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Bobrov et al.

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[54] **LOOP ELECTROLYZER**

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[63] Continuation of Ser. No. 174,767, Aug. 25, 1971, abandoned.

[52] **U.S. Cl.** **204/206,** 204/28, 204/211, 204/273, 204/277, 204/DIG. 7

[51] **Int. Cl.** **C23b 5/68**

[58] **Field of Search** ..... 204/28, 206, 207, 208, 204/209, 210, 211, DIG. 7

[56] **References Cited**

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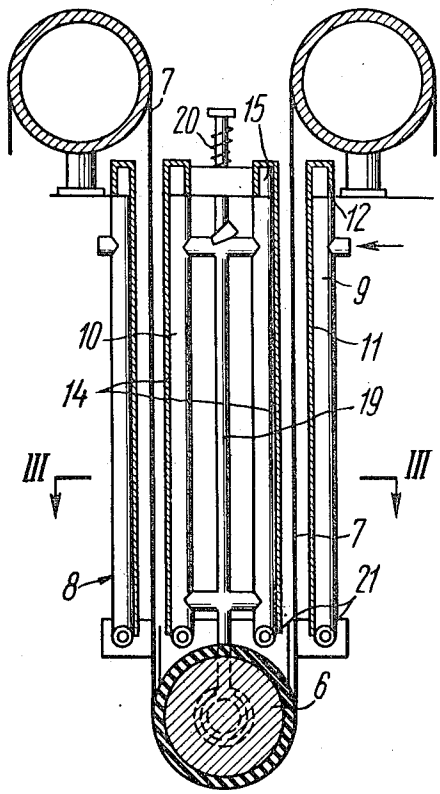
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[57] **ABSTRACT**

An electrolyzer is disclosed in which the anode plates have their vertical edges flanged and are fixed on separate space tubular frames. Each of the frames comprises two single separate sections and a twinned section between the two single separate sections. Each of the following space tubular frames arranged in the direction of run of the cathode ribbon is longer than the preceding one. Each of the frame sections comprises tubes having bubblers in their lower portions for introducing air to the electrolyzing tank, to thereby agitate the electrolyte.

4 Claims, 3 Drawing Figures



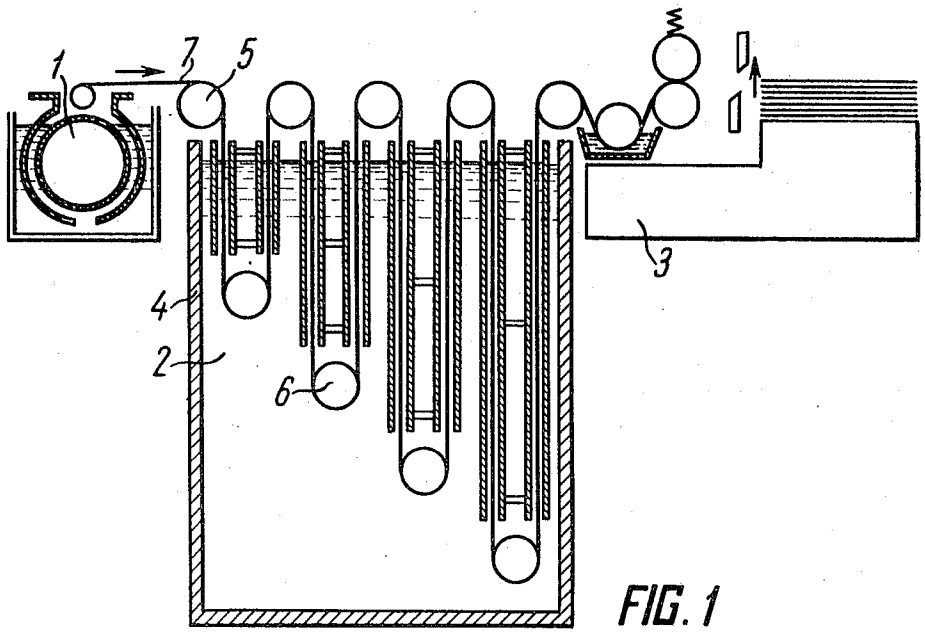


FIG. 1

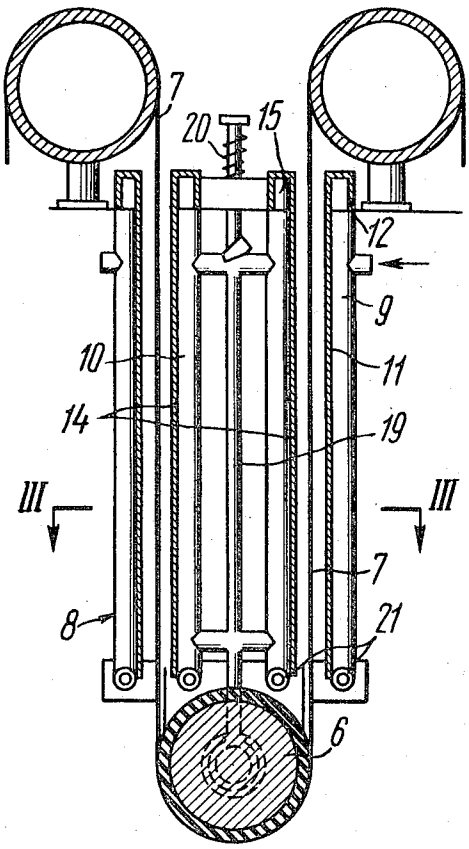


FIG. 2

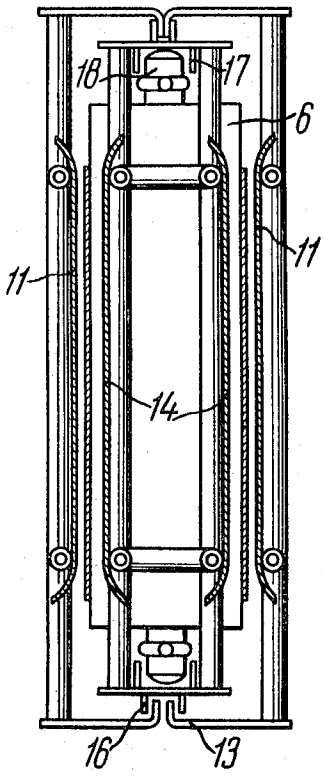


FIG. 3

LOOP ELECTROLYZER

This is a continuation, of application Ser. No. 174,767, filed Aug. 25, 1971 and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates generally to non-ferrous metallurgy and has particular reference to equipment for electrowinning of non-ferrous metals.

It is widely known in the prior art to use a loop electrolyzer, comprising a bath with electrolyte, top driven current-carrying drums and bottom tension drums between which passes a cathode ribbon and anodes.

The electrolyzer has bubbler cells to stir the electrolyte and vinyl-plastics screens located on both sides of the cathode ribbon to preclude thickening of the ribbon edges.

An essential disadvantage inherent in such a prior art loop electrolyzer is in its relatively low specific capacity.

In addition, like all loop electrolyzers previously known, the aforesaid electrolyzer is designed in such a manner that the top driven drums and the bottom tension drums are fixed respectively to the top and bottom chords of a common space truss. Such a construction presents some difficulties in attendance. Thus in order to gain access to the bath for inspection or repairs, or to take out the bottom drum one has to remove all the heavy-weight structure from the bath and to disconnect the current-carrying bus-bars and technological communication lines.

To provide a continuous bilateral ribbon deposition the anodes are made as blocks assembled from separate rectangular bars; each of the latter has its own contact suspension.

In the course of operation of the electrolyzer fresh anode bars must be suspended as fast as the anodes are dissolved, and all the bars must be pushed under the ribbon and the anode butts taken away on the opposite side of the ribbon.

Such a construction of the electrolyzer makes its attendance and servicing a labour-consuming procedure when replacing the anodes and calls forth the necessity for operation with a minimum yield of the anode scrap equal to 25 percent to render the possibility of breakage of the anode butts as low as possible.

When broken the anode butts may hinder the run of the ribbon or break it, damage the bubbler cells and thus make the entire electrolyzer inoperative.

The dielectric screens located at the edges of the ribbon to preclude thickening thereof and growth of dendrites thereon, are likely to get jammed and break during the run of the ribbon also, passing of the ribbon into the screens is a highly laborious operation.

Apart from all the points discussed above, all hitherto-known constructions of loop electrolyzers have loops and, consequently, anodes of equal length. Current flowing through the electrolyzer is conducted via the ribbon whose thickness in the course of deposition process gets increased progessively from one loop to another (from 0.05 mm to 0.5 mm), with the result that its electric resistance decreases and, consequently, current magnitude rises from the initial to the last loop. As the length of the loop is calculated on the ground of a permissible current load on the initial loop, all the following loops remain current-underloaded and the power capacity of the electrolyzer is eventually underutilized.

SUMMARY OF THE INVENTION

It is a general object of the present invention to eliminate the disadvantages mentioned above.

It is a specific object of the present invention to provide a loop electrolyzer of such a design that will make it possible to obtain equal current densities at every loop of the ribbon, high specific capacity of the electrolyzer, preclude the formation of thickened ribbon edges and be simple in attendance and servicing.

According to these and other objects in a loop electrolyzer, comprising a bath with electrolyte, top driven current-carrying drums and bottom tension drums between which passes the cathode ribbon and anode plates are vertically mounted, according to the invention, said anode plates are flanged along the vertical edges and fixed on separate space tubular frames arranged successively in the direction of the run of the ribbon, each of the successive frames being longer than the preceding one.

The tubular frame comprises single sections and a twinned section arranged therebetween and in its bottom portion has retainers to engage detents provided in the single sections, and guides for the journals of the bottom tension drums.

Such a construction enables higher current load to be imposed upon every following loop in the direction of the ribbon movement, i.e., to increase the electrolyzer specific capacity. Also, the abovesaid design is instrumental in producing highquality ribbon free from thickened parts and facilitates the attendance of the electrolyzer during operation and its servicing during inspection and repairs.

BRIEF DESCRIPTION OF THE DRAWINGS

In what follows a specific embodiment of the present invention is described in detail with due reference to the accompanying drawings, wherein:

FIG. 1 is a longitudinal-section view of a device, according to the invention;

FIG. 2 is a longitudinal-section view of a tubular frame with anode plates of the device, according to the invention; and

FIG. 3 is a sectional view taken along the line III—III in FIG. 2.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The herein-disclosed loop electrolyzer may comprise part of a copper-ribbon production line.

Now referring to FIG. 1, a drum-type electrolyzer 1 is installed at the beginning of the production line, wherein copper foil is produced which is then fed for redeposition into a loop electrolyzer 2. Ribbon leaving the loop electrolyzer 2 is washed, dried, cut into sheets and the latter are piled up in a piler 3.

The loop electrolyzer 2 comprises a bath 4 filled with electrolyte, top driven current-carrying drums 5 mounted on the side of the bath 4 and bottom tension drums 6. A cathode ribbon 7 is passed in the form of vertical loops in between the top current-carrying drums 5 and the bottom tension drums 6. Arranged on both sides of the cathode ribbon 7 in parallel therewith are anode plates (not shown in the drawing) made of lead.

The anode plates (not shown in the drawing) are fixed on separate space tubular frames 8 (FIG. 2) ar-

ranged sequentially in the direction of motion of the ribbon **7**.

Each tubular frame **8** is composed of titanium tubes and comprises two single sections **9** and a twinned section **10** located therebetween.

The single section **9** carrying an anode plate **11** in its top portion has an anode rod **12** to conduct current from the busbar to the anode plates **11**, while in its top portion the single section **9** is provided with detents **13** made as flanged plates (FIG. **3**).

Two anode plates **14** are fixed on the twinned section **10** and, respectively, two anode rods **15** are provided in the top portion thereof to supply current from the busbar to the anode plates **14**. In its bottom portion the twinned section **10** has a retainer **16** to engage the detents **13** of the adjacent single sections **9**. In addition, provision is made in the bottom portion of the twinned section **10** for special vertical ways **17** in which journals **18** of the bottom tension drums **6** are free to move vertically.

Links **19** are fitted onto the journals **18** and fixed in position through dampers **20** in the top portion of the twinned section **10**. The links **19** are interconnected through electric switches (not shown in the drawings) with the drive of the top current-carrying drums **5** and are intended to restrict vertical motion of the bottom tension drums **6**. The links **19** are to keep the bottom tension drums **6** in case of ribbon breakage.

The titanium tubes of the bottom chord of the single sections **9** and twinned section **10** serve at the same time as bubblers **21** to feed air which is effective in electrolyte stirring. The air is fed to the bubblers **21** along the vertical tubes (not shown in the drawings) of the tubular frame **8**.

The insoluble anode plates **11** and **14** have their edges flanged (FIG. **3**).

The ribbon **7** passes in between the anode plates of the single sections **9** and twinned section **10** to form a loop.

The length of the anode plates **11** and **14** and, accordingly, that of the space tubular frames **8** are different, depending upon the thickness of the ribbon **7**.

Each of the following tubular frames **8** (as to the direction of the ribbon **7** motion) is longer than the preceding one.

The length of the initial tubular frame with the anode plate (not shown in the drawing) is found by way of calculation and depends upon the permissible current load on the cross-sectional area of the ribbon **7** making part of the loop electrolyzer, and upon the predetermined current density.

The length of the following tubular frames with anode plates is determined likewise to suit the thickness of the incoming ribbon and the present current density.

The loop electrolyzer of the invention operates as follows:

The cathode ribbon **7** preliminarily produced in the drum electrolyzer **1** is drawn through the bath **4** filled with electrolyte and, while rounding successively about the top current-carrying drums **5** and the bottom tension drums **6** in the form of vertical loops, passes in between the anode plates **11** and **14**, being thus deposited up to a preset thickness.

Then the resulting copper strip is washed, dried, cut into lengths and piled up in the piler **3**.

The flanged edges of the anode plates **11** and **14**, due to their progressive departure from the edge of the cathode ribbon, make it possible to diminish the concentration of the line of forces at the ribbon edge and, thus, to eliminate the fringe effect and obtain the finished strip free from thickened edge.

In case of repairs or inspection of the bottom portion of the electrolyzer the design of the tubular frame **8** enables any of its section to be dismantled, thus adding much to the facility of the electrolyzer attendance and servicing.

What is claimed is:

1. A loop electrolyzer for producing metal strip, comprising: a container for holding a bath of electrolyte; a plurality of top driven current-carrying drums mounted on the sides of said container; a plurality of bottom tension drums located inside said container and rotating on journals; a cathode ribbon movably passing in between said top driven drums and said bottom tension drums; a plurality of anode plates having their vertical edges flanged and each attached to separate detachabley mounted frames arranged consecutively in the direction of travel of said cathode ribbon inside said container, each of said frames comprising single separate sections and a twinned section disposed therebetween.

2. The loop electrolyzer as claimed in claim **1**, wherein said twinned section is provided with retainers which engage detents disposed on adjacent ones of said separate sections and the journals of respective ones of said bottom tension drums.

3. The loop electrolyzer as claimed in claim **1**, wherein each of the successively located frames in said container is longer than the preceding one.

4. The loop electrolyzer as claimed in claim **1**, wherein said separate sections and twinned section of each of said frames comprise tubes having in their lower portions bubblers for feeding air for electrolyte stirring.

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