Fig. 4.

Fig. 5.

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This invention relates generally to electroplating apparatus and, more particularly, to apparatus for manipulating the anode bars of electrodeposition apparatus. In the ensuing specification my invention is described in detail as applied to the movement of the anodes used in an electrolytic lining lime for manufacturing tin plate. However, it will be quite apparent that my invention is not limited to such use and that it may be used to advantage in many installations where it is desirable to intermittently or continuously move one or a plurality of elements such as anode bars along supports.

In one process of continuously lining steel strip by electrodeposition, such as that disclosed in the copending application, Serial No. 497,769, which E. W. Rieger and I filed on May 22, 1943, and which issued as Patent No. 2,368,264, bars of tin are placed side by side in an electrolyte tank below the path of the strip and are advanced progressively from one side toward the other along inclined guides. With this arrangement, the tin of the anode bars is dissolved principally from the upper surface thereof and deposited on the strip, the thickness of the bars decreasing with the length of their immersion in the electrolyte. It is for this reason that the guides are inclined upwardly to maintain substantially a constant spacing between the upper surfaces of the bars and the strip. A new bar is deposited on the entering side whenever the bars previously placed on the guides have been advanced far enough to make room for it.

My invention comprises means adapted to be disposed on the side of the tank and movable from one tank to another for applying a thrust or push to the last bar deposited in any particular row of anode bars, thereby moving all the bars in the row along the supporting guides. In a preferred embodiment, the device comprises a housing having a base and a thrust member mounted therein for extension and retraction. The thrust member extends inwardly from the housing over the side of the tank and is provided at its inner end with a bearing member adapted to engage the last anode bar placed on the guides. A screw shaft journaled in the housing is threaded into the thrust member for reciprocating it as desired.

Further details, novel features and advantages of the invention will be explained during the following complete description which refers to the accompanying drawings illustrating the preferred embodiment. In the drawings,

Figure 1 is a partial plan view of an electrolyte tank having the invention applied thereto;

Figure 2 is a partial section taken along the plane of line II—II of Figure 1;

Figure 3 is a partial side elevation such as would be observed by looking on the structure of Figure 2 from the left;

Figure 4 is a plan view showing the device of my invention to enlarged scale, removed from the electrolyte tank;

Figure 5 is a partial horizontal section taken along the plane of line V—V of Figure 2, the electrolyte tank being omitted.

Figure 6 is a plan view of the electrolyte tank with which my invention is adapted to be used, showing two full sets of anode bars in position therein;

Figure 7 is a partial longitudinal section taken along the plane of line VII—VII of Figure 6; and

Figure 8 is a transverse section taken along the plane of line VIII—VIII of Figure 6.

Referring now in detail to the drawings, a tank 10 which is one of a series forming a lining line, is fabricated from plates and sheathed with rubber or other material which is not subject to attack by the electrolyte employed. The tank includes side walls 11, end walls 12 and secondary side walls 13 forming overflow troughs 14 on each side of the tank. An electrolyte is circulated continuously through the tank, being supplied through a central inlet 15 and being delivered from the troughs 14 to a collecting tray 16 through overflow connections 17. Baffles 18 and 19 in the tank control the flow of electrolyte therein. The baffles 18 and 19 are fabricated from plates and covered with protective sheathing.

Anode bars 19 are disposed side by side across the width of the tank in two banks, as shown in Figure 6. The ends of the bars rest on guides 20 and 21 which slope upwardly as shown in Figure 8. The guides 20 are box-section members fabricated from plate and having a protective sheathing of rubber therein. The guides 21 are slabs of hard carbon resting on metal bars 22 preferably of tin. A spacer strip 24 is disposed on the guide 21 separates the anode bars of the two banks. A terminal 23 extends upwardly from the bar 22 adjacent one side of the tank for connection to a suitable source of current. The anode bars are placed on the guides 20 and 21 and progressively moved therealong as the metal is removed from the upper surface of the bars. They are advanced along the guides to maintain a substantially constant spacing.
from the strip being coated. The normal position of the strip is shown at 24 and the direction of travel is indicated by the arrow 25 in Figure 6.

The apparatus of my invention which is intended particularly for use on an electrolytic tank such as that described above, is illustrated generally at 26. It comprises a housing 27 having a base 28. Supporting feet 29 extend downwardly from the base and housing and are adapted to rest in a bracket 30 in the form of an angle bar secured to the side wall 11 of the tank on the operator's side thereof. The jack 26 is confined against movement along the side of the tank by spaced positioning lugs 32a secured inside the angle bracket 30. As shown in Figure 1, the device 26 which is the nature of a jack, extends inwardly of the side wall of the tank. A bearing pad 31 secured to the inner end of the base 28 rests on the secondary side wall 13. The housing and base may be fabricated from plate and structural shapes. The housing includes spaced side walls 12, a top 32a and a gauge plate 33. The top and gauge plate have longitudinal slots 34 therein for a purpose which will appear presently. The gauge plate is slidable on the top and may be secured in adjusted position by a clamping screw 32b. It will be understood that the jack 26 is removable supported in overhanging relation with the side of the tank by the feet 29 and the bearing pad 31. It may be quickly removed by means of a lifting handle 33 secured to the top 32a and moved to any desired bank of anode bars in the line.

A thrust member in the form of a slide or pusher bar 35 is movable longitudinally in the housing 27 and along the base 28. A yoke 37 secured to the base adjacent the bearing pad 31 guides the outer end of the slide 35. The slide has a longitudinal vertical slot 38 therethrough and a tapped hole is provided in the outer end to receive the inner end of a screw shaft 39 journaled in a bearing block 40 secured in the outer end of the housing 27. The shaft 39 has a thrust collar 41 on the inner side of the bearing 40 and a hand crank 42 pinned thereto on the outer side of the bearing. It will thus be apparent that, by turning the crank 42, the slide 35 may be advanced from or retracted into the housing 27.

An index 43 extends through the slot 34 in the gauge plate 33 and is mounted on the outer end of the slide 35. The index cooperates with arrow points 44 on the gauge plate to indicate the position of the slide at any time, relative to the extreme limits of its movement.

At the inner end of the thrust member or slide 35 a bracket 45 is pivotally mounted by means of a hinge bolt 46 extending through spaced lugs 47 secured to the bracket. As shown in Figure 2, the bracket 45 extends downwardly and inwardly from the end of the slide. By means of adjusting screws 48 threaded through opposite sides of the upper end of the bracket 45 for engagement with a bearing plate 49 secured to the end of the slide, the bracket may be shifted to a selected angular position relative to the slide for a purpose which will be explained later. A bearing member or pusher bar 50 is secured to the lower end of the bracket 45 and has rounded vertical ribs 51 at its ends for engagement with the side of the last anode bar 19 placed on the guide 20 and 21, as shown in Figure 2.

The manner of using the device of my invention will now be briefly explained although it is fairly apparent from the foregoing description. The jack 26 is normally disposed in operating position on the side of the tank 10, as shown in Figures 1 through 3. The crank 42 is given a few turns periodically to slide the anode bars 19 along their upwardly inclined guides sufficiently to maintain the desired constant spacing between the outer surfaces of the bars and the strip being coated. When the last bar placed on the guides has been advanced approximately to the position illustrated in solid lines in Figure 2, the slide 35 and the bearing member 50 are retracted by reverse rotation of the screw shaft 39 and the entire rig is preferably removed from the tank to provide ample room for placing an additional anode bar on the guides. This may conveniently be done by any suitable form of crane. When the added bar has been placed on the guides, the jack 26 is replaced and the slide and bearing member thereof advanced by rotation of the crank 42 and the screw shaft 39 until the bearing member engages the added anode bar. Continued rotation of the screw shaft forces the added bar into snug engagement with the last bar previously placed and further rotation of the crank and screw shaft from time to time will successively advance the entire bank of bars progressively in the manner already described. Successive positions of the added anode bar and the bearing member 50 are illustrated in chain lines in Figure 2.

With the disposition of anode bars shown in Figure 6, the travel of the strip is parallel to the length of the bars. Slight striations in the tin coating applied to the strip may result from the fact that the amount of tin deposited in the portion of the strip width opposite the bars themselves is slightly heavier than the amount deposited on portions of the strip opposite the spaces between adjacent bars. For this reason, it may be advisable to have the bars move along their guides in a position at an oblique angle to their path of movement instead of normal thereto as illustrated. To this end, the bearing member 50 is adjusted to a position making an angle slightly less than 90° with the slide by backing off one of the adjusting screws 48 and turning up the other; then the anode bars will traverse the width of the tank in positions at an oblique angle to the path of the strip. Any point on the width of the strip will thus lie opposite the space between adjacent anode bars only for a very short time and is opposite the bars themselves for a greater portion of the time so that the thickness of the deposited coating is quite uniform over the entire strip width.

It will be apparent from the foregoing that the invention provides a simple and easily actuated means for positively moving the banks of anode bars progressively. It will be understood that a separate jack is preferably provided for each bank of anode bars but a single jack may, if desired, be shifted from one bank to another as required. The jack may easily be removed to facilitate the placing of additional anode bars. The position of the index lugs shown clearly when it is time to place another bar on the guides, even though the bars already placed are concealed by the strip traveling thereover. The pivotal mounting of the bearing member and the adjusting screws therefor make it possible to obtain a uniform rate of feeding the anode bars along the guides in angular relation to the travel of the strip. The use of a screw shaft for actuating the thrust member makes it possible to advance the banks of
the bars by very small increments as required by
the gradual transfer of the metal of the bars
to the strip being coated.

While the invention has been described in con-
nection with a tinning line, it is equally useful
in electrolytic coating lines for electroplating a
coating of zinc or other metal onto steel strip
or strip of some other metal.

Although I have illustrated and described only
a preferred embodiment of the invention, it will
be appreciated that changes in the construction
and arrangement of the parts may be made
without varying the principle of my invention,
within the scope of the appended claim.

I claim:

A jack comprising a base, a slide movable
longitudinally along the base, means carried on
the base for reciprocably moving the slide there-
along, a pusher head movable by the slide, said
head comprising an arm having one end thereof
pivotally carried by the slide and the other end
thereof extending below said base, a bearing head
carried by said arm below the base and means
for adjusting the bearing head angularly with
respect to the slide, and a plurality of bearing
members for supporting the base and the parts
carried thereby.

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