July 6, 1937. J. A. HENRICKS, JR 2,086,224

ANODE

Filed May 17, 1934 2 Sheets-Sheet 1

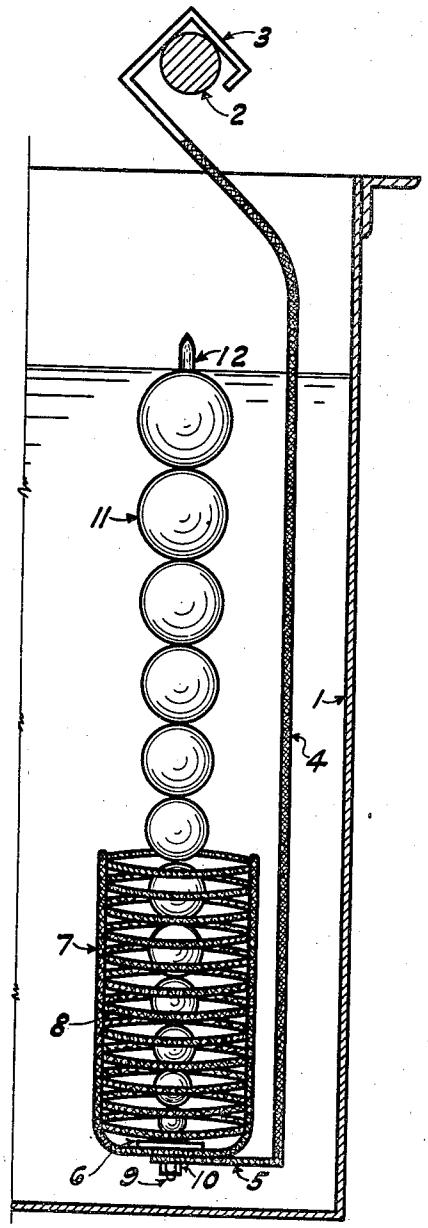


FIG. Nº1

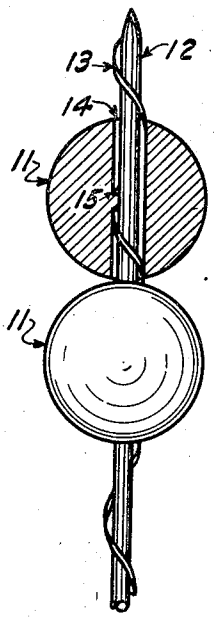


FIG. Nº2

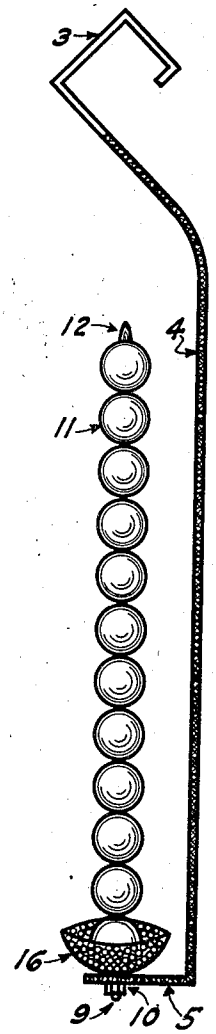


FIG. Nº3

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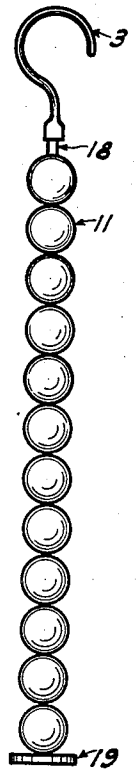


FIG. Nº 4

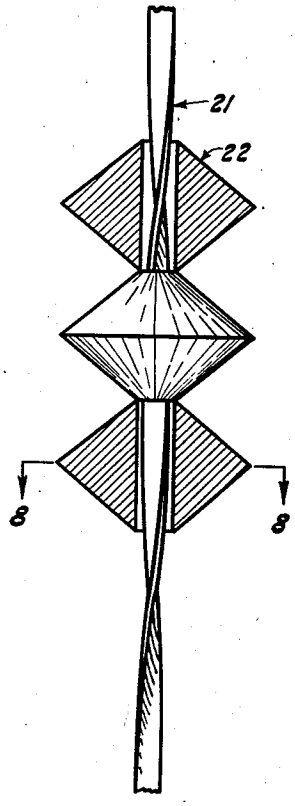


FIG. Nº 7

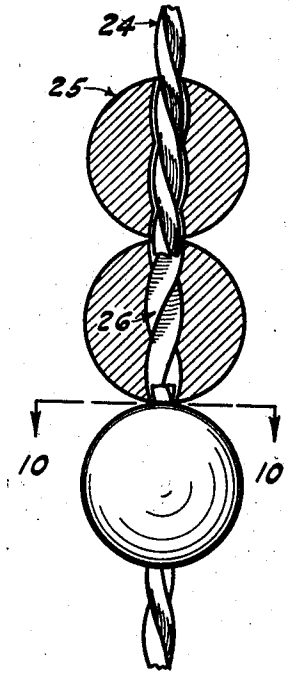


FIG. Nº 9

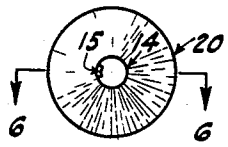


FIG. Nº 5

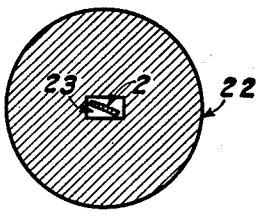


FIG. Nº 8

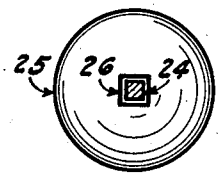


FIG. Nº 10

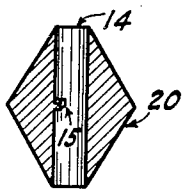


FIG. Nº 6

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UNITED STATES PATENT OFFICE

2,086,224

ANODE

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Application May 17, 1934, Serial No. 726,021

10 Claims. (Cl. 204—4)

This invention relates to renewable anodes for use in electroplating, and is particularly directed to an anode wherein anode sections may be readily added as required, and wherein the anode sections are automatically rotated as the electroplating proceeds.

There are two types of removable anodes in general use. One uses ball-shaped anode sections which are held in a vertical spiral, iron wire basket. The other employs washer shaped anode sections which are strung on a vertical rod.

The first type is very convenient, as additional balls may be added when required, but it has the very serious disadvantage that the iron holder carries the positive current, and, being insoluble, will cause undesirable secondary oxidations. The second type presents a much smaller amount of insoluble metal, but it has the fault that, as the rate of solution is greatest on the side facing the cathode, the anode corrosion tends to cut through to the center hole of the washer with the result that the washers fall from the rod and are no longer available.

It is an object of my invention to overcome the disadvantages heretofore experienced in the use of renewable anodes.

I provide a vertical rod as a support for a plurality of anode sections. The rod is constructed of an inert material and is provided along its length with a spiral means of rather great pitch. The anode sections, preferably spherical in shape, are provided with means through their centers which co-operate with the spiral means on the support to cause a rotation of the sections as they move along the support. As the anode sections are utilized they travel down the rod, and, by reason of the co-operating means, the downward motion causes them to rotate.

My improved construction insures uniform corrosion of the anode, with the result that the anode sections do not fall from the rod and become unavailable, but may be almost entirely utilized. My improved anode also offers the advantages that its area is substantially constant, and that there is a relatively small amount of insoluble metal which would set up secondary oxidation reactions. Moreover, my preferred construction permits the ready addition of anode sections.

In the drawings:

Figure 1 is an elevation, partly in section, of a portion of a plating tank showing my device as it appears in use.

Figure 2 is a detail view showing a spiral and lug arrangement by means of which the anode sections are caused to rotate.

Figure 3 is an elevation of a modification of my anode.

Figure 4 illustrates another modification.

Figure 5 is a plan view of a modified anode section.

Figure 6 is a vertical section on line 6—6 of Figure 5.

Figure 7 is an elevation, partly in section, of a modified support and anode sections.

Figure 8 is a section taken on the line 8—8 of Figure 7.

Figure 9 shows another modified support, and

Figure 10 is a section on the line 10—10 of Figure 9.

In Figure 1 my preferred anode is shown in place in a plating tank 1 of conventional design. Positive current is supplied to the anode by a bus bar 2 which may be of any well known construction. The anode is supported on the bus bar by a hook 3 which makes electrical contact with the bus bar. The hook 3 is integral with a supporting rod 4 which extends towards the bottom of the tank and terminates in a support 5. The elements 4 and 5 are insulated, as shown.

Mounted on the support 5 is a U-shaped frame 7. Suitable spaced, circular ribs 8 are secured to the frame 7, the ribs and frame together constituting a basket-like receptacle. The frames 7 and 8 are covered with an insulating material, though if one desires, they may be made of a non-conductor.

At the bottom of the basket-like receptacle, and above the bottom of frame 7 there is provided a contact disc 6. At the center of the basket-like receptacle is a vertical rod 12 which terminates above the normal solution level in a point. At its lower end the rod 12 is reduced in diameter, forming a shoulder, and the portion of reduced diameter, 9, threaded to receive a nut 10. The shoulder rests upon the contact disc 6 and the reduced portion 9 goes through suitable holes in the contact disc 6, the frame 7 and the support 5. The nut 10 securely holds the elements in the shown relation. The rod 9, and, if so desired, nut 10, make an electrical contact with the metal of support 5. The rod 12 and the contact disc 6, in operation, are positively charged by a current from the bus bar 2.

The rod 12, as best seen in Figure 2, is provided with a spiral ridge 13, of relatively long pitch. The anode sections 11 are cast with a hole 14 therethrough, and inside of the hole is a lug 15 which is adapted to follow the spiral 13.

The balls receive an electric charge from contact disc 6 and rod 12. The contact disc 6 and the rod 12 are made of any metal which is substantially uninfluenced by the plating conditions. For instance, they may be iron, steel, lead, etc. It may sometimes be considered desirable to make the rod 12 of an electrically non-conducting material, thereby reducing the amount of insoluble metal present. The electrical connection is not so good, however, when the disc alone is relied upon. The anode sections are, of course, made of the material one desires to electrodeposit, such as cadmium, zinc, tin, etc.

In operation my device is placed in the plating tank with enough anode sections in place to reach to the top of the solution. After the anode has been in use for a while the balls become smaller in diameter and settle slowly on the rod 12. Another anode section is easily placed on the rod 12. As the plating continues the balls become still smaller and another anode section is added. After a considerable period of operation the balls will be of increasing size from the bottom upward, each ball having been in use a different length of time.

As the balls move downwardly the lugs 15 follow the spiral ridge 13 and cause the balls to rotate. The bottom ball, of course, will not rotate, and after remaining stationary for a while, the corrosion on one side and its increasing thinness may cause it to break under the weight of the column of anode sections. The ball next to the bottom may sometimes break in a similar fashion. The basket-like receptacle, 7—8, catches any anode material which falls off of rod 12 and directs it to the contact disc 6 where it is almost entirely utilized.

Instead of a single U-shaped member 7 with ribs 8 the basket may, of course, be of any desired construction.

In the modification of Figure 3, I use a metal bowl in lieu of the basket-like receptacle and contact disc of the device of Figure 1.

This modified anode has a hook 3, support 4—5, vertical rod 12, etc., as does the device of Figure 1. Between the shoulder at the lower end of rod 12 and the nut 10 there is secured a perforated, metal bowl 16 which is held in place against support 5. Fragments falling from the anode sections are caught by the bowl and there given an electric charge and almost entirely utilized.

The modification of Figure 4 is provided with a hook 3 removably secured to a rod 18. The anode may be suspended from a bus bar by means of the hook 3. The rod 18 is provided with a spiral ridge, such as that seen on rod 12 in Figure 2. At the lower end of rod 18 is a stop to prevent further movement of the anode column. This device is somewhat simpler in construction than those heretofore illustrated, but it is not as convenient in use, as the hook must be removed before additional balls can be put on the rod 18. By making the rod 18 rather long, extra anode sections will be held above the solution level until needed.

Instead of using only the simple stop 19 I may, of course, add a bowl, basket-like receptacle, or similar means to catch and utilize any material which falls off the rod 18.

It is noted that the rod 18 may be made of a non-conducting material and provided with a conductor through its center for electrically connecting the stop 19 with the hook 3. The electrical connection is not as good, however, as when the rod 18 is a conductor.

While I have shown only spherically shaped anode sections, I may use any shape of anode section which will decrease in height under the influence of the plating conditions. In general the sections are of such a shape as to permit the access of the plating solution to their tops and bottoms. In Figure 5, for example, there is illustrated a modified form of anode section. This modification is in the form of two cone frustums base to base. The section is provided with a hole 14 and a lug 15 as was the anode section 11, illustrated in Figure 2. In general the anode sections will be of such a form that the size of the anode section in a direction normal to a central aperture is smaller at one end than at points removed from the said end. The anode section must, of course, be provided with means which can co-operate with spiral means on a support to cause rotation of the section as it moves along the support.

The support for the anode sections and the means for rotating the sections may be widely varied.

In Figures 7 and 8 there is shown a portion of a modified support. The support 21 is a flat twisted rod. The anode sections, illustrated as cone frustums base to base 22, are provided with a rectangular passage 23. The opening 23 is of sufficient width that it can receive the spiral support 21 despite the turning of the support within the sections height.

The modified support of Figures 9 and 10 is very similar, being a twisted rectangle 24. The anode section 25, however, is provided with a spiraled opening 26 which conforms to the spiral of the support.

The modifications of Figures 7 to 10 are not quite as desirable as those above described, as the weight of the anode sections tends to deform the support when very long anodes are used.

It is apparent that the anode holder, the device for catching fragments, the anode sections, etc., may be widely varied without departing from the spirit of my invention and I intend to be limited only by the appended claims.

I claim:

1. An anode for use in electrodeposition comprising a plurality of anode sections, means for supporting said sections, and means for automatically rotating said sections in a uniform manner relative to said supporting means.

2. An anode for use in electrodeposition comprising a plurality of anode sections and a vertical support provided with means for rotating said sections in a uniform manner relative to said support.

3. An anode for use in electrodeposition comprising a plurality of anode sections of such form that the plating conditions reduce their height, a vertical support substantially uninfluenced by the plating conditions, and means for uniformly rotating the sections relative to the support as they move downwardly.

4. An anode for use in electrodeposition comprising a plurality of anode sections of such form that the plating solution has access to their tops and bottoms, a vertical support for the sections which is substantially uninfluenced by the plating solution, and spiral means provided by the support which engage a portion of a section to impart a uniform rotary motion to the section on a downward movement thereof.

5. An anode for use in electrodeposition com-

prising a plurality of anode sections of such form that the plating solution has access to their tops and bottoms, a vertical support for the sections which is substantially uninfluenced by the plating solution, and means connected to the lower end of said support for suspending it in vertical position whereby anode sections may be added at the top of the support, and spiral means on the support which engage the anode sections to impart a rotary motion thereto on a downward movement thereof.

6. An anode for use in electrodeposition comprising a plurality of anode sections of such form that plating conditions reduce their height, a vertical support substantially uninfluenced by the plating conditions, means for uniformly rotating the sections relative to the support as they move downwardly, and means at the lower end of said support for catching fragments of anode sections.

7. An anode for use in electrodeposition comprising a plurality of anode sections of such form that the plating solution has access to their tops and bottoms, a vertical support for the sections which is substantially uninfluenced by the plating solution, and spiral means provided by the support which engage an anode section to impart a rotary motion to the section on a downward movement thereof, a conducting means at the bottom of said support, and means for catching fragments and directing them to the said conducting means.

8. An anode for use in electrodeposition comprising a vertical rod of a material relatively uninfluenced by the plating conditions, spiral means carried by the rod, a conducting means at the bottom of said rod, a basket-like non-conducting means secured below said conducting means for catching anode fragments and directing them to said conducting means, a support secured below said basket-like means and extending upwardly to suspend the anode and to supply an electrical charge to the conducting means and anode, spherical anode sections provided with a hole to receive the rod, and means associated with the said hole which co-operate with the said spiral means to cause rotation of the anode section on a downward movement thereof.

9. An anode section provided with a central vertical aperture, the size of the anode section in a direction normal to the aperture being smaller at one end than at points removed from the said end, and the said central aperture being provided with means which can co-operate with a rod carrying spiral means to impart a rotary motion to the anode section as it moves along the rod.

10. An anode support adapted to receive a plurality of anode sections, comprising a U-shaped member one leg of which serves to carry the said anode sections and the other leg of which serves to suspend the support.

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