March 11, 1952 J. V. DAVIS 2,588,910

ANODE SHIFTING DEVICE

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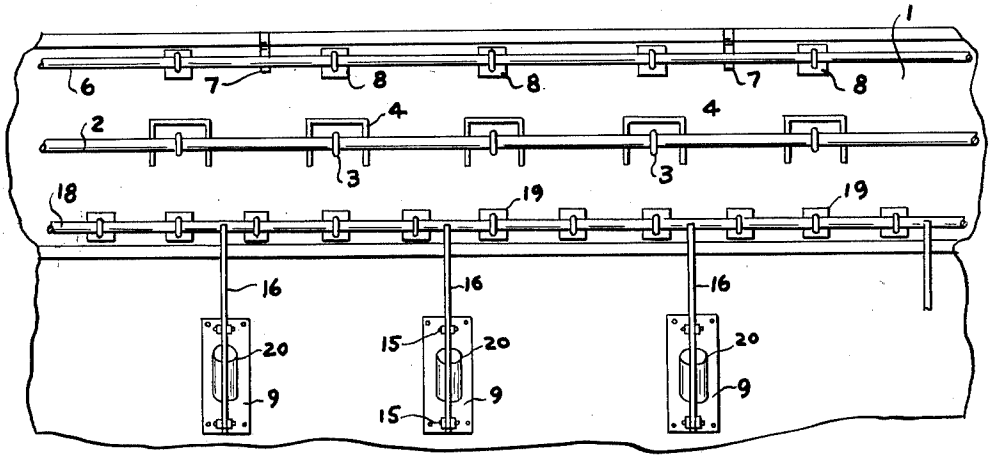


Fig. 1

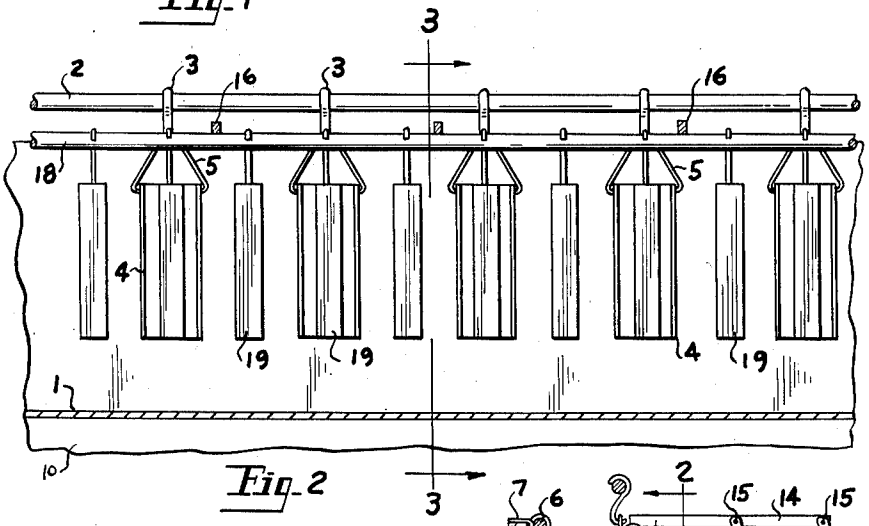


Fig. 2

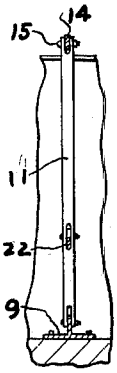


Fig. 5

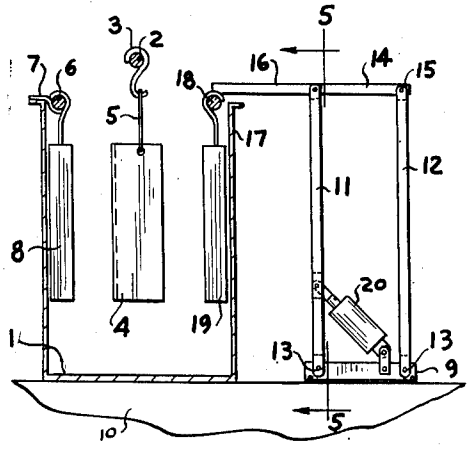


Fig. 3

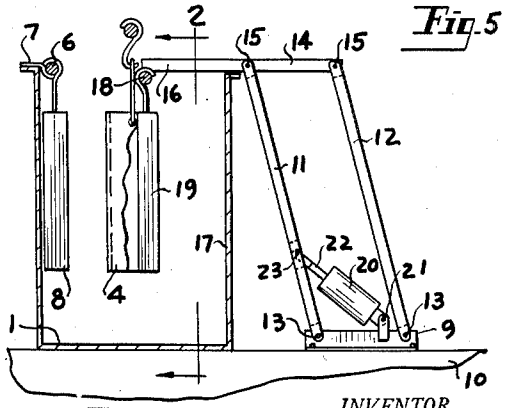


Fig. 4

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ANODE SHIFTING DEVICE

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2 Claims. (Cl. 204—198)

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It is well known in the art of plating that it is difficult to plate into a cavity of the cathode. The metal ions appear to be obstructed by the walls and edges of the cavity from reaching the bottom of the cavity. In the case of a stationary cathode, the anodes may be specially adjusted to plate into the cavity, and in some cases auxiliary anodes are directed into the cavity.

Such expedients, however, cannot be used with moving cathodes such as work pieces that are conveyed on a rail from tank to tank in a modern plating machine. The principal object of this invention is to provide, in such a mechanism, an apparatus that shifts the anode into the cavity of the work piece during its dwell in the intermittent movement of the work along the tank. Another object of the invention is to proved this mechanism in multiple to shift a number of anodes into the cavities of a corresponding number of work pieces at various stations in the machine and also into the spaces between successive work pieces for efficient external plating.

In the accomplishment of these objects, there is provided an anode supporting rail that lies parallel to the usual work carrying or cathode rail that extends lengthwise of the series of tanks. The anode rail is carried by a member that is adapted to be shifted transversely of the rails. Consequently the anode or anodes suspended from the anode rail may be shifted close to the work and in fact into the cavity thereof. The anode rail carries several anodes for similar positioning with respect to a number of work pieces and may also carry additional anodes that will enter between successive work pieces. The shifting of the anode rail support is timed to bring the anodes close to work pieces when the latter are at rest in their intermittent movement along the cathode rail.

The preferred embodiment of the shifting mechanism is an articulated parallelogram mounted vertically and adjacent to the rails and preferably outside the tank. The top member of the parallelogram is preferably extended to constitute the support for the anode rail. The base of the parallelogram is fixed, and the remaining sides are shifted toward and from the cathode rail by a suitable timed mechanism. This may take the form of a cylinder and piston connected respetcively to two adjacent sides of the parallelogram with timed valves for charging and exhausting the cylinders. In the multiple system mentioned above, several such parallelograms are provided, and their extended top members carry but one rail from which the anodes are suspended.

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The invention is fully disclosed by way of example in the following description and in the accompanying drawings in which:

Figure 1 is a plan view of an apparatus according to the invention;

Figure 2 is a longitudinal vertical section thereof, on the line 2—2 of Figure 4;

Figure 3 is a section on the line 3—3 of Figure 2;

Figure 4 is a similar section showing a different positions of the parts, and

Figure 5 is a section on the line 5—5 of Figure 3.

Reference to these views will now be made by use of like characters which are employed to designate corresponding parts throughout.

In the several figures is shown a plating tank 1 of a continuous plating apparatus through which the work is propelled. The tank is divided into a number of compartments for containing different solutions as known in the art, and each compartment may be of such length to contain several work pieces as shown.

A cathode rail 2 is supported lengthwise over the tank in any usual manner. Hooks 3 are slidably mounted on the rail 2, and the work pieces 4 are suspended from the hooks 3 by means of auxiliary or special hooks 5, if necessary. Each work piece has a prominent cavity to be plated and is illustrated in the form of a channel member, all facing the same side of the tank. The opposite side of the tank supports an anode rail 6 by suitable brackets 7. From the rail 6 are suspended anodes 8 which being disposed behind the pieces 4, have little or no plating effect in the respective cavities thereof.

Additional anodes adapted to enter these cavities are provided, and the shifting support for them will now be described. Adjacent to a wall of the tank, and preferably externally thereof, is provided a series of articulated parallelograms standing vertically. Each such parallelogram includes a base 9 fixed to a floor 10, with sides 11 and 12 pivoted to the base 9 at 13. The top member 14 of the parallelogram, opposite the base is pivoted at 15 to the upper ends of the sides 11, 12. This member is extended at 16 generally toward the rail 2, passing over or through the adjacent side 17 of the tank.

The several extensions 16 carry an anode rail 18 from which are suspended a number of anodes 19. Some of these lie directly opposite the cavities of the respective work pieces 4 when the latter are at rest, and others lie opposite the spaces between the work pieces.

The parallelograms are shifted from the position shown in Figure 3 to that shown in Figure 4, and vice versa, in proper sequence. An illustrative mechanism for this purpose consists of a cylinder **20** in each parallelogram, pivotally attached at **21** to the base **9** at one end, and a piston rod **22** passing through the other end of the cylinder and pivotally attached at **23** to an adjacent side **11** or **12**. The cylinder has timed intake and exhaust valves, not shown but well known in the art, and synchronized with the intermittent movement of the hooks **3** along the rail **2**. The hooks are propelled by suitable pushers which also are not shown but well known in the art.

A typical dwell interval in the intermittent movement of the work may be on the order of twenty seconds. At the beginning of this interval, the cylinders **20** are automatically charged to advance the anodes **19** into the cavities of the work pieces **4**. The reverse movement is effected shortly before the end of the dwell interval. While the anodes **19** are in the position shown in Figure 4, those that have entered the pieces **4** will effect an adequate plating of the interior or cavities thereof. The remaining anodes **19** will lie between the successive pieces **4**, as may be seen in Figures 1 and 2, and will improve the plating of the outer surfaces of the sides of the pieces **4**.

Hitherto all the anodes in a plating machine have been stationary, and the internal plating of moving work pieces has suffered because of this condition. It is now evident that this difficulty is remedied by the shifting anodes provided by this invention.

Although a specific embodiment of the invention has been illustrated and described, it will be understood that various alterations in the details of construction may be made without departing from the scope of the invention as indicated by the appended claims.

What I claim is:

1. In a continuous plating apparatus, a tank, a rail lying over said tank lengthwise thereof, said rail having a plurality of supports for work pieces carried thereby in spaced relationship, an anode rail lying parallel to the first rail also carrying a plurality of anodes spaced in opposing relationship to said work pieces, means for intermittently moving said supports along said first-mentioned rail, and oscillating frame means connected in synchronism with said first mentioned means for intermittently moving said anode rail transversely of said first rail during the dwell in the movement of the work pieces thereon, the oscillation of the anode rail being in an amplitude sufficient to bring said anodes in close proximity to said work pieces.

2. The structure of claim 1, said anode rail carrying additional anodes to be positioned intermediate said work pieces when said anode rail has brought the other of said anodes in close proximity to all of said work pieces during the aforementioned dwell period.

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