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3,394,071

PLATING BARRELS

Original Filed Oct. 30, 1963

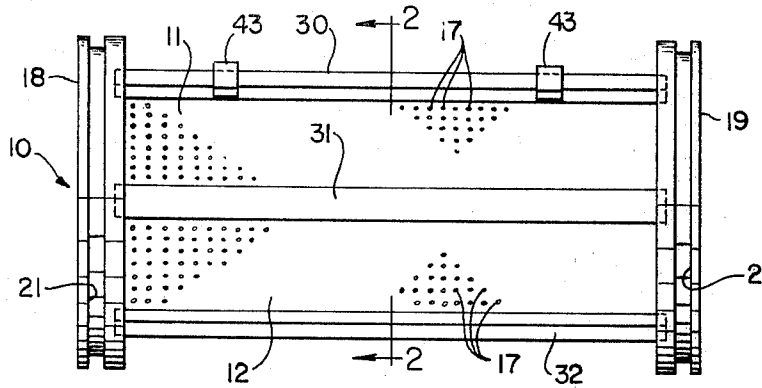


Fig. 1

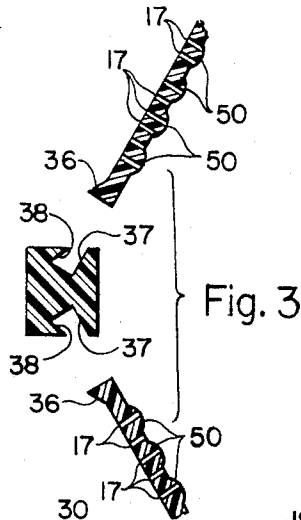


Fig. 3

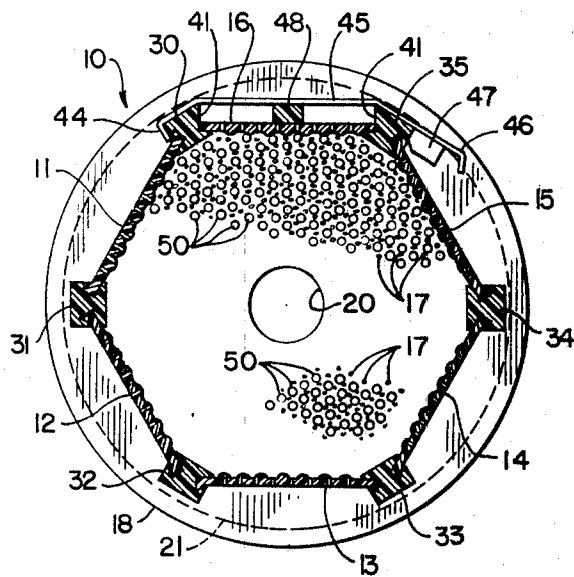


Fig. 2

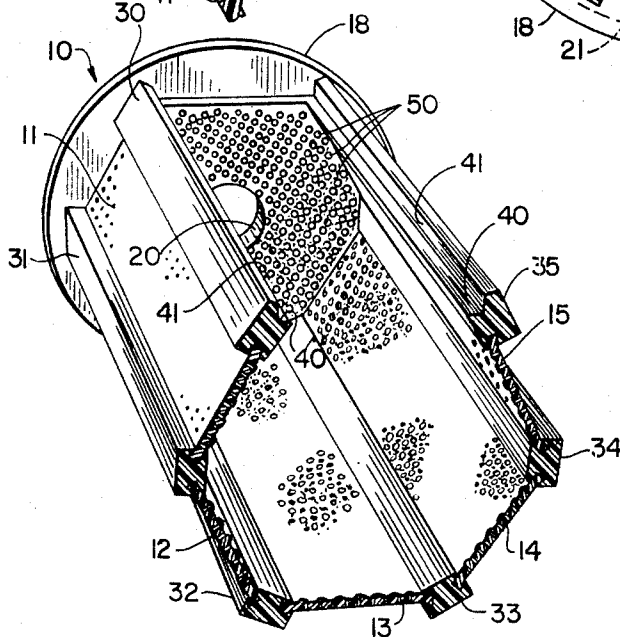


Fig. 4

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PLATING BARRELS
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1963. This application Aug. 1, 1966, Ser. No. 573,741
5 Claims. (Cl. 204—213)

ABSTRACT OF THE DISCLOSURE

A plating barrel having closely spaced, discrete nodules on its inner side wall surface and circulation holes formed through the side wall between the nodules.

CROSS REFERENCE TO RELATED APPLICATION

This application is a continuation of application Ser. No. 320,040, filed Oct. 30, 1963, entitled, "Plating Barrels," assigned to the assignee of the present application and now abandoned.

This invention relates generally to apparatus for treating or plating articles, and more specifically to new and improved plating barrel constructions.

Typical article treating or plating apparatus include perforated, hollow cylinders which are generally referred to as barrels and which are used to contain the articles to be processed in suitable solutions, such as plating and cleaning baths and the like. These perforated barrels are suspended in the baths and are rotated by belt or gear drives. The rotation of the barrel causes the articles to tumble around the inside of the barrel so that all surfaces of the articles are exposed to the solution. As is more fully described in U.S. Patent No. 2,562,084, the barrel may include a permanently open slot so that, when the barrel is rotated in one direction, the solution will flow through the slot into the barrel and discharge through the perforations. Alternatively, as disclosed in U.S. Patent No. 2,886,505, the barrel may be completely closed in use and the perforations in its sidewalls depended upon for flow of the solution into and out of the barrel.

In an electroplating operation or similar process, it is necessary to maintain a free flow of electric current and the plating solution into and out of the barrel through the perforations in the sidewalls of the barrel. When using the barrel constructions of the prior art, the tumbling of the articles within the barrel against its sidewalls has been found to deform or peen the perforations closed and thereby impair proper circulation and cause a decrease in the efficiency of the plating operation and uniform treatment of the articles. As a result, the barrels of the prior art must be frequently replaced or repaired to open the perforations.

Another problem encountered with conventional plating barrels is that the articles being treated tend to stick to the inside surfaces of the barrel walls. The sticking or adherence of the articles to the barrel walls effectively closes the perforations through the walls and further restricts the free flow of electric current and the plating solution through the barrel. When the articles stick to the sidewalls of the barrel, there is also an impairment of the desired tumbling action which is necessary for an efficient electroplating operation and a uniform surface treatment of all of the articles.

The foregoing problems have been recognized by others in the electroplating art and various attempts have been to overcome them. One prior art proposal has been to form the inside surfaces of a plating barrel with a multiplicity of depressions, such as conically tapered counterbores at the inner ends of the wall perforations. A barrel constructed in this manner does not overcome the prob-

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lem of the articles adhering or sticking to the inner wall surfaces. The barrel is still characterized by flat inner surfaces and the depressions are not effective to prevent articles from sticking to the flat surfaces during a plating operation and thereby closing over the ends of the perforations or circulation holes.

Another prior art proposal has been to provide a ribbed inner wall surface consisting of alternating grooves and ribs which extend from one end of the barrel to the other. In commercial use, it has been found that the articles will lodge and stick within the grooves between the ribs. As in the case of other conventional plating barrels, the sticking of the articles within the grooves closes the perforations and impairs the uniformity of surface treatment. Another disadvantage is that the continuous ribs and grooves tend to "comb" the articles as the barrel is rotated rather than urging the articles toward the center of the barrel as is desired for an optimum tumbling action.

An object of the present invention is to provide a new and improved barrel construction which overcomes the foregoing difficulties encountered with prior art structures.

A more specific object of the invention is to provide a new electroplating barrel having a construction which prevents the articles being treated from sticking to the surfaces of the barrel and from peening the wall perforations closed as the articles are tumbled within the barrel.

Another object of the invention is to provide a new plating barrel construction which promotes an optimum tumbling action of the articles being treated so as to assure uniform surface treatment of all the articles and an efficient electroplating operation.

The foregoing objects are attained and disadvantages of the prior art are overcome by a new barrel construction having its inner sidewall surface or surfaces formed with a multiplicity of closely spaced, discrete nodules or embossments. The sidewall structure of the new barrel is perforated to provide circulation holes and the holes are located between and through the discrete nodules.

The nodular formation of the inner surface of the new barrel prevents the circulation holes from being peened closed by the articles being treated. As a result, the new barrel has a longer life and obtains a better flow of electric current and plating solution into and out of the barrel than constructions of the prior art.

The discrete, preferably conical or rounded, nodules over the inner surface of the new barrel also prevents the articles being treated from sticking or adhering to the barrel surfaces. Because of the fact that the nodules form a barrel surface which is interrupted in all directions relative to the barrel axis, the articles being tumbled within the barrel can impinge in a crosswise direction on any article which tends to lodge between two adjacent nodules and thereby free the article. This advantageous action cannot be obtained with the prior art barrels having continuous alternating grooves and ridges. In such a construction articles cannot impinge crosswise on an other article lodged in a groove because of the continuous ribs which bound the grooves.

Still another advantage of the invention is that the nodular inner wall surface promotes an optimum tumbling action of the articles. As distinguished from the conventional rib and groove construction described above, the nodules tend to urge the articles toward the center of the barrel. The improved tumbling action which results assures an efficient electroplating operation and uniform surface treatment of the articles.

Other objects and a more complete understanding of the invention will be apparent from the following detailed description when taken in conjunction with the accompanying drawing.

In the drawing:

FIGURE 1 is a side elevational view of a plating barrel embodying the present invention;

FIGURE 2 is a cross-sectional view taken on the line 2—2 of FIG. 1;

FIGURE 3 is an exploded, enlarged fragmentary view of a portion of the new and improved barrel construction; and

FIGURE 4 is a perspective view of the barrel with portions broken away.

Referring now to the drawing, the new and improved plating barrel is generally indicated by reference numeral 10. In the illustrated form of the invention, the barrel 10 is of regular hexagonal cross-sectional shape and includes a plurality of sidewalls 11-15 and a removable wall 16. The walls 11-16 are formed by separate, flat rectangular panels having rows of perforations or circulation holes 17. The ends of the barrel 10 are closed by barrel heads 18, 19 which are formed with axially aligned openings 20. As shown, each of the barrel heads 18, 19 extends radially outwardly of the wall panels 11-16 and defines a pulley having a belt groove 21.

The plating barrel 10 is adapted to be provided with suitable electrodes in the usual manner. As shown, for example, in FIGS. 1 and 2, the electrode structure may comprise a pair of insulated, flexible electrical conduits 22 which extend into each end of the barrel through the openings 20. The conduits 22 are connected to suitable cathode rods (not shown) and have removable metal electrodes 23 which are positioned near the bottom of the barrel.

The barrel 10 may be constructed of any material of suitable strength which will resist or can be protected against the corrosive action of the solutions encountered in use. Preferably, however the barrel 10 is made of a corrosion resistant plastic material, such as polypropylene, polymethacrylate, polystyrene, or the like. Although plastic plating barrels have been proposed in the past because of their advantageous low weight and corrosion resistance, the preferred construction hereinafter described in more detail provides for better strength and rigidity than conventional plastic barrels. In addition, the preferred construction of the plastic barrel facilitates repair.

In the illustrated embodiment, the sidewall panels 11-15 are secured in fixed positions by ribs 30-35 which extend between the barrel heads 18, 19. The ends of the ribs 30-35 may be welded or cemented to inner faces of the barrel heads. However, in the preferred construction, the ends of the ribs are recessed in the barrel heads as shown in FIG. 1, and the barrel heads and recessed ends of the ribs are fusion-welded together in order to provide improved strength and rigidity. This preferred construction has the additional advantages of preventing small articles from lodging in the joints between the ribs and barrel heads. The ends of the sidewall panels 11-15 also may be welded or cemented to the faces of the barrel heads.

The separate sidewall panels 11-15 are rigidly interlocked by the ribs 30-35 in such a manner that the panels can be individually replaced when necessary. To this end, the outside face of each panel 11-15 is formed with an outwardly flaring anchor surface 36 along each side edge. As shown most clearly in FIG. 3, the ribs 30-35 have inclined grooves 37 which receive the side edge portions of adjacent panels, and these grooves are formed with undercut portions 38 which cooperate with the anchoring surfaces 36. With this ribbed interlocked panel construction, the weight of a load in the barrel 10 forces the anchoring surfaces 36 into positive, secure locking engagement with the undercut wall portions 38 of the grooves 37. Any one of the side wall panels 11-15 can be easily removed, as for purposes of replacement, simply by removing one or both of the barrel heads 18, 19 and then sliding the wall panel longitudinally from between the adjacent ribs.

The removable wall 16 serves as a closure or lid which

permits access into the barrel 10 for inserting or removing articles to be treated. As shown, the removable wall 16 is engageable in grooves formed in the ribs 30, 35. Each of these grooves in the ribs 30, 35 is defined by a wall 40 on which portions of the flat inner surface of the removable wall 16 may rest and by a wall 41 which is engageable with the side edge of the wall 16. The removable wall 16 is clamped in position by a plurality of clamps 43 which may be resilient metal strips coated with a suitable corrosion-resistant plastic material. Each clamp 43 is shown as having a hooked end 44, a flat intermediate portion 45, and a bent end 46. A block 47 is connected to the bent end 46.

In use the hooked ends 44 of the clamps are engaged over the rib 30 and the blocks 47 are tightly engaged against the side of the rib 35. In this clamping position, the removable wall 16 is forced against the rib walls 40 by a member 48 which is engaged between the wall 16 and the intermediate portion 45 of each clamp. The member 48 may be a block connected to either the clamp or the outer surface of the wall 16 or a bar which extends the full length of the wall.

The inner barrel surface defined by the wall structure 11-16, and if desired the inner surfaces of the barrel heads 18, 19 are formed with a multiplicity of discrete, rounded nodules or embossments 50. As will be apparent from the drawing, the nodules 50 form a surface which is interrupted in all directions relative to the barrel axis. The perforations or circulation holes 17 are located between and through the nodules 50.

As generally discussed above, the raised curvatures of the multiple embossed nodules 50 prevent articles being treated from sticking to the walls 11-16 and thereby closing the circulation holes 17. To the extent that any article tends to lodge between adjacent nodules, other articles can impinge on it in a crosswise direction and free the article. Further, the nodules 50 also act to urge the articles toward the center of the barrel in order to promote an optimum tumbling action and uniform surface treatment.

Because of the nodules 50 articles are prevented from peening the circulation holes closed as the articles tumble around the inside of the barrel. Thus, with the new construction provided by this invention, uniform flow of electric current and circulation of solution through the barrel is assured. It is also easier to unload treated articles from the barrel 10 since the articles do not stick to the walls 11-16. The embossed nodules 50 provide the additional advantage of forming thick wearing surfaces which improve the useful life of the barrel.

In its illustrated form, the barrel 10 is adapted to be incorporated into apparatus such as disclosed in U.S. Patent No. 2,562,084. As is more fully described in that patent, endless belts are provided which not only rotate the barrel but carry the weight of the barrel and its contents. When embodied in that type of apparatus, the lightweight barrel 10 of this invention provides the important advantage of reducing the stresses imposed on the belt drive. At the same time, the improved barrel construction is rugged and will support heavy loads.

It is to be understood, however, that the barrel comprising the present invention can be used with equal advantage in apparatus of the type in which the barrel is suitably journaled and rotated by a gear drive. When used in place of either conventional belt or gear driven barrels, the nodular wall surfaces of the barrel 10 assure uniform circulation of plating or other solutions. In addition, the nodular wall surfaces result in longer barrel life, since the circulation holes are not peened closed and because of the thick wearing surfaces which are formed. The unique ribbed interlocked panel construction provides a positive method of securely locking together the component parts of the barrel and makes it easy to replace wall sections when this is necessary.

Many modifications and variations of the invention will be apparent to those skilled in the art in view of the foregoing detailed description. Therefore, it is to be

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understood that, within the scope of the appended claims, the invention can be practiced otherwise than as specifically shown and described.

What is claimed is:

1. In an article treating apparatus of the type including a perforated barrel for holding articles which are to be processed in a liquid bath, said barrel being adapted to be supported and rotated while immersed in the liquid bath to cause the articles to tumble around the insides of said perforated barrel so that all surfaces of the article are exposed to the liquid, an improved barrel construction for promoting tumbling of the articles and uniform circulation of the liquid in contact with all surfaces of the articles, said barrel comprising wall structure providing an inner barrel surface, said inner surface having a multiplicity of inwardly extending discrete nodules which serve to interrupt said inner surface at locations spaced apart in all directions and to provide passageways about the nodules in all directions and thereby prevent the articles within said barrel from sticking to said inner surface, and said wall structure being perforated to provide a plurality of circulation holes extending through said wall structure between said nodules so that liquid can flow into and out of said barrel and so that said nodules prevent the articles tumbled within said barrel from peening said holes closed.

2. A barrel construction as claimed in claim 1 wherein said wall structure is made of plastic.

3. A barrel construction as claimed in claim 1 wherein said wall structure comprises a plurality of rectangular panels arranged to define a barrel which is a polygon in cross-section and which has a barrel opening, and a removable wall panel which fits in said opening.

4. A barrel construction as claimed in claim 3 includ-

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ing ribs extending axially of said barrel between the side edges of each pair of adjacent panels, said ribs being in engagement with said side edges to hold said panels in position, and barrel heads secured to the ends of said ribs in engagement with the ends of said panels, each of said heads having an opening for permitting electrode structure to be inserted into each end of said barrel.

5. A method of electroplating comprising the steps of providing a barrel having a multiplicity of inwardly projecting nodules on its inner surface and a multiplicity of circulation holes formed through the wall structure of said barrel between said nodules, placing articles to be treated within said barrel, mounting electrode means in said barrel, disposing said barrel in a bath of plating solution, and rotating said barrel in said bath while operating said electrode means, said nodules being effective to prevent the articles from sticking to the inner surface of said barrel and from closing said circulation holes during the rotating step.

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