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MACHINE FOR TREATING WORK OR ARTICLES ELECTROLYTICALLY

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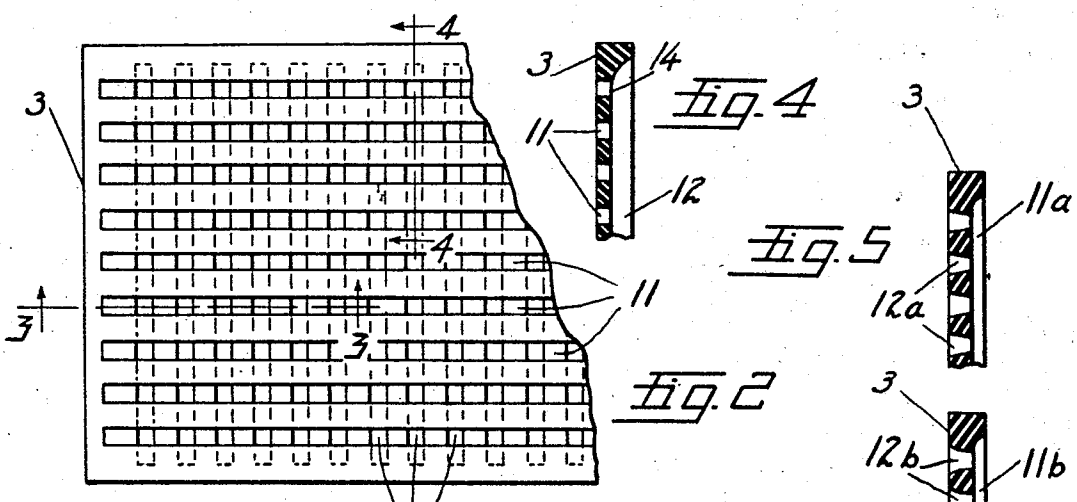


Fig. 2

Fig. 4

Fig. 5

Fig. 6

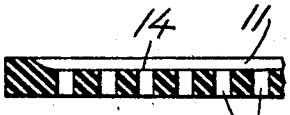


Fig. 3

Fig. 1

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MACHINE FOR TREATING WORK OR ARTICLES ELECTROLYTICALLY

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8 Claims. (Cl. 204—213)

This invention relates to a machine for treating work or articles electrolytically and more particularly to a machine of this type having a container for holding either the anodes or the articles to be treated electrolytically while such articles are being treated. Specific examples of this general type of machine are shown in the United States patent to Bogle 2,035,633 showing a plating machine wherein the work container is a hollow cylinder rotatable about a horizontal axis; the patent to Daniels 1,936,382 wherein the work container comprises a cylinder rotatable about an up and down axis; and in my prior application Serial No. 131,296, filed March 17, 1937, showing a work container in the form of a swinging cradle.

In this general type of machine the container for the articles to be plated is immersed in the plating solution and the side or end walls or both are perforated. The plating solution flows through these perforations into the work container so that the work is immersed. The current also travels from the anode to the cathode, that is, the articles being plated, through these perforations.

It is the object of this invention to produce a machine for treating work or articles electrolytically having a container for holding electrically charged metals, either cathodic or anodic, provided with one or more perforated walls which is more efficient and economical in operation and cheaper to produce than those machines of the above-described type heretofore known and used. This object has been achieved by means of a novel perforated wall for the container.

In the drawing:

Fig. 1 is an end elevation partly in section of a plating machine incorporating my novel wall structure.

Fig. 2 is a plan view of one of the perforated walls of the work container.

Fig. 3 is a section along the line 3—3 of Fig. 2.

Fig. 4 is a section along the line 4—4 of Fig. 2.

Figs. 5 and 6 are sectional views showing modified forms of the perforated walls for the work container.

For descriptive purposes rather than by way of limitation, there is shown in the drawing a barrel type plating machine which comprises a tank 1 for the plating solution and a container generally referenced 2 for the work or articles to be plated. The work container comprises a hollow cylinder of hexagonal cross section bounded on its six sides by the perforated panels 3 and closed at its ends by the end plates 4. The wall panels 3 have a tongue and groove connection with, and are carried by, the ribs 10 which extend between and are secured at each end to the end plates 4.

The work container is supported at each end by the brackets 5 for rotation about a horizontal axis within the tank 1. The work container 2 is provided with two cathode contacts 6. Each contact 6 takes the form of a spoked hexagonal ring which is supported against the inside face of the end plate 4 and arranged to rotate with the work container. The tank 1 is also provided with anode rods 7 which support any suitable anodes such as the insoluble helical metal coil 8 for holding the soluble metal anode balls 9. The anodes and cathodes are connected in the plating electrical circuit in any well-known manner. As thus far described the plating machine is identical with that shown in the above-mentioned Bogle patent.

The panels 3 can be made from any suitable material but preferably should consist of a non-metallic substance such as Bakelite, hard rubber or rubber and fiber composition, Celluloid or rubber covered perforated sheet steel. The wall panel 3 is shown in detail in Figs. 2, 3 and 4. The panel 3 is provided preferably lengthwise thereof with a plurality of parallel grooves 11 which extend from one face of the panel inwardly and on the opposite face with a plurality of preferably parallel grooves 12 extending crosswise of the panel and part-way through the panel. The grooves 11 and the grooves 12 each extend inwardly of the panel so that they meet within the panel thereby forming a perforation at each intersection of the grooves 11 and 12. The grooves 11 and 12 can be formed in any suitable manner, for example, the grooves can be cut or milled into the panel 3 by means of rotary cutters used on both sides of the material or they may be molded, rolled or extruded into the material or formed by a combination of these methods. The panel 3 can also be made from two laminations one of which is provided with parallel slots lengthwise and the other with parallel slots crosswise and the two laminations cemented, vulcanized or otherwise secured together. The important thing is that the perforations should be formed by the intersection or meeting within the panel of non-parallel grooves in its opposite faces.

As shown in the drawing, crosswise grooves 12 are deeper than lengthwise grooves 11. Preferably, as shown in Fig. 1, the grooves 12 are cut in that face of the panel 3 which forms an inside face of the work container 2, and the grooves 11 are cut inwardly from that face of the panel 3 which forms an outside face of the container. The grooves 12 on the inside of the cylinder

should preferably be deeper than those on the outside because then the cylinder can be worn down to a minimum thickness with a minimum loss of strength. A two to one ratio of the depth of the grooves 12 to the depth of the grooves 11 has been used successfully.

The grooves 12 which extend crosswise of the panel are shorter than the grooves 11 and extend in the direction of rotation of the cylinder. This assists in preventing parts from sticking in these grooves. The grooves 11 and 12 preferably but not necessarily are rectangular in cross-section. The grooves 11 and 12 may be of the same width or different widths and the spacing between the grooves 11 can be the same or different than the spacing between the grooves 12.

In Fig. 5 the longitudinal grooves 11*a* and crosswise grooves 12*a* have a different cross section than in the principal form of the invention. The side walls of grooves 11*a* and 12*a* taper or converge inwardly of the panel 3.

In Fig. 6 still a different form of cross section for the lengthwise grooves 11*b* and transverse grooves 12*b* are shown. In this form the side walls 13 of the grooves are curved so that the grooves flare outwardly from within the panel along a curved line.

A plating machine in which the walls of the work container were fabricated as above described has been found considerably more efficient in operation than a similar plating machine having the panels formed with circular perforations. This method of perforating gives a greatly increased amount of current at a given voltage. For example, a cylindrical work container with circular perforations having a diameter of $\frac{3}{64}$ of an inch drilled on centers ½ inch apart drew 405 amperes and a cylindrical work container with $\frac{3}{64}$ of an inch square perforations formed as above described and on centers ½ inch apart drew 600 amperes. In each case the voltage between the anode and cathode was 8 volts; at 9 volts the amperages were 450 and 675 respectively. In these tests the copper leads of the barrel became very hot limiting the amount of current drawn. Other tests were made to show the difference between these two types of panels, that is, the panel with the circular drilled perforations and the panel with the square section perforations formed by intersecting grooves milled from opposite sides of the panel as above described. In these tests the panel with the circular perforations was first used as a side wall in a work container hanging in a plating tank with the anodes on the outside and a cathode inside the container. This panel was then removed and the other type of panel with the square holes cross milled from opposite sides of the panel was inserted as one of the side walls of this same work container with the same anodes on the outside and the same cathode on the inside of the container. The panel with the circular drilled holes drew from 12 to 13 amperes of current whereas the panel with the square holes cross milled as above described drew 24 to 25 amperes of current at the same voltage. The change from circular to square cross section of the perforation is responsible for 28% increase in area (that is, current) where the circular hole had the same diameter as the width and breadth of the square hole. However, the increase in current drawn by the panel with the square holes cross milled as above described was considerably more than 28%. The remainder of this increase may be accounted for by the greater spreading of the current through the cross grooves in both directions. This effect is similar to that obtained by the use of much thinner panels but without the loss of strength and wearing life which would follow the use of such thin panels.

It is evident from the above description that each perforation through the panel 3 actually consists of a longitudinal groove 11 and a transverse groove 12 and that this perforation has its smallest cross-sectional area in the plane in which the groove 11 and the groove 12 intersect. This smallest cross-sectional area is designated 14. Thus, for example, as the current travels from the anode 8 through any one opening, after the current passes through the smallest cross-section area 14 of the opening it is free to spread out along the entire transverse groove 12. This, it is believed, accounts for the remarkable increase in the amount of current passing through the work container wall 3 in comparison with the above described conventional work cylinder with the circular drilled holes.

Although the container 2, for descriptive purposes and not by way of limitation, is herein specifically shown and described as a container for the work or articles being electroplated, which articles are the cathodes in the electrolytic circuit, it is specifically understood and pointed out that this type of container 2 can also be used for holding the anodes in the electroplating circuit and in general as a container for holding electrically charged metals whether they be cathodic or anodic. The container can be used for holding the work or articles being anodically pickled or otherwise anodically treated in which case the work itself is anodically charged.

In this type of machine for treating metals electrolytically the highest temperature is reached in the perforation and inside the work container because the current density per volume of solution is highest there. A work container such as described above having perforations formed by intersecting grooves in the opposite faces of the work container panels has an advantage over the work container heretofore known having circular drilled perforations because the average cross-sectional area of the former type of perforation is much larger than that of the latter perforation which causes less resistance and heat evolution and also permits greater flow of cooler solution to the inside of the work container. Further, where the perforations are formed by intersecting grooves in the opposite faces of the work container panels, the outside area of the panels is greater which offers a larger cooling surface to the cooler solution on the outside. This feature of the instant work container is advantageous when the material used for the panels, such as rubber, softens at high temperature which causes the rubber to become less resistant to abrasion and tend to warp particularly under heavy load.

I claim:

1. A machine for treating work electrolytically comprising an anode, a cathode, a container for the electrolyte and a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container being placed between the anode and cathode and having a wall composed of insulation material with a plurality of spaced grooves formed in its inner face and a plurality of spaced grooves formed in its outer face, the grooves in the one face extending angularly in respect to and across the grooves in the

other face, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

2. A machine for treating work electrolytically comprising an anole, a cathode, a container for the electrolyte and a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container being placed between the anode and cathode and having a wall composed of insulation material with a plurality of spaced grooves of greater depth formed in its inner face and a plurality of spaced grooves of lesser depth formed in its outer face, the grooves in the outer face extending generally lengthwise of the said wall and the grooves in the inner face extending generally crosswise of the said wall, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

3. A machine for treating work electrolytically comprising an anode, a cathode, a container for the electrolyte and a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container being placed between the anode and cathode and having a wall composed of insulation material with a plurality of spaced parallel rectilinear grooves formed in its inner face and a plurality of spaced parallel rectilinear grooves formed in its outer face, the grooves in the one face extending generally lengthwise of the said wall and the grooves in the other face extending generally crosswise of the said wall, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

4. A machine for treating work electrolytically comprising an anode, a cathode, a container for the electroylte and a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container being placed between the anode and cathode and having a wall composed of insulation material with a plurality of spaced parallel grooves formed in its inner face and a plurality of spaced parallel grooves formed in its outer face, the grooves in the one face extending generally lengthwise of the said wall and the grooves in the other face extending generally crosswise of the said wall and at right angles to the grooves in the first mentioned face, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

5. A machine for treating work electrolytically comprising a container for the electrolyte and anodically and cathodically electrically charged electrodes in circuit in the electrolyte, a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container having a wall composed of insulation material for separating the anodically and the cathodically charged electrodes in the electrolyte during such treatment, said wall having a plurality of spaced parallel grooves formed in its inner face and a plurality of spaced grooves in its outer face, the grooves in the one face extending generally lengthwise of the wall and the grooves in the other face extending generally crosswise of the wall, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

6. A machine for treating work electrolytically comprising a container for the electrolyte and anodically and cathodically electrically charged electrodes in circuit in the electrolyte, a container for the work or articles to be treated by electrolysis adapted to hold the work in the electrolyte during such treatment, said work container having a wall composed of insulation material for separating the anodically and the cathodically charged electrodes in the electrolyte during such treatment, said wall having a plurality of spaced parallel grooves in its outer face and a plurality of spaced parallel grooves formed in its inner face, the grooves in the inner face having a greater depth than those in the outer face and extending angularly in respect to and across the grooves in the inner face and meeting the same between the inner and outer faces of said wall to form a plurality of spaced holes adapted for the passage of current during the electrolytic treatment, each hole consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

7. A machine for treating work electrolytically comprising a container for the electrolyte and anodically and cathodically charged electrodes in circuit in the electrolyte, and a movable container for the work to be treated adapted to receive electrodes having a like charge to separate the anodically and cathodically charged electrodes in the electrolyte during such treatment, said movable container moving the electrodes contained therein in the electrolyte during such treatment, said container having a wall composed of insulation material with a plurality of spaced parallel grooves formed in its inner face and a plurality of spaced parallel grooves in its outer face, the grooves in the one face extending generally lengthwise of the wall and the grooves in the other face extending generally crosswise of the wall, the grooves in the one face intersecting the grooves in the other face within the wall to form a plurality of spaced perforations adapted for the passage of current during the electrolytic

treatment, each perforation consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

8. A machine for treating work electrolytically comprising a container for the electrolyte and anodically and cathodically charged electrodes in circuit in the electrolyte, and a movable container for the work to be treated adapted to receive electrodes having a like charge to separate the anodically and cathodically charged electrodes in the electrolyte during such treatment, said movable container moving the electrodes contained therein in the electrolyte during such treatment, said container having a wall composed of insulation material with a plurality of spaced parallel grooves in its outer face and a plurality of spaced parallel grooves formed in its inner face, the grooves in the inner face having a greater depth than those in the outer face and extending angularly in respect to and across the grooves in the inner face and meeting the same between the inner and outer faces of said wall to form a plurality of spaced holes adapted for the passage of current during the electrolytic treatment, each hole consisting of grooves extending inwardly of the opposite faces of said wall and intersecting within the wall throughout an area smaller than the area of at least one of said grooves at the surface of said wall.

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