PUBLISHED
JUNE 22, 1943.
BY A. P. C.

G. HAGERUP-LARSSEN
ELECTRODE FRAME STRUCTURES
Filed May 23, 1942

Serial No.
444,238

Fig. 1

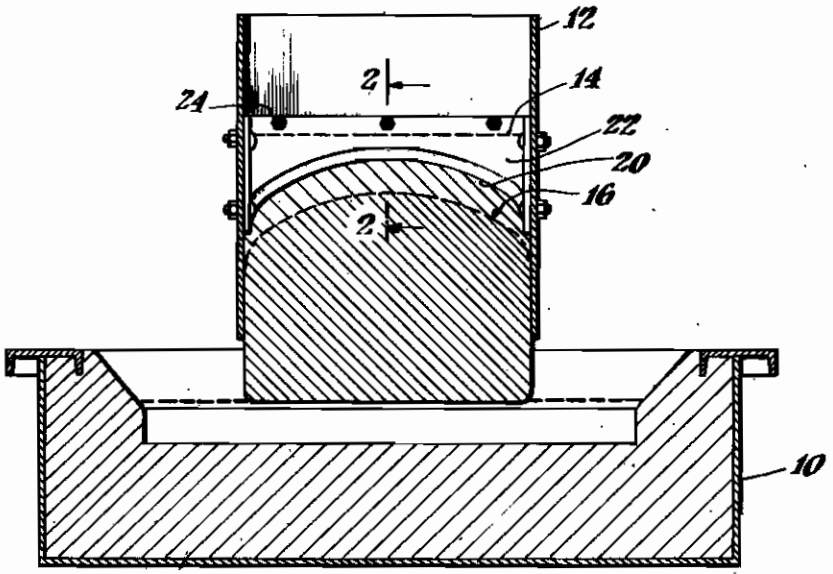
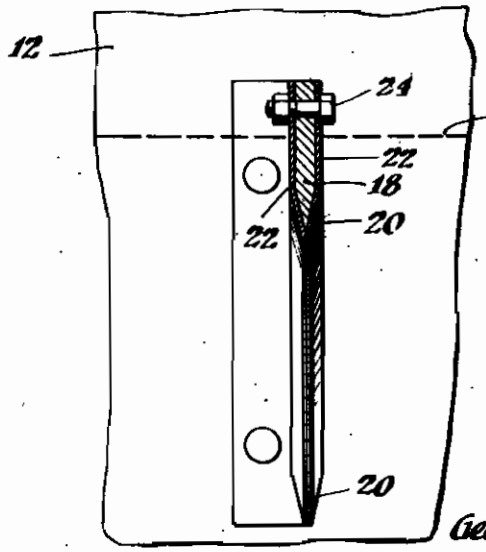


Fig. 2



INVENTOR.
Georg Hagerup-Larssen
BY
Dorsey, Colman
ATTORNEYS

Published June 22, 1943

Serial No. 444,238

ALIEN PROPERTY CUSTODIAN

ELECTRODE FRAME STRUCTURES

Georg Hagerup-Larssen, New York, N. Y.; vested in the Alien Property Custodian

Application filed May 23, 1942

This invention relates to an improvement employed in connection with the Soederberg continuous electrode system, and is particularly intended for use with electrodes of non-cylindrical shape. For example, oblong electrodes of great size are now being employed in connection with the production of aluminum.

In the operation of this system, the raw electrode paste is introduced into the upper part of a casing and moves downwardly toward the furnace. As it approaches the furnace it becomes partly hardened by the heat of the furnace and is given final and additional hardening by passing some of the electric current through it before it is called upon to carry a full load.

Working with non-cylindrical electrodes, it has been found that the electrode paste is sufficiently fluid so that it exerts a substantial hydrostatic pressure tending to distort the casing which encloses the electrode. In some instances this casing may be a movable one which travels with the electrode material and in others it may be a fixed outside casing. If desired, both a movable and a fixed casing may be employed simultaneously. It has heretofore been suggested that the distortion of the electrode be prevented by the use of rigid bars arranged around the exterior of the electrode casing to hold it in place.

I have now discovered that there is a substantial zone through which the electrode moves where the electrode material is exerting hydrostatic pressure tending to distort the casing and still has the ability to recoalesce into a unitary structure if temporarily separated. Based on this discovery, I have found that the electrode casing can be very simply and efficiently reinforced by the use of internal rods or plates. The electrode paste moves around such reinforcements and coalesces below them to reform a unitary structure.

There is one difficulty with this problem. It is highly essential that the cross braces should not extend so far down in the electrode material that they reach the zone where baking has progressed to the point where the paste will not reunite. It has been found that the hardened zone of the electrode extends considerably higher near the middle of the electrode than at the edges. Thus if a straight rod or bar is used for cross bracing, it must be high enough up so that the central portion of the electrode where it has begun to be baked will still be below the cross brace. This means that at the sides a zone of fluidity will extend a substantial distance below the cross braces and may result in distortion.

I have found that this problem can be overcome by using flat plates for the cross braces, and by studying the characteristics of each individual furnace, the line of safety can be determined for the bottom edge of such a plate. This bottom edge will be shaped to follow the approximate line of hardening and of course should be positioned an appreciable distance above the line of hardening in order to insure that the paste will reunite. By making the plates of this shape to follow the contour of the baked portion of the electrode, the reinforcement can be carried down sufficiently far on the sides to maintain the casing in shape without having the reinforcement extend into the baked zone near the center.

While the cross braces may be made of steel, I have found that the electrode paste will slide very easily past faces of smooth aluminum. Instead of making the cross braces of solid aluminum, it is advantageous to make these of steel with removable aluminum plates.

It sometimes happens that operation of the furnace is stopped and the electrode hardens around the cross braces sufficiently so that its flow or movement will be stopped. If the faces of the braces are formed of separable aluminum plates, they may be released from the cross braces and allowed to go on down into the furnace and new face plates substituted. Since these plates are made of aluminum, they will not have any injurious effect on the metallic bath in the furnace.

It is obvious that if bracing between the sides of the fixed casing is employed and a movable casing is also used, the movable casing will have to be slitted or subdivided into sections so that it can move past the fixed braces.

It is also possible to provide cross bracing between the sides of the movable casing but in such case the cross bracing should be in the form of rods or relatively narrow plates so that no line of cleavage in the baked portion of the electrode will occur.

The invention may readily be understood by reference to the accompanying drawings in which Fig. 1 shows a sectional view through a furnace and electrode embodying my invention. For the purpose of simplicity the electric connectors for the electrode and the supports for the fixed casing are not shown. Fig. 2 shows a detailed sectional view on line 2—2 of Fig. 2 illustrating a manner in which releasable aluminum plates may be attached to the braces.

In these drawings 10 indicates the furnace and

12 is the fixed casing through which the electrode moves, which we may presume is of oblong shape. The broken line 14 indicates the approximate level to which the casing is filled with the electrode paste and the broken line 16 illustrates the curve of the top of the hard-baked part of the electrode. 18 is the metal plate serving as a cross brace, attached to the sides of the casing 12.

As shown in Fig. 2, the cross brace 18 extends above the normal level of the electrode mass which is indicated by the line 14. In this case the lower edge of the brace 18 is streamlined as indicated at 20 and the faces of the brace 18 are covered with thin sheets of aluminum indicated by the numeral 22. These may be held in place on the brace 18 in any desired manner as by the nut and bolt 24 which is positioned above the line 14 so that they may readily be released simply by removing this bolt.

While this is a preferred form of my invention, it is to be understood that it will have to be modified to suit the particular conditions that arise in connection with various types of furnace. Also while I have described this invention as principally used with aluminum furnaces, it may of course be used in any case where non-cylindrical continuous electrodes are employed.

GEORG HAGERUP-LARSSEN.