July 5, 1932. M. KIRCHNER 1,865,767

ELECTROPLATING EQUIPMENT

Filed Dec. 6, 1930

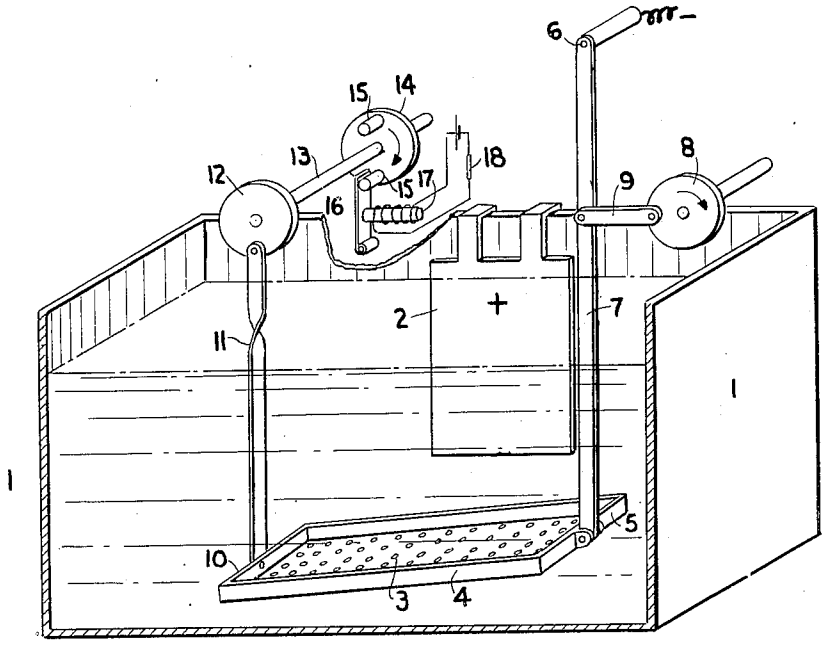


FIG. 1

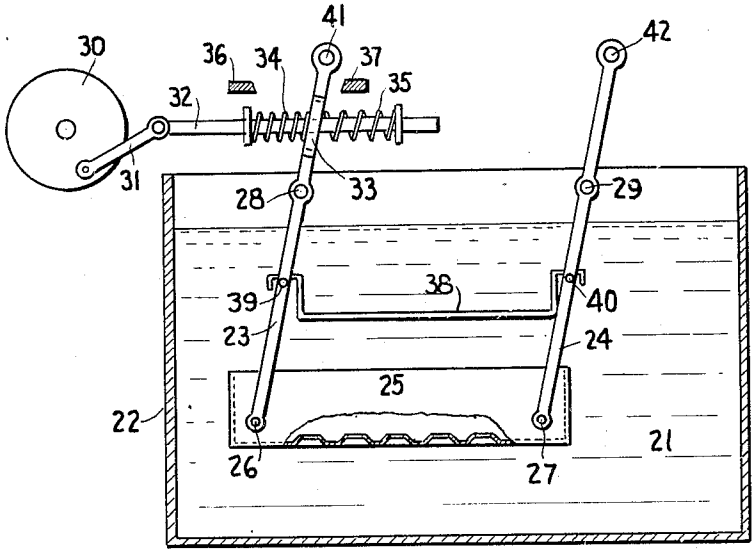


FIG. 2

Martin Kirchner INVENTOR

BY Gustav R. Thompson

ATTORNEY

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UNITED STATES PATENT OFFICE

MARTIN KIRCHNER, OF BERLIN-LANKWITZ, GERMANY, ASSIGNOR TO UNITED CHROMIUM, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF DELAWARE

ELECTROPLATING EQUIPMENT

Application filed December 6, 1930, Serial No. 500,459, and in Germany October 18, 1929.

My invention relates to improvements in electroplating equipment, and more specifically to a container for small articles, such as screws, springs, pins, bolts and the like to be treated in bulk in the electrolyte.

In order to obtain good galvanic coatings in a simple manner on such articles or objects in bulk, I provide a sieve-like perforated plate with raised edges, tray or trough, for supporting the articles in the bath in conjunction with means for shaking, oscillating or vibrating the tray continuously. A considerable saving of time is thus attained by my improved apparatus as the time for introducing the articles into the machine is shortened, as compared with known equipment, since the articles in bulk can simply be poured on to the plate or into the tray or trough. My improved apparatus also retains the advantage of the continuous motion of the articles and thus leads to the production of very uniform coatings in a comparatively short time.

My improved apparatus is particularly suitable for producing coatings or deposits of chrome, nickel or zinc on base metals, since the difficulties arising in the production of such coatings in other apparatus are effectively avoided. If the objects to be treated are not to be suspended in the bath individually, which requires much time and is thus very expensive, the electroplating would have to be carried out in tumblers or oscillating apparatus immersed in the electroplating solution.

In such apparatus frequent although short interruptions in the depositing process occur on some of the objects so that dull and brittle coatings or layers are produced. These difficulties are entirely eliminated by my improved apparatus.

In a preferred form of my apparatus two differently acting groups of driving members are connected to the tray or trough. This takes place in such a way that one group of driving members engaging the tray at one end shakes, vibrates or oscillates the tray continuously, while the other group of driving members engaging the tray at the opposite end raises this end of the tray intermittently into one or the other of two limit positions. In consequence of the cooperation of these two groups of driving members the supporting tray, which has always a slight inclination, one end or the other being in a raised position, the objects move alternately from one end of the tray to the other due to the shaking or vibrating action, whereupon after some time the far end of the tray is moved into the other limit position and the objects travel in the opposite direction.

This construction may be further improved. While in the just described embodiment of my invention two separate driving elements are required a substantial simplification is brought about by another feature of my invention according to which a single device is provided for operating the tray carrying the objects to be plated. The tray is here movably suspended from rods and these rods are limited in their oscillatory motion by encountering stationary stops. When the rods come in contact with these stops at a certain speed they are suddenly arrested with a shock and the articles resting upon the perforated tray are thrown forward upon the tray.

Two embodiments of my invention are illustrated in the drawing affixed to my specification and forming part thereof. The drawing shows:

Fig. 1, a perspective view of one embodiment, and

Fig. 2, a sectional elevation of the other embodiment.

Referring to Fig. 1 of the drawing 1 indicates a tank containing the electroplating solution in which, for instance, a plate-shaped anode 2 is suspended. As cathode serves a sieve-like perforated plate 3 with raised edge 4, tray or trough. One end 5 of the plate 3 is connected to a lever 7 pivoted or fixed at 6 to which is hinged a connecting rod 9 continuously driven by an eccentric 8. The plate 3 is connected as the cathode. For this purpose the lever 7 may be provided with an electrically well conducting core or wire enveloped by an insulating material. This core is connected to the negative pole of a source of current. If preferred the lever 7

may consist of an elastic material and then be rigidly fixed at the point 6. In this case the passage of the current at the point 6 takes place between stationary parts.

The other end 10 of the tray 3 is connected to a rod 11 eccentrically secured to a disk 12 driven by a clockwork mechanism in customary and therefore not shown manner. On the driving shaft 13 of this disk 12 is mounted a further disk 14 on which there are fixed two diametrically opposite pins 15. In the position shown the lower pin 15 is in contact with the armature 16 of an electromagnet 17 so that the rotation of the shaft 13 and thus a motion of the tray 3 by the last described operation gear is prevented. If the circuit of the electromagnet 17 is broken, for instance at the contact 18, the armature 16 of the electromagnet drops off and thus releases the shaft 13. The opening of the contact 18 takes place periodically during such short periods that during the next following completion of the circuit of the electromagnet 17 the shaft 13 is again arrested due to the pin 15 shown at the top in the drawing coming in contact with the armature 16 of the electromagnet 17.

The apparatus functions in the following manner: The objects in bulk to be electroplated are poured on to the tray 3, the raised edge or rim 4 preventing the articles from dropping off. The current and the driving mechanism for the tray 3 are then switched on. Owing to the continuous action of the eccentric gear 8, 9 the tray 3 with the articles upon it is continuously shaken, vibrated or oscillated. Since, as shown in the drawing, the tray or plate 3 is slightly inclined the objects resting upon it move towards the opposite end 10 of the tray under the action of the shaking or oscillatory motion. After some time the shaft 13 is released in consequence of the disengagement of the locking arrangement 15, 16 and the eccentric gear 11, 12 raises the end 10 of the tray which up to now occupied the lower limit position into the upper limit position. The articles on the tray now move towards the end 5 of the tray under the action of the shaking motion imparted to the tray by the eccentric gear 8, 9. This procedure is repeated until the articles have a coating or layer of the desired thickness. Preferably the tray is lifted out of the bath together with the finished articles and immersed again after the finished articles have been removed and the fresh raw articles placed upon it.

To facilitate the introduction and the removal of the goods the connection between the rod 11 and the disk 12 as well as the connection between the rod 7 and the lever 9 and the attachment at 6 may be made detachable so that after detaching these connections the plate 3 with the articles may be lifted out of the bath by means of the rods 7 and 11. If desired a pair of rods like the single rods 7 and 10 may be provided whereby a tipping over of the tray 3 during the electroplating process or when lifting the tray out of the bath is effectively avoided.

Referring to Fig. 2 of the drawing the sieve-like tray or trough with perforated bottom 25 connected as cathode is movably suspended in the tank 22 containing the electroplating solution 21, by means of the rods 23 and 24 pivoted at 26 and 27 respectively. The objects to be plated are again placed on this sieve. The rods 23 and 24 are adapted to oscillate or vibrate around the stationary spindles 28 and 29. The drive of the sieve is effected by means of the wheel 30 rotating continuously and on the face of which is pivoted the connecting rod 31 hinged to the sliding bar 32.

The bar 32 is passed through an eye 33 in the rod 23 and coupled to this rod by means of the springs 34 and 35. To stop the vibrating or oscillating motion of the rods suddenly stops 36 and 37 are provided.

These stops are preferably made adjustable to enable the shocks when arresting the rods to be controlled and to be made stronger or weaker according to the size and shape of the articles to be plated. This object, viz. the adaptation of the apparatus to various objects, may also be attained by providing a plurality of plates or trays with perforations of different sizes.

The anode 38 is by the aid of the rods 39 and 40 suspended above the cathode and the current is supplied by means of the contacts 41 and 42. The supply cables may be directly connected to these contacts so that sliding contact members and easily breakable flexible connections are entirely avoided. If the positive pole of the source of current is connected to the contact 41 and the negative pole to the contact 42 the spindle or pivot pin 27 and the rod 40 must consist of an insulator. It will be understood, however, that the insulation between cathode and anode can also be effected in any other well known manner so that shunts to the rods 23 and 24 are avoided as far as possible.

My improved equipment is particularly suitable for producing layers or coatings of such metals which require a high current density or voltage for their deposition and in which even a short interruption of the galvanic decomposition of the electrolyte has an adverse effect upon the quality of the deposited metal coating or layer. Such metals are in particular chrome, iron and cobalt, but even with nickel and zinc similar difficulties arise.

The treatment in the improved apparatus is particularly suitable for objects or articles capable of rolling or tumbling, such as screws, balls, pins, rings and the like.

The objects should preferably be placed

on the perforated shaking or oscillating tray in such numbers that they form a single layer only and the tumbling of articles over one another is avoided.

The perforations in the plate or bottom of the tray or trough must be provided in such numbers and be of such sizes that the objects cannot be arrested for any length of time as otherwise the galvanic deposition would be interrupted at the place of contact between the plate, tray or trough and the object or article.

It will be readily understood that structural modifications may be made without departing from the spirit of my invention or the scope of the appended claims.

I claim as my invention:

1. In an apparatus for electroplating articles in bulk, a container having an extended substantially flat bottom and means for connecting articles resting on the bottom thereof cathodically to a source of current, an anode, means for supporting said tray-like container in an inclined position and for periodically reversing the direction of inclination, and means for agitating the tray-like container while in positions of inclination, whereby the said articles are caused to move intermittently down the inclined bottom first in one direction and then in the other.

2. Apparatus according to claim 1 wherein said means for supporting said container comprises a crank, a connection between said crank and container, and means for intermittently operating said crank.

3. Apparatus according to claim 1 wherein said agitating means comprises an arm connected to said container and a rotary crank connected to said arm.

4. In an apparatus for electroplating articles in bulk, a container having an extended substantially flat bottom and means for connecting articles resting on the bottom thereof cathodically to a source of current, an anode, means for oscillating said container in a substantially level position, and means for producing sudden impacts upon said container on oscillations in opposite directions whereby to agitate said articles and protect them along the container in the direction in which the container is moving when arrested.

5. Apparatus according to claim 4 wherein said means for oscillating said container comprising a driving part and a yielding connection between said driving part and container, whereby said container on impact, can move independently of said driving means.

6. Apparatus according to claim 4 wherein said means for oscillating said container comprises swinging arms connected at opposite points to said container.

In testimony whereof I affix my signature.

MARTIN KIRCHNER.