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METHOD OF ELECTRODEPOSITING METALS AND APPARATUS THEREFOR

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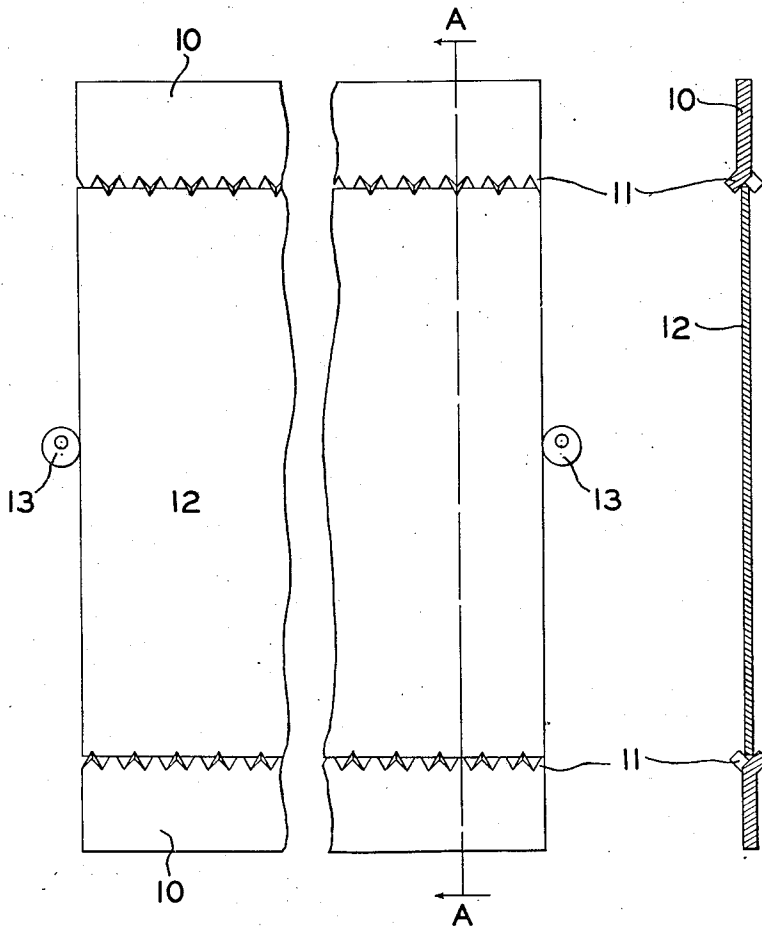


FIG. 1.

FIG. 2.

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METHOD OF ELECTRODEPOSITING METALS AND APPARATUS THEREFOR

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This invention relates to an improvement in the art of electrodepositing metals and more particularly to an improved method of, and apparatus for, obtaining uniform current distribution over the article to be plated.

While my invention may be used to advantage in the electrodeposition of any of the metals, it is of particular advantage in those cases where the bath has a poor throwing power, where a high cathode current density is required, and where therefore a uniform current distribution is of the greatest importance. By "poor throwing power" is meant that when an irregularly shaped article is being plated, those portions farthest from the anode receive a very much lighter deposition of metal than the portions closest to the anode, or may not receive any metal at all depending on the shape and size of the article and various other factors. Such conditions exist in the electrodeposition of chromium and for this reason my invention is particularly suitable for electroplating articles with chromium. The method is applicable to articles of all sizes but its advantages are more pronounced in the plating of articles having relatively large surface areas such as metal sheets and plates.

My invention has for a principal object the obtaining of uniform current distribution over the article to be plated and this is brought about by making the electrical connections between the cathode current lead and the article to be plated by means of a multiplicity of point or line contacts.

The invention has for a further object the use of means for supporting and electrically connecting the article to be plated which permit of the plating of all the surface portions of the article; that is, not only those which are normally in contact with the plating bath, but also those which are normally shielded from the bath by such supporting and current-conducting means as are commonly employed.

The accompanying drawings illustrate an embodiment of the invention.

Fig. 1 is a view in elevation of a form of the invention applicable in plating sheets.

Fig. 2 is a cross-sectional view taken on the line A—A of Fig 1.

In the drawings 10 is a copper or other suitable conductive metal strip or bar adapted to support a sheet or other article to be plated and to connect the article to a suitable current lead not shown. The metal strip 10 is provided with a serrated edge portion 11. The alternate teeth are bent to the right and left respectively much in the same manner as in "setting" a saw, with the result that the teeth are arranged into two parallel rows so inclined the one to the other as to form a V-shaped groove or recess between them. A serrated strip 10 is pressed against each edge of the sheet to be plated, referred to as 12 in the drawings, so that the edge of the sheet will fit into the groove or recess formed between the two rows of teeth. It will be observed that the sheet forms a line contact with a limited portion of each tooth or serration of the strip 10. A sufficient number of points or lines of contact are provided to make it possible to pass the required current through the article without the necessity of clamping or otherwise fastening current leads to the sheet or other article to be plated.

A further advantage of the use of a multiplicity of point or line contacts for electrically connecting the sheet to the appropriate current lead lies in the fact that all the surface portions, even those small portions of the surface of the sheet or other article which rest upon the serrated edge portion of the metal strip 10, receive a coating of chromium. The fact that deposition of the plating metal takes place on these apparently shielded portions of the article is contrary to what would ordinarily be expected. It is advanced as a possible explanation that a certain amount of vibration is set up in the article during the plating operation, particularly when operating under the high current density conditions obtaining in electrodepositing chromium. On the other hand, it may be that a slight creeping of the plating bath takes place between the article and the support and is sufficient to insure that the entire point, edge, or other small area of contact between the article and the support will be suffi-

ciently wet with the plating bath to permit of deposition of the plating metal thereon. However, the invention is not dependent upon the correctness of the theories advanced and they are not to be construed to limit the invention in any way.

While the means above-described have proven satisfactory in securing a coating or plating completely enveloping sheets or other articles, it is desirable, in order to obtain greater uniformity and greater thickness of the coating on the edge portions which are engaged by the current-conducting strip 10, particularly when plating relatively heavy sheets, to shift the points or lines of contact along the edge or surface of the article during the plating operation. This shifting may be produced manually at will or periodically by mechanical means as desired. One form of means for producing periodic relative movement between the sheet which is being plated and the current-conducting means is shown more or less diagrammatically in Fig. 1. This consists of cams 13 positioned in the plating bath so as to contact with the opposite side edge portions of the sheet 12. These cams are connected through a suitable mechanism, not shown, to rotate either continuously or periodically. Thereby causing the sheet to move back and forth along the current-conductor 10. When means for shifting the article back and forth along the conductor are used, it may be desirable to omit such conductors from the side edge portions as shown in Fig. 1. Many forms of apparatus will readily suggest themselves as equivalent to the cams 13 for bringing about relative movement between the sheet and the conductor 10, and these are considered to be embraced within the present invention. Instead of reciprocating the sheet the desired result may be obtained by reciprocating the conductor which contacts with the sheet.

While I have described with particularity one embodiment of my invention, it is not to be understood therefrom that the invention is restricted to such embodiment. Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is:

1. In electroplating apparatus for plating sheets, means for obtaining uniform deposition over the sheet to be plated, comprising a conductor having a multiplicity of relatively sharp projecting portions biased to engage the sheet and form a discontinuous contact area therewith, said contact being of a limited point or line character.

2. In electroplating apparatus, means for obtaining uniform deposition over the article to be plated, comprising a conductor having a relatively sharp serrated edge portion of saw tooth character adapted to engage the article and form a discontinuous contact area

therewith, said contact being of a limited point or line character.

3. In electroplating apparatus for plating sheets, means for obtaining uniform deposition over the sheet to be plated, comprising a conductor having a relatively sharp serrated edge portion, said serrations being biased to engage the sheet at a plurality of point or line contacts.

4. In electroplating apparatus for plating articles, means for obtaining uniform deposition over an article to be plated, comprising a conductor having a multiplicity of projections, said projections being arranged in two adjacent rows inclined the one to the other so as to form between the outer extremities of the projections of the adjacent rows a recess V-shaped in cross-section, said recess being adapted to receive an edge portion of the article to be plated.

5. In electroplating apparatus, means for obtaining uniform deposition over the article to be plated, comprising a conductor having a multiplicity of projecting portions biased to engage an article to be plated and form a discontinuous contact area therewith, and means adapted to produce relative movement between such contact and the surface of the article during the electroplating operation.

6. In electroplating apparatus for plating sheets, means for obtaining uniform deposition over the article to be plated, comprising current-conducting means adapted to engage the exterior edge portions only of said article and to make limited relatively sharp contact adjacent to and at a multiplicity of points along such edge portions.

7. Process of obtaining uniform deposition of chromium on metal articles which comprises forming a multiplicity of contacts of limited area between the article and a conductor of electric current, passing current between the article and an anode in a chromium plating bath, and causing the said contacts to assume different positions on the surface of the article while the deposition is taking place so as to effect plating on practically all portions of the said article.

8. In electroplating apparatus, means for obtaining substantially uniform deposition over the article to be plated, comprising a conductor shaped to the peripheral contour of an article to be plated, and adapted to make contact with an edge of said article, said conductor having a portion composed of a multiplicity of sharp projections adapted to make immediate contact with said article.

9. Process of obtaining uniform deposition of metal on metal articles which comprises forming a multiplicity of contacts of limited area between the article and a conductor of electric current, passing current between the article and an anode in a plating bath, and positively causing the said contacts to assume different positions on the surface

of the article while the deposition is taking place, so as to effect plating on practically all portions of the said article.

5 10. An electro-plating apparatus of the character set forth in claim 5 in which the means adapted to produce relative movement between the article to be plated and the supporting contacts is of a reciprocating character.

10 In testimony whereof, I affix my signature.
MARVIN J. UDY.

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