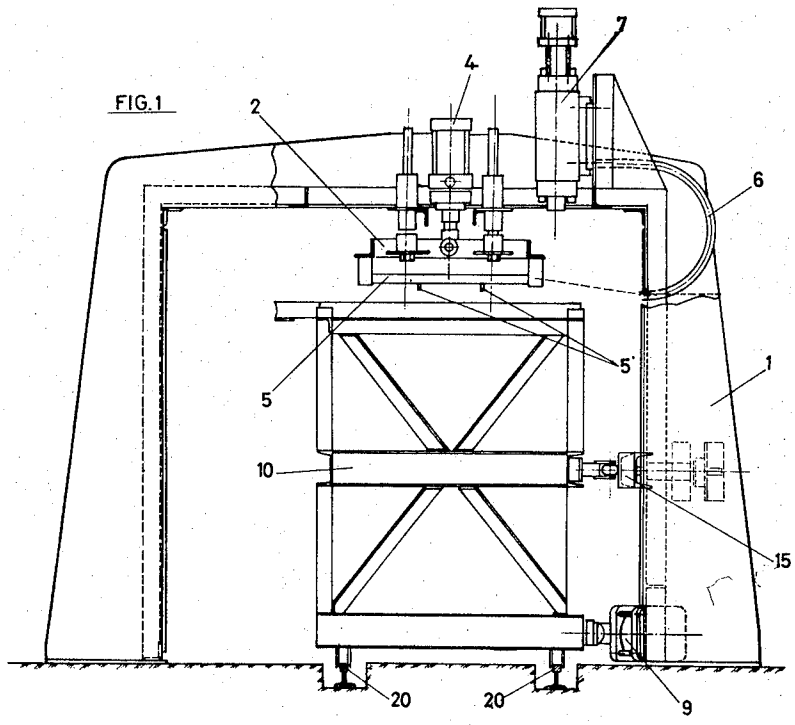
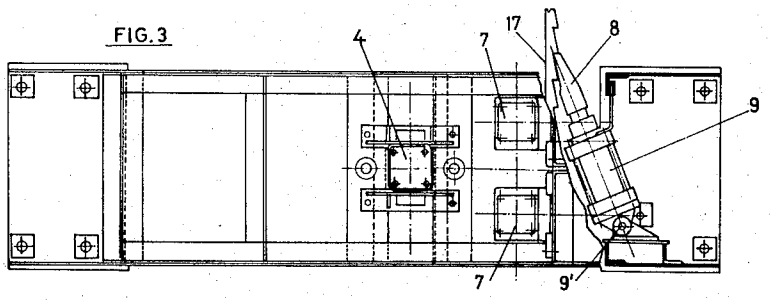


FIG. 3



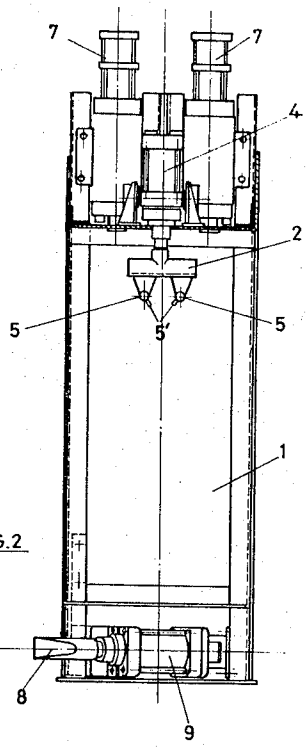
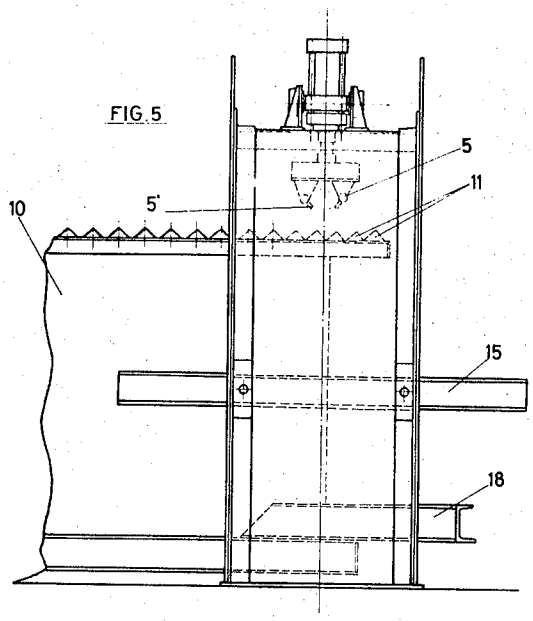


FIG. 2

FIG. 5



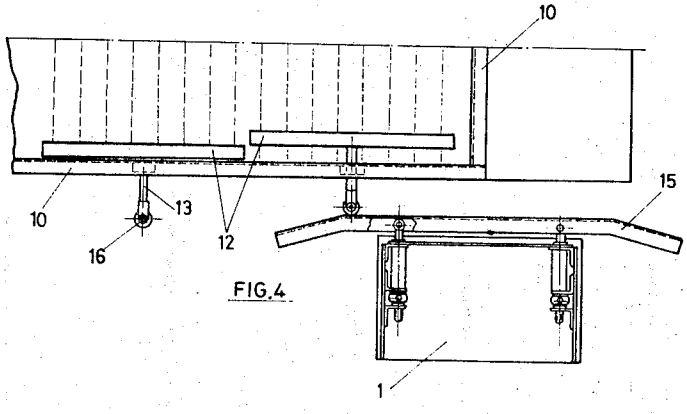


FIG. 4

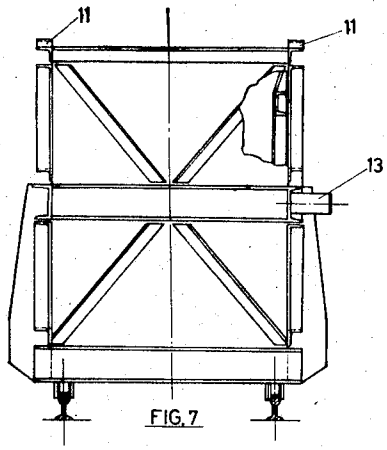
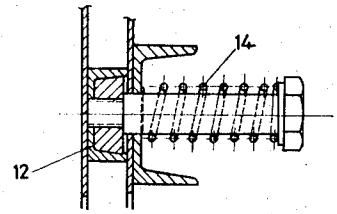


FIG. 7

FIG. 8



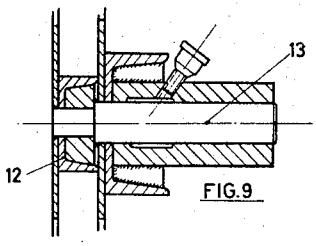


FIG. 9

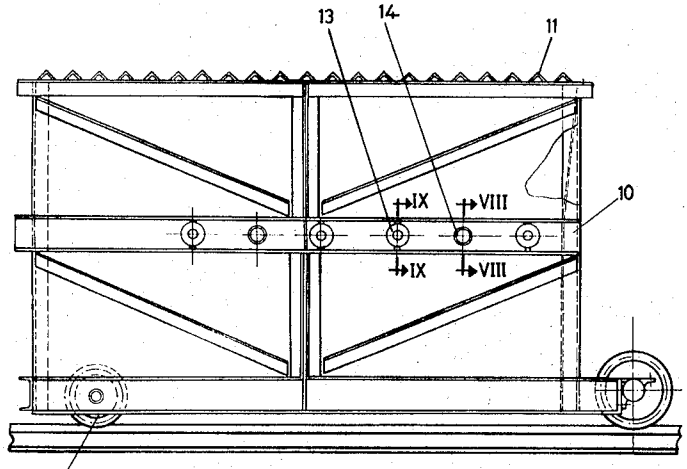


FIG. 6

HYDRAULIC APPARATUS FOR REMOVING THE ZINC DEPOSITED ON ZINC ELECTROLYSIS CATHODES

This is a division of copending application Ser. No. 83,810, filed Oct. 26, 1970, now U.S. Pat. No. 3,724,471.

This invention relates to a hydraulic apparatus for removing the zinc deposited on zinc electrolysis cathodes and greatly reduces the time and labour required for this step.

One of the disadvantages in obtaining zinc by electrolysis is its separation from the cathodes on which it has been deposited; conventionally this step is performed manually by means of spatulas or similar devices with which the deposited sheets or the like of zinc are removed. This is a very laborious step which takes a long time.

This invention relates to an apparatus which enables the sheets of zinc deposited on the cathodes to be removed rapidly and which helps to reduce the labour required for this step.

According to a first feature of the invention, after removal of the cathodes from the electrolytic tanks the cathodes are placed vertically and equidistant to one another on a support, and a high-pressure stream of water is applied to each cathode surface so as to be incident upon the float line — i.e., upon the boundary line between the aluminium sheet and the zinc deposited thereon — at an angle adapted to separate the zinc. To this end, the stream of water is incident upon the float line fan-fashion.

According to a second feature of the invention, the corresponding apparatus comprises a system of moving supports or cathode carriages and a removal device. Each cathode carriage comprises a box or frame in which the cathodes are placed and has at the top on both sides separators adapted to position the cathodes vertically and equidistant from one another. Preferably, the carriage runs on rails and can move thereon from the cathode reception position to a position in which the carriage is disposed below the removal device.

The removal device comprises a number of parallel high-pressure water lines each having one or more nozzles directed so as to be incident upon the boundary line between the aluminium sheets and the zinc deposited thereon so as to separate the zinc. The removal device comprises a portal below which the cathode carriage rails extend. Disposed at the top of the portal is a vertically moving frame serving as a support receiving the high-pressure water lines and corresponding nozzles. Since the frame can move vertically, the height of the nozzles can be adjusted so that the fan-like streams of water can be incident along the required line.

The frame can carry as many lines as there are cathodes on the support, so that when the cathode carriage is placed below the removal device and water is turned on, all the sheets of zinc are separated in a single step.

Preferably, the frame has two high-pressure water lines having nozzles directed to be incident upon the two surfaces of each cathode to separate the zinc sheet deposited on each such surface, the carriage moving progressively in accordance as the zinc sheets are separated. To this end, the carriage can have at the bottom and on one side a toothed rack actuated by a pawl disposed at the bottom of the portal. Consequently, as the sheets are separated from each cathode, the pawl acts on the rack to move the carriage until a new cathode has been placed below the nozzles. Accordingly, the travel of the pawl and the rack tooth pitch are calculated so that each operation of the pawl moves the carriage through a distance equal to the spacing between the cathodes, thus ensuring that a cathode is always disposed below the nozzles so that the stream or fan of water is incident on the boundary line.

The cathodes have in known manner rubber or plastics or similar insulating coverings on their vertical edges to prevent the deposition of zinc thereon and facilitate the removal and positioning of the cathodes. So that the streams of water from the removal device do not remove this covering, the portal on which the water lines are disposed can have on one of its lateral uprights a shoe or runner or the like which moves pushers disposed on the cathode carriages when the same are introduced below the portal, the pushers acting on the rubber coverings to inhibit the separation thereof.

The cathode carriages can be designed for any required number of cathodes.

A discharge ramp for the separated sheets or plates of zinc can be provided below the removal device, the ramp conveying the removed material to a conveyor belt which conveys them to a packing machine for subsequent drying and melting.

The operation begins with the removal of the cathodes from the tanks and the placing of the cathodes on the cathode carriage on which all the cathodes are positioned vertically and in equidistant relationship, whereafter the carriage moves until it is below the removal device, passing below the water streams produced by the mechanism hereinbefore described until all the zinc has been separated, the zinc dropping on to the conveyor belt for conveyance to the packing machine.

Each of the surfaces of any cathode is treated with a stream of water from one or more nozzles, depending upon the fan shape produced by the nozzles and upon the width of the cathodes. Preferably, two nozzles act on each surface of each cathode, each nozzle delivering a fan-shaped stream adapted to be incident along the whole top edge of the zinc sheets to separate the same from the aluminium sheet. The angle at which the stream of water impinges on the cathode depends upon the width thereof, the pressure of the stream and the number of nozzles acting on each surface; this angle must not be reduced, for the pressure of the stream is such that the same may pierce the cathode without separating the zinc.

The nozzles produce a fan-shaped stream of the required opening or amplitude, for instance, of up to an angle of 90°. The pressure of the streams depends upon the zinc deposition conditions in the tanks, the pressures usually not exceeding 300kg/cm^2.

A description will now be given of an apparatus according to this invention and will enable the characteristics and advantages thereof to be more readily understood. The apparatus shown in the drawings is of an exemplary non-limitative embodiment.

In the drawings

FIG. 1 is a view in front elevation of the removal mechanism below which the cathode carriage can be seen;

FIG. 2 is a vertical section through the removal mechanism;

FIG. 3 is a plan view of the removal mechanism;

FIG. 4 is a sectioned plan view of the removal mechanism;

FIG. 5 is a diagrammatic view in side elevation of the removal mechanism;

FIG. 6 is a view in side elevation of the cathode carriage shown in FIG. 1;

FIG. 7 is a view in front elevation of the cathode carriage and

FIGS. 8 and 9 are sections on the lines VIII—VIII and IX—IX respectively of FIG. 6.

Basically, the apparatus according to the invention comprises the removal mechanism shown in FIGS. 1–3 and comprising a portal 1 having at the top a frame 2 adapted to be moved vertically through the agency of guides 3 and a cylinder 4. Disposed on frame 2 are a number of lines 5—two in the example described — having two nozzles 5′ delivering pressure water supplied through a line 6 and valve 7.

The cylinder 4 serves to move the frame 2 vertically and vary its initial height so that when the water is turned on the streams of water impinge on the boundary or separation line between the aluminium and the zinc deposited thereon so as to separate the zinc, such separation being facilitated and completed as the frame 2 descends and as the place of impingement of the streams descends with the frame 2, the same returning to its initial position upon completion of the zinc-removing step.

Also, the portal has at the bottom of one of its uprights a pawl 8 operated by a cylinder 9 for a purpose to be described hereinafter.

The apparatus also comprises a number of cathode carriages one of which is shown in FIGS. 6 and 7 and comprises a box or drawer-like structure 10 in which the cathodes are placed. The carriage has at the top on both sides abutments or spacers 11 for separating the cathodes so that the same are disposed in equidistant relationship to one another. The carriages have on both sides pushers 12 which can be seen in FIGS. 4, 8 and 9 and which are disposed on the carriage structure 10 with the interposition of guide rods 13; restoring springs 14 are also provided.

As can be seen in FIGS. 1, 4 and 5 the removal mechanism comprises a number of runners 15 on which wheels 16 disposed at the end of the rods 13 bear, so that the pushers 12 move inwards bearing against the edge of the cathodes and retaining in position the protective coverings on the cathode vertical edges. When the carriage 10 moves away from below the removal mechanism, the pushers 12 are restored to their initial position by the restoring springs 14 and cease to bear on the cathode edge.

The carriages 10 can be driven through the agency of a motor and reducer and associated gear train.

The carriages have at the bottom an outer toothed rack 17 which can be seen in FIG. 3 and which is actuated by a pawl 8 to move the carriage below the removal mechanism. The travel of the pawl 4 and the rack tooth pitch are calculated so that each actuation of the pawl 8 results in the carriage 10 moving far enough for a cathode to be positioned below the lines 5 so that the nozzles 5′ are incident on the boundary line of the cathodes. Consequently, and as can be seen in FIG. 5, a cathode is positioned between the first two separators 11, and the stream of water from the two nozzles 5′ disposed on each of the two lines 5 impinges upon each surface of the cathode until the zinc deposited on the two surfaces of the aluminium sheet serving as cathode has been separated, whereafter the pawl 8 moves the carriage so that the next cathode is brought into exactly the same position below the lines 5 and the zinc deposit on such cathode is then separated. The carriage continues to move in this way until all the cathodes have been dealt with, whereafter the carriage can be returned to its initial position to receive a fresh load of cathodes.

Once the time taken for the zinc separation step has been calculated the supply of water to the nozzles can be devised automatically, in synchronism with the carriage-moving pawl actuation, so that when the carriage arrives below the frame 2 the operation of separating all the zinc from the aluminium cathode proceeds automatically.

The whole apparatus is so devised that the steps of loading and unloading the cathodes into and from the cathode carriages, and the separation of the zinc, proceed simultaneously, to which end the apparatus is provided with carriages to a number sufficient for the process to be able to proceed continuously.

The carriage 10 has wheels 19 running on rails 20 leading to a position below the removal mechanism.

The cylinder 9 for operating the pawl 8 is secured by means of a spindle 9′ so as to be able to rotate partially when the pawl 8 drives the rack 17.

The removal mechanism described by way of example is intended for separating the zinc deposited on a single cathode, but water lines can be provided to a sufficient number to separate all the zinc on the cathodes disposed above the machine in a single step.

I claim:

1. An apparatus for removing the zinc deposited on zinc electrolysis cathodes, characterized in that it comprises: a stationary support having at the top a vertically movable frame adapted to serve as support means for a number of parallel high-pressure water lines; and at least one moving cathode carriage running preferably on rails and adapted to move thereon as far as a place below the top moving frame, the moving carriage having at the top on both sides separators adapted to maintain the cathodes vertical and equidistant from one another, each high-pressure water line having at least one nozzle so directed that the fan-shaped stream of water is incident upon the boundary line between the aluminium sheet and the zinc deposited thereon in a manner adapted to dis-engage the zinc, the moving carriage being open at the bottom so that the separated zinc sheets can drop through, said cathode carriage has on both sides pushers which are displaceably mounted on such carriages through the agency of guide rods and which are adapted to bear on the vertical edges of the cathodes when the carriage moves below the top moving frame.

2. An apparatus according to claim 1, characterized in that the stationary support is a portal on which the top moving frame is suspended with the interposition of vertical guide rods and a hydraulic cylinder.

3. An apparatus according to claim 1, characterized in that the portal has on at least one of its side uprights a runner which is rigidly secured to the upright and on which the outer end of the guide rods of the respective pushers can move.

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