Oct. 14, 1969 S. W. WOJTANEK 3,472,753

ELECTROPLATING BARREL

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FIG. 1

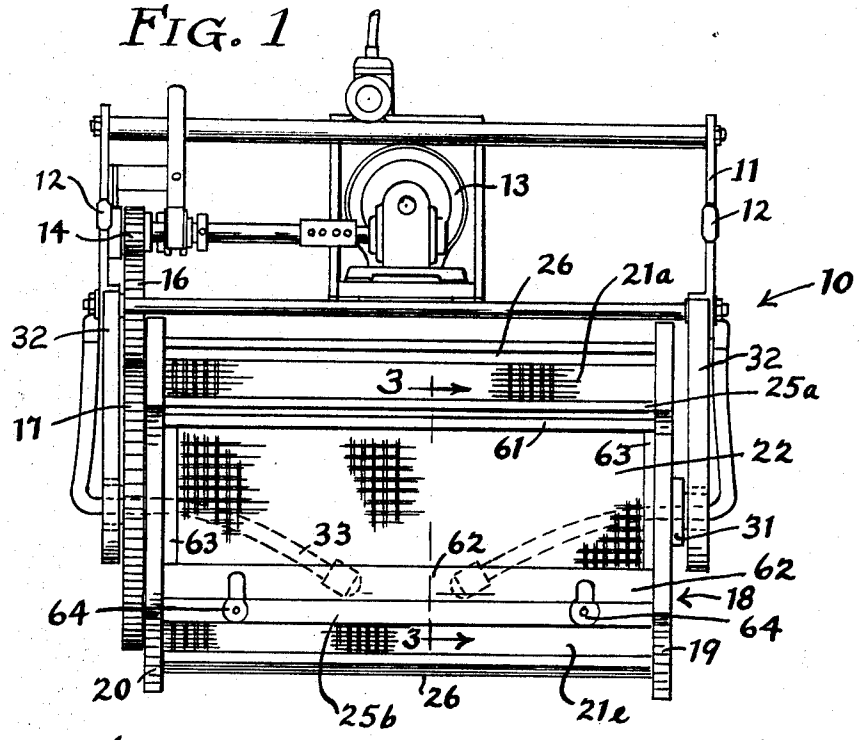


FIG. 2

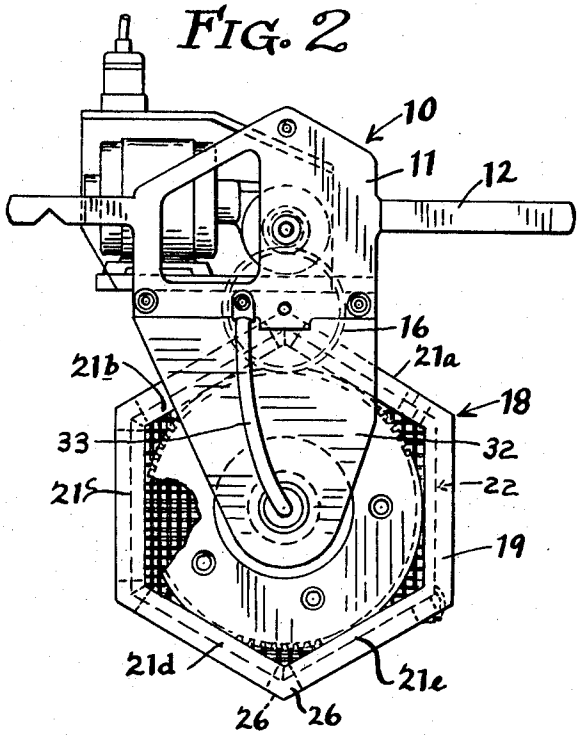
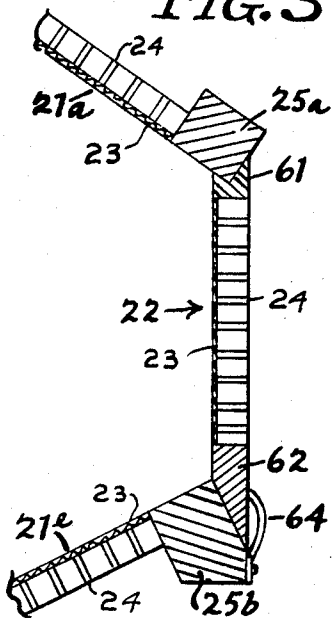


FIG. 3



INVENTOR

Steve W. Wojtanek

By Nathan N. Kraus

Frank H. Marbo Attys.

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FIG. 4

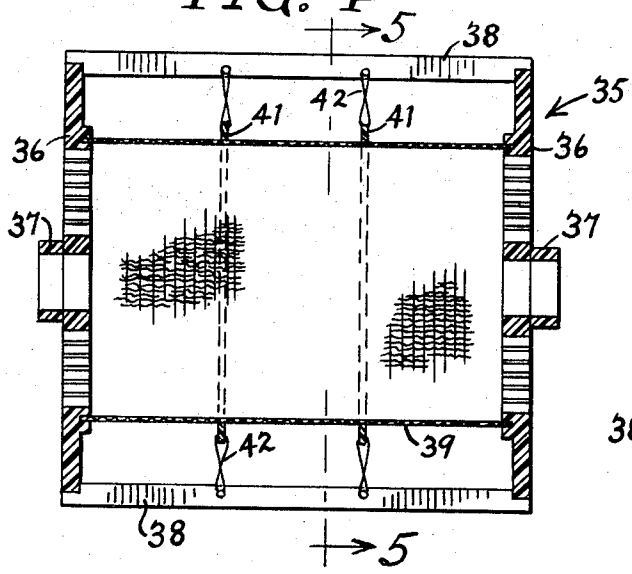


FIG. 5

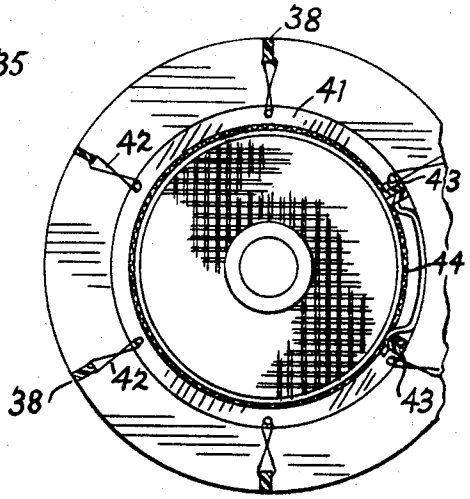


FIG. 6

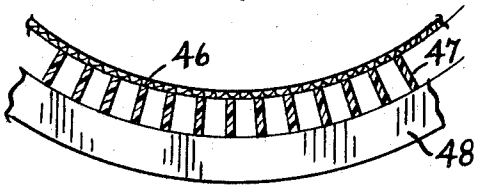


FIG. 7

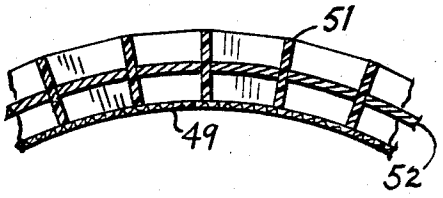
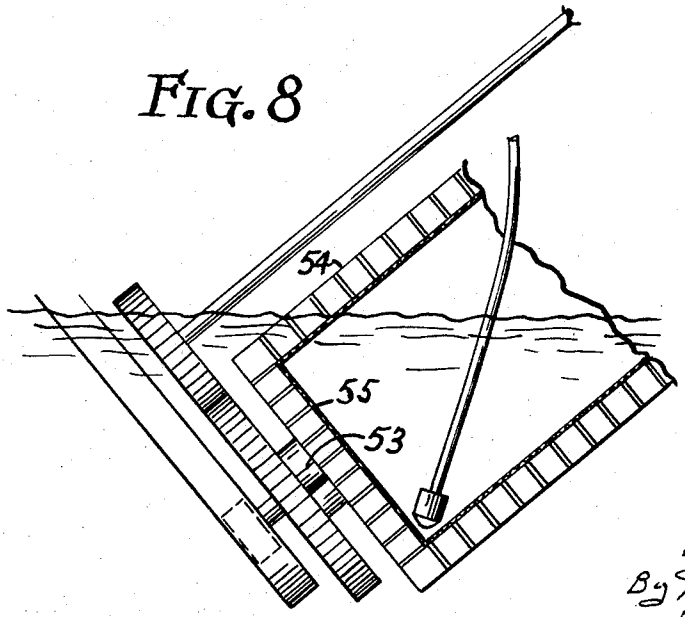


FIG. 8



INVENTOR
Steve W. Wojtanek
By Nathan H. Kraus
Francis H. Marks Attys.

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3,472,753

ELECTROPLATING BARREL

Steve W. Wojtanek, Lake Forest, Ill., assignor to Sterling Systems Ltd., Chicago, Ill., a corporation of Illinois

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Int. Cl. C23b 5/78
U.S. Cl. 204—213 8 Claims

ABSTRACT OF THE DISCLOSURE

An electroplating barrel formed of an open mesh fabric and a generally rigid open grid structure coextensive with the fabric and bonded to the outer surface of the fabric. The fabric and grid are formed of chemically inert materials.

This invention relates to improvements in electroplating barrels.

One of the objects of this invention is the provision of an improved electroplating barrel construction which is adapted for use in plating small articles, for example, electronic components and the like, although not necessarily limited in use to such articles.

Another object of this invention is the provision of a plating barrel having a sidewall formed of an inert fabric or mesh material and a rigidifying or supporting outer structure permitting maximum circulation or transfer of electroplating solution into and out of the barrel to provide a markedly higher electrical current input than in prior art devices, thereby to effect a more rapid plating of parts than heretofore.

A further object of this invention is the provision of a plating barrel of the foregoing character, which is adapted to be used for plating very small articles, some of which may have wire terminals, or sharp points, without the articles catching in the fabric mesh or projecting therethrough, thereby avoiding any likelihood of burning of the projecting ends by reason of the concentration of electrical current at such ends.

Still another object of this invention is the provision of a plating barrel of the foregoing character, in which the textured surface of the fabric mesh assists in effecting tumbling of the parts being plated so as to achieve a more uniform plating on the surfaces of the parts than heretofore.

Another object of this invention is the provision of a plating barrel which is simple in construction, economical to manufacture and highly efficient in operation.

Other and further objects and advantages of this invention will become apparent from the following description when the same is considered in connection with the accompanying drawings in which

FIG. 1 is a front elevational view showing an electroplating barrel embodying the invention.

FIG. 2 is an end elevational view of the same.

FIG. 3 is a cross-sectional view, on an enlarged scale, taken substantially on line 3—3 of FIG. 1.

FIG. 4 is a vertical cross-sectional view of a modified embodiment of my invention.

FIG. 5 is a cross-sectional view taken substantially on line 5—5 of FIG. 4.

FIGS. 6 and 7 are fragmentary cross-sectional views of other modified embodiments of my invention.

FIG. 8 is a cross-sectional view of a modified embodiment of my invention, illustrating a plating barrel of the type adapted to be operated at an oblique angle.

Referring to the drawings, particularly FIGS. 1 and 2, the numeral 10 indicates generally a conventional electroplating barrel supporting and rotating structure including a frame 11 having transverse members 12 adapted to

be rested on the upper edges of a tank containing electroplating solution. The frame supports an electric motor 13 coupled to a drive pinion 14 which is operatively connected through an idler gear 16 to a ring gear 17 suitably fixed to the barrel 18. The supporting and driving structure for the barrel forms no part of the present invention.

The barrel 18 comprises a pair of end members 19 and 20 which may be generally circular or hexagonal in shape and six generally rectangular panels forming the hexagonal barrel wall. Five of the panels 21*a*, *b*, *c*, *d* and *e* are cemented to the end members 19 and 20 while one of the panels 22 constitutes a removable closure member for an opening through which the parts to be plated may be placed within the barrel and removed therefrom.

It will be understood that the term "barrel" as used throughout the specifications and claims includes any tubular form, whether polygonal, circular or other form in cross section.

Each of the panels 21 and 22 basically comprises a sheet of woven fabric 23 of any suitable inert material which is unaffected by electroplating solutions. Such a fabric may be woven from polypropylene filaments and may be of any suitable size mesh depending upon the character of the articles being plated so as to avoid penetration of any of the articles into the mesh openings.

Cemented or otherwise bonded to the outer surface of each fabric sheet 23 is a supporting or rigidifying grid 24 which may also be formed of a suitable inert plastic material, such as acrylic resin. The grid 24 may also be formed of suitable metal or combination of plastic and metal. The grid 24, for example, may comprise a series of uniformly spaced longitudinally extending strips intersected by correspondingly spaced transversely extending strips. Thus, the openings defined by the intersecting grid strips are generally square, or rectangular as illustrated in FIGS. 1 and 2 of the drawings. However, it will be understood that any other suitable or desirable arrangement or pattern of grid strips may be used. As seen clearly in FIG. 3, the grid strips have substantial depth in relation to the dimensional area of the panel so that each panel is relatively rigid in structure. It will be understood that where the panel is increased in dimensional area it is desirable to increase the depth of the strip in order to provide the necessary rigidity and strength to the panel. It will also be understood that the grid preferably is molded as an integral unit so as to achieve maximum rigidity and economy in manufacture. The grid strips are relatively thin in cross section so that the total area of contact with the fabric sheet is maintained at a minimum to expose a maximum area of the fabric sheet for the passage of electroplating fluid and current therethrough, as will be hereinafter explained.

The fabric sheet provides a textured surface in the interior of the barrel on which the articles to be plated are supported. The character of the fabric which is arranged preferably with the warp of the fabric sheet extending longitudinally and parallel to the axis of rotation of the barrel, is such that when the barrel is rotating the edges of the articles being plated engage against the warp strands of the fabric sheet. This substantially prevents the articles from sliding on the panel until the particular panel in the rotation of the barrel reaches a generally vertical position, at which time the articles are caused to tumble into the lowermost portion of the barrel within the electroplating solution. Such tumbling, of course, is extremely desirable and results in uniform plating throughout the surfaces of the article. It will be apparent that in prior art barrels utilizing panels formed of plastic sheets, such as Lucite, which have been drilled with a plurality of holes, the smooth surfaces of the plates do not assist in the tumbling of the articles, and as a result, the articles

merely slide as a mass from one panel to another as the barrel is caused to be rotated. With the use of an electroplating barrel in accordance with my invention a greater transfer of plating solution is effected than in prior art devices using perforated plastic panels, with the result that spent plating solution is readily replaced with more active solution. Accordingly, substantially thirty percent more electrical current is carried into the plating barrel resulting in a plating rate which is approximately thirty percent greater than that accomplished with plating barrels of the prior art.

The adjacent longitudinal edges of the panels **21** may be provided with cooperating abutment elements **26**, such as illustrated in FIG. 2, said abutment elements being bonded to the longitudinal edges of said panels and to each other. It will be understood that instead of bonding the abutment elements, other suitable means may be provided for detachably connecting adjacent panels.

Panels **21***a* and **21***e* are provided with longitudinally extending edge members **25***a* and **25***b*, respectively, shaped in cross-section substantially as illustrated in FIG. 3.

The closure panel **22** includes a frame having upper and lower longitudinal members **61** and **62**, respectively, and side member **63**. The upper frame member **61** is grooved as illustrated to cooperate with the edge member **25***a* and the lower frame member **62** has a bevelled edge to cooperate with the edge member **25***b*. One or more spring clamps **64** are pivotally mounted on edge member **25***b* and serve to secure the closure panel **22** in closed position. It will be understood that any suitable locking means may be employed in place of that described.

While the panels **21** and **22** have been illustrated as being arranged in hexagonal arrangement to form the barrel wall, it will be understood that any other suitable form or shape may be employed and that instead of using separate panels to form the barrel wall, both the fabric sheet **23** and reinforcing grid **24** may be a single unit large enough to be bent into suitable shape which may be polygonal, circular, or any other form, as desired.

The end members **19** and **20** may be formed similarly as the side walls, that is, with a fabric sheet bonded to a grid but, of course, such members will be provided with conventional trunnions **31** which extend axially from opposite sides of the barrel **18** and are received in suitable bearings carried in conventional hanger member **32** depending from the frame **11**. The trunions have axial bores through which are passed the conventional electrical conductors **33**, each of which has an electrode or its inner end dangling into the barrel to engage the articles being electroplated. The outer end of each conductor, of course, is connected to an electrical circuit.

While the use of end panels, as above described, is preferable, it will be understood that such panels may also be formed of metal or plastic members which are perforated or inperforate and which are bonded or otherwise suitably secured to the end edges of the side panels **21** constituting the wall of the barrel.

While the fabric sheet **23** in and of itself permits the transfer of a high volume of solution into the plating barrel, the character of the grid structure **24** itself is such that the spaces defined by the grid strips function as scoops or retaining pockets to scoop up plating solution from the tank as the barrel is rotating, which solution, of course, then drips into the interior of the plating barrel. Thus, an additional quantity of plating solution is carried into the barrel over and beyond that which would normally pass through that portion of the side wall which is submerged in the plating solution at any particular time.

In the modified embodiment illustrated in FIGS. 4 and 5, the barrel **35** comprises a pair of end plates **36** which may be circular or of any suitable shape. The end plates may be perforated or imperforate plastic or metal, or a fabric mesh supported on a grid, as hereinabove described, and including trunions **37**. A plurality of transverse brace members **38** are rigidly connected to the peripheral edge portions of the end plates **36** and are circumferentially spaced, as illustrated in FIG. 5. The barrel wall comprises a web of fabric **39** of the type hereinabove described, which is suitably secured to the end plates **36**, the web being in cylindrical form or in any suitable polygonal form desired. Cemented to the outer surface of the web **39** are a plurality of spaced arcuate ribs **41** which are secured to the brace members by hanger elements **42**, as shown. As illustrated in FIG. 5, the barrel wall is provided with a pair of longitudinally extending rigidifying members **43** which define an opening for the barrel. Said opening is closed by a removable panel **44** which is also formed of the same fabric as the rest of the wall and is provided with rigidifying elements and a suitable latching means for locking the closure panel in position.

While only two arcuate ribs **41** are illustrated in FIG. 4, it will be understood that a greater number may be employed and that, in any event, a maximum area of fabric is exposed for the passage of plating solution therethrough.

In the modified embodiment illustrated in FIG. 6, the barrel wall **46** is formed of the same fabric as hereinabove described, and a plurality of longitudinally extending ribs **47** spacedly arranged are cemented or bonded to the fabric. Said ribs are either integral with or suitably connected to bracing and rigidifying outer arcuate members **48**. The ribs **47** and fabric sheet **46** may be bonded to any of the types of end members hereinabove described.

In the modified embodiment illustrated in FIG. 7, the barrel wall **49** is formed of the same fabric, as hereinabove described, to the outer surface of which is cemented a plurality of longitudinally extending ribs **51** which are perforated intermediate their ends to receive cables or cords **52** which secure the ribs together, in the manner illustrated. It is, of course, understood that the end portions of the ribs **51** are suitably anchored in end plates constituting the end members of the barrel.

FIG. 8 illustrates modified embodiment in which the barrel is of the type adapted to be operated at an oblique angle and has an open upper end. The barrel wall **54**, similarly as in the other embodiments, comprises a sheet of woven fabric supported on a grid and may have any desirable form. The bottom or lower end wall **55** of the barrel may be formed like the end members **19** and **20** hereinbefore described except that it is provided with a suitable drive adapter **53** so that the barrel may be driven by the conventional drive means illustrated.

It will be apparent from the foregoing that in each of the embodiments, hereinabove described, the use of the fabric sheet for the wall of the barrel, together with the provision of exterior rigidifying members secured to the sheet affords a maximum passage of electroplating solution therethrough, with the result that plating may be accomplished more effectively and at more rapid rate than heretofore possible with the use of corresponding prior art apparatus.

Various changes coming within the spirit of my invention may suggest themselves to those skilled in the art; hence, I do not wish to be limited to the specific embodiments shown and described or uses mentioned, but intend the same to be merely exemplary, the scope of my invention being limited only by the appended claims.

I claim:

1. An electroplating barrel comprising a sidewall formed of an inner layer of open mesh fabric having a fine opening size and an outer supporting layer consisting of a generally rigid grid structure having a multiplicity of relatively larger openings, the inner edge of the grid being coextensive with and bonded to the outer surface of said fabric, both of said layers being formed of chemically inert resinous materials.

2. The invention as defined in claim 1 in which the grid structure has substantial depth to provide scoops adapted to pick up plating solution as the barrel is rotated in a plating tank.

3. The invention as defined in claim 1 in which the total area of the grid elements in contact with the fabric layer is relatively small in relation to the area of the fabric layer so as to expose a maximum area of fabric layer for the passage of plating fluid therethrough.

4. The invention as defined in claim 1 in which the barrel is substantially hexagonal in cross section.

5. The invention as defined in claim 1 in which the barrel is substantially circular in cross section.

6. The invention as defined in claim 1 in which the warp strands of the fabric extend parallel to the longitudinal axis of the barrel.

7. The invention as defined in claim 1 in which the fabric is formed of polypropylene.

8. An electroplating barrel comprising a sidewall formed of a woven fabric of chemically inert material adapted to pass electroplating solution but adapted to retain small articles to be electroplated with a minimum penetration of said articles into said fabric, a plurality of substantially rigid spaced longitudinally extending

strips, each bonded along one edge to the outer surface of said fabric and a member passing substantially through all of said strips and extending circumferentially of said sidewall.

References Cited

UNITED STATES PATENTS

888,093	5/1908	King	204—213
1,030,053	6/1912	Catlin	204—213
1,376,052	4/1921	Taylor et al.	204—213
2,640,025	5/1953	Lazaro	204—213
3,159,560	12/1964	Belke	204—213
3,340,174	9/1967	Buynak	204—213
3,379,632	4/1968	Henig	204—213

FOREIGN PATENTS

631,015	10/1949	Great Britain.
880,843	10/1961	Great Britain.

JOHN H. MACK, Primary Examiner

W. B. VANSISE, Assistant Examiner

U.S. Cl. X.R.

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