May 27, 1958 W. H. JACKSON 2,836,400

PLATING BARREL

Filed June 4, 1954 3 Sheets-Sheet 1

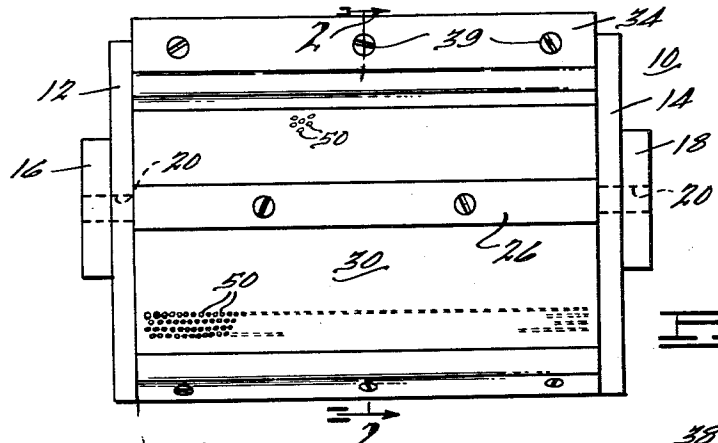

FIG. 1.

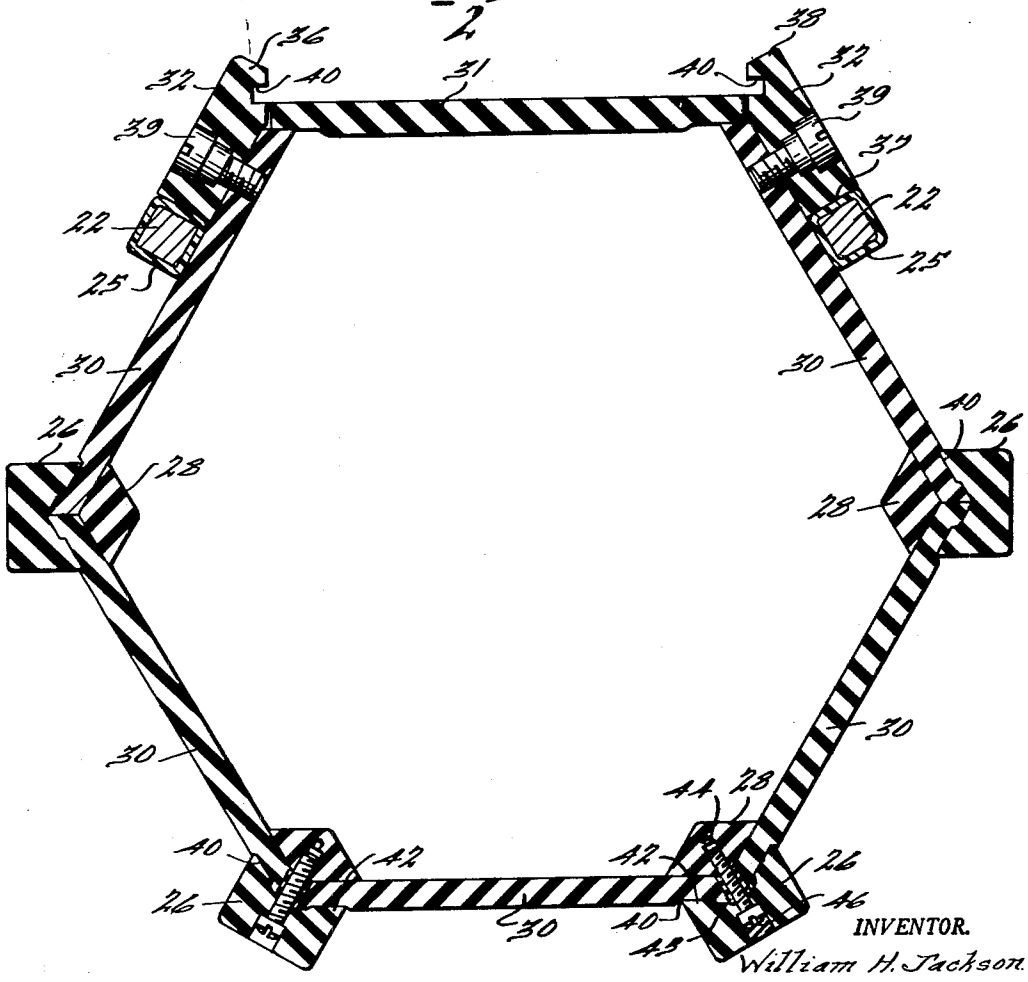

FIG. 2.

INVENTOR.
William H. Jackson.
BY
Harness, Dickey & Pierce.
ATTORNEYS

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PLATING BARREL

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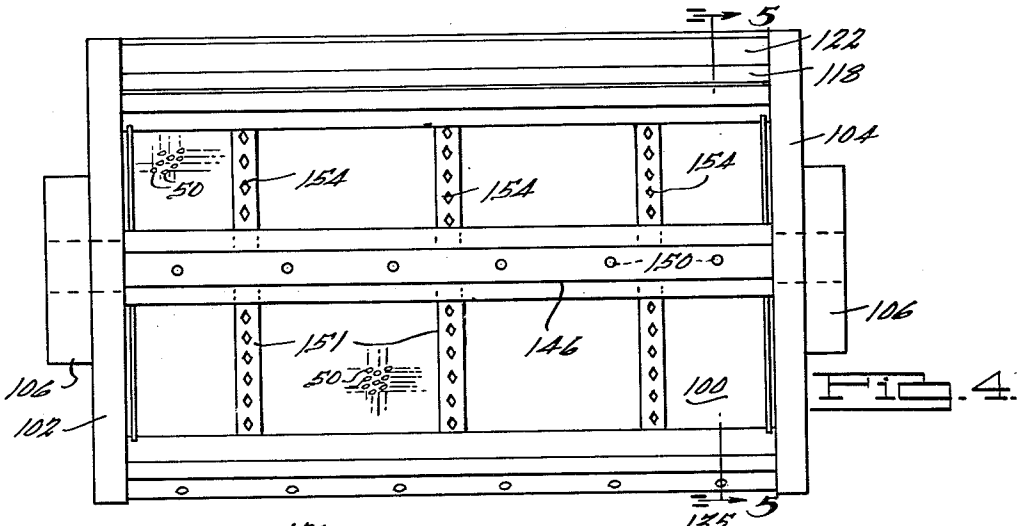

Fig. 4.

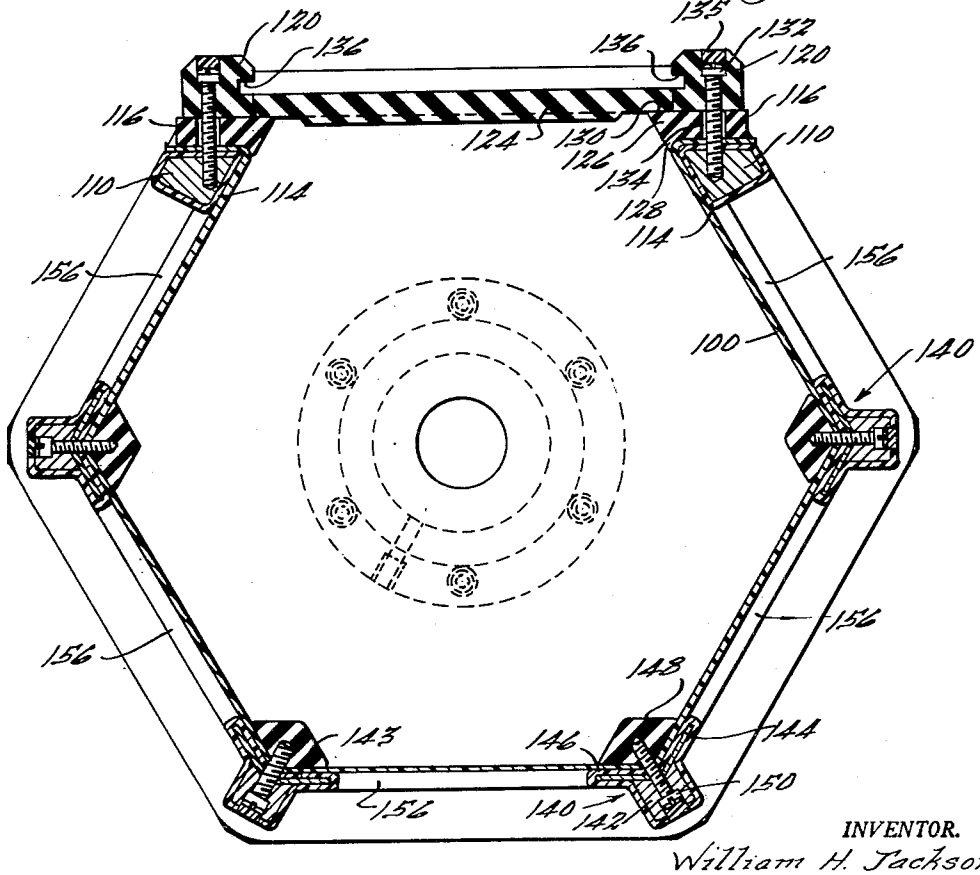

Fig. 5.

INVENTOR.
William H. Jackson.
BY
Harness, Dickey & Pierce.
ATTORNEYS.

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PLATING BARREL

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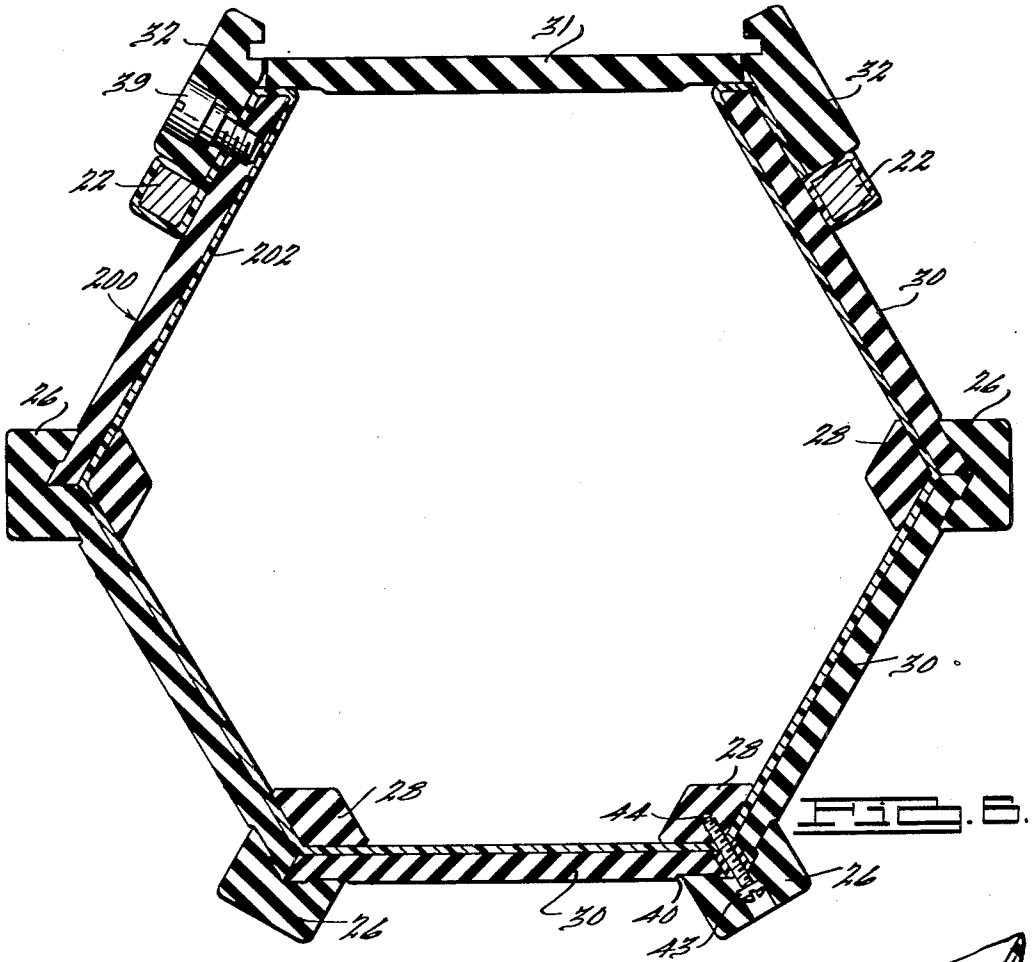

FIG. 6.

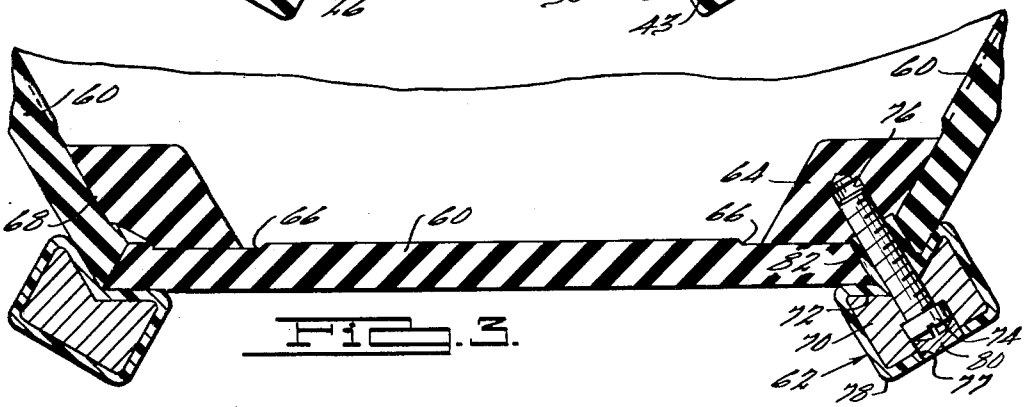

FIG. 3.

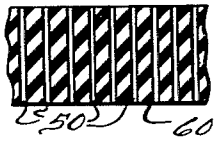

FIG. 7.

INVENTOR.
William H. Jackson.
BY
Harness, Dickey & Pierce
ATTORNEYS.

United States Patent Office 2,836,400 Patented May 27, 1958

2,836,400

PLATING BARREL

William H. Jackson, Birmingham, Mich., assignor to The Udylite Corporation, Detroit, Mich., a corporation of Delaware

Application June 4, 1954, Serial No. 434,565

8 Claims. (Cl. 259—89)

The present invention relates broadly to electroplating apparatus and more particularly to improvements in barrel plating cylinders of the type employed in electroplating barrel units.

Barrel plating cylinders are used extensively in industry for simultaneously electroplating large numbers of small articles which, because of their size, are not conveniently or economically adaptable to individual handling. In electroplating of this type, the articles are placed within a perforated cylinder and the entire unit is carried through the plating process which includes rotating and immersing the cylinder in different types of acidic or alkaline solutions. Aside from being subjected to severe chemical punishment during immersion, the cylinders are further subjected to heavy physical punishment, due to the continuous impingement of the articles against the cylinder or against the liner or membrane when used. Because of this, it is highly essential that the cylinders and its liners or membranes possess characteristics of high strength and resistance to abrasion, buckling and deterioration. The attainment of such characteristics is relatively difficult because of the necessity for using electrically non-conducting materials.

In the past various structural arrangements have been employed in an effort to provide the above stated characteristics. One commercial arrangement utilizes a cylinder made from an acrylic resin material designated "Lucite." Some difficulty has been encountered because the acrylic cylinders are limited to relatively low temperature operation. Another commercial barrel employs a liner constructed from a phenol-formaldehyde condensation product such as "Bakelite." The phenol-formaldehyde resin liners are not completely satisfactory inasmuch as they require several laminations for strength and tend to delaminate in certain types of solutions.

In accordance with the teachings of the present invention an improved cylinder is provided for a barrel plating unit which overcomes the difficulties heretofore encountered. The cylinder is constructed with a novel rigid frame assembly having a plurality of removable corner frame members and interconnecting cylinder side wall panels, which together form a structural unit of high strength that is fully capable of withstanding the severe chemical and physical punishment to which it is subjected. The frame members are arranged to overlap the corners of the unit and to interlock with the side wall panels and hold the panels rigidly in position at all times, yet individual wall panels may be readily removed for maintenance. Moreover, the frame permits the use of unitary or segmented liners which are formed of materials having characteristics of high strength and resistance to abrasion, heat, and the corrosive effects of acids or alkalies.

Accordingly one object of the present invention is the provision of an improved cylinder for a barrel plating unit constructed in a manner to withstand severe chemical and physical punishment.

Another object of the invention is the provision of

an improved plating barrel cylinder having a frame assembly employing a plurality of removable frame members for supporting the liner.

A further object of the invention is to provide a cylinder having means for rigidly but removably supporting the liner whereby the liner may be quickly and easily replaced for maintenance.

Still another object of the present invention is the provision of a plating cylinder of high strength having separate replaceable side wall panels which are interlocked with each other.

A still further object of the present invention is the provision of an improved plating barrel cylinder employing membranes or liners having advantageously high resistance to heat, abrasion, and corrosion.

Another object of the present invention is the provision of a plating barrel cylinder which is economical to manufacture, efficient in operation and requires little maintenance.

In the drawings:

Figure 1 is a front elevational view of a plating barrel cylinder constructed in accordance with the teachings of the present invention;

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

Fig. 3 is a fragmentary, sectional, side view, showing a modification of the interlocking arrangement of Fig. 2;

Fig. 4 is a front elevational view showing another modification of the plating barrel cylinder embodying features of the present invention.

Fig. 5 is a cross-sectional view taken substantially on the line 5—5 of Fig. 4; and

Fig. 6 is a side elevational view, in section, showing a further modification of the instant invention.

Fig. 7 is a sectional view of a panel showing the perforations.

Referring more particularly to the drawings, wherein like reference characters designate like or corresponding parts throughout the several views, there is shown in Fig. 1 a plating barrel cylinder **10** which is adapted to receive therein a number of articles to be electroplated and which serves as a carrier for the articles throughout an electroplating operation.

The cylinder generally designated **10** preferably comprises a cylindrical container of polygonal cross-sectional shape having a pair of spaced, parallel end walls or heads **12** and **14** defining the end portions of the cylinder. The heads **12** and **14**, which are similar in construction, are provided on their outer side with bearing bosses **16** and **18**, respectively, for receiving the lower end of a hanger (not shown) that suspends the cylinder from an overhanging rail or the like so that it may be positioned in and removed from a plating barrel tank. A pair of axially aligned bores **20** are formed in the bosses and heads to provide access for electrodes to extend into the interior of the unit. Conventionally, a driving gear (not shown) is also fixedly mounted on bearing boss **18** for rotatably driving the cylinder during processing.

The end walls **12**, **14** are formed of solid corrosive resistant material and function as the foundation for the framework of the cylinder. As best shown in Fig. 2, a pair of elongated stay bolts **22** are positioned adjacent the top corners of the polygonal-shaped container and are suitably secured at their ends to the respective heads **12** and **14** for rigidly spacing the heads in position and to brace the cylinder member. Stay bolts **22** are preferably formed of high strength material such as steel or the like and are covered with a suitable protective coating **25** for protection against the corrosive effects of acidic or alkaline solutions to which it is subjected in an electroplating operation. A wide variety of plastic coating materials now well known in the art are suitable for use as

protective coating 25. Plastic materials which are suitable include the vinyl resins and highly fluorinated polymeric hydrocarbons such as tetrafluoroethylene. Vinyl resins may be applied in the form of dispersion known as pastisols, or in the form of sheets suitably secured to the bolts 22. If desired, additional stay bolts may be provided at intermediate points around the cylinder to insure a sufficiently rigid and stable cylinder construction.

An elongated, interlocking outer frame member 26 is positioned on the outer side of the cylinder adjacent each corner thereof and preferably, is removably secured at its end to the heads 12 and 14. These outer frame members 26 are formed of a sturdy, corrosion resistant material such as a hard rubber sold commercially under the trademark "Tempron," and cooperate with inner frame members, or tumbling ribs 28, of similar material, for rigidly supporting a plurality of interlocked perforated panels or side walls 30 therebetween. Each panel 30, which may also be formed from "Tempron," is generally rectangular in shape and is adapted to substantially cover one side of the polygonal-shaped cylinder such that the panels, in multiple, comprise the side walls of the cylinder. For this purpose, the panels 30 are made such that they are grooved into the inner walls of the heads 12 and 14, and fit flush with adjoining panels along their lower and upper edges. As will hereinafter be described, adjoining panels are provided with complementary miter cuts such that they seat flush against each other, with the outer and inner frame members 26 and 28 interlocking the panels in position.

Positioned on the upper portion of the cylinder 10, as viewed in Fig. 2, upon the top edges of the upper ones of the panels 30 which define a supporting ledge therefor, is a door panel 31. This panel 31, which serves as a door for the cylinder, is generally rectangular in shape and of such size as to cover one side of the polygonal-shaped cylinder. In order to lock the door panel in position, a pair of opposed retaining members 32 are provided and adapted to cooperate with a suitable latch (not shown). The retaining members 32, which may also be formed of "Tempron," have a lower edge portion 37 resting on the stay bolts 22, and an upper edge portion 38 projecting above the edges of upper panels 30. The retaining members 32 are suitably secured at their ends to the heads 12 and 14, and intermediate their ends to their respective upper panels as by screws 39. The upper projecting portion 38 is provided on its inner surface with a latch receiving groove 40. This groove serves to slidably receive a latch of any suitable type to appropriately lock the door. It will be noted that the retaining members 32 serve a dual function in that they act with a latch as a locking means for the door panel, and as a lateral brace or support for the cylinder.

The panels 30 which form the body of the cylinder 10 are removably interlocked together by the inner and outer frame members 26 and 28 such that they may be easily removed for maintenance. For this purpose and as best shown in Fig. 2, the panels are provided with miter cuts such that their adjacent edges fit flush against each other to define closed corner portions of the cylinder. Each of the panels 30 that do not abut the door 31 is provided with a shallow longitudinal interlocking groove 40 along each of its outer edges, while the panels 30 immediately adjacent to the door are provided with a similar shallow groove at their edges opposite from the door. The outer frame members 26 fit against the outer edges of adjoining panels and are each provided with a V-groove on their inner surfaces which are formed to have a complementary contour with the inclined panels 30. To interlock the panels together a pair of integral raised portions 42, constituting inwardly projecting longitudinal ribs are formed along the outer edges of each V-groove side of the frame members 26 to be received within the interlocking grooves 40 of the panels. The outer frame members 26 are retained in this position by inner frame members, or tumbling ribs 28 of substantially rhombic-shape in cross section which are fitted flush in the troughs formed by adjoining panels. These ribs preferably are formed of corrosive resistant "Tempron." The inwardly facing surfaces of these ribs 28 meet the side wall panels 30 at obtuse angles, so that there are no internal acute angle corners which might trap workpieces.

The frame members 26 and the ribs 28 are secured together, for interlocking the panels together, by a plurality of spaced, high strength bolts 43 threaded into aligned bores 44 formed in the corner members 26, the adjoining panels 30 and the tumbling ribs 28. Preferably, the bores are enlarged within the panels 30 to permit suitable seals 45 to be inserted therein. The arrangement is such that the seals are placed in compression by the bolts 43. In so doing, "treeing" or relative twisting of the members is prevented. Materials which are suitable for the seal include tetrafluoroethylene or vinyl sheeting or film available commercially under the trademark "Koroseal." So that bolts 43 may be protected against corrosive solutions, the bolts are preferably recessed within the bores 44, and the bores, above the bolts, filled with a protective putty 46 or other suitable material. It will be noted that with this corner support structure, the panels will be firmly retained in position to provide a rigid cylinder structure, but may be easily removed by simply removing the bolts 43.

Each one of the panels 30 and, if desired, the door panel 31 is provided with a multitude of perforations or apertures 50 to facilitate circulation of an electrolyte into and out of the cylinder 10 when it is immersed in a plating bath. Since the volume of fluid flow through the panels has a direct effect on the efficiency of the unit, it is highly desirable that the perforated area be as large as possible. In practice, however, the size of each aperture 50 is limited to a size smaller than the size of the articles to be electroplated, and the total perforation area is restricted by the required strength of the material and other factors. One of the important advantages which results from constructing the panels of "Tempron," which has excellent strength, heat, corrosion and abrasion resistance characteristics, is that the perforations may be closely spaced and evenly formed, thus permitting a large total area of perforations.

In many instances it is desired to provide a plating barrel cylinder which is suitable for handling extremely heavy loads. Fig. 3 discloses a modification of the invention in which the outer frame members and the cylinder panels are formed of high strength materials and the panels are interlocked by grooves formed along their inner sides. In this embodiment, the structural arrangement of the cylinder is essentially the same as in the first embodiment and includes a plurality of perforated, removable side wall panels 60, each of which is preferably constructed of "Tempron" and forms one complete side of a polygonal-shaped container. The panels are interlocked in position by outer frame members 62 and tumbling ribs 64, with the panels being interposed between these members.

For the purpose of interlocking the panels, as in the case of the first embodiment, each of the lower panels 60, as viewed in the drawings, is provided with a longitudinal, internal groove 66 on its inner surface adjacent to each edge, while the upper panels (not shown) are formed with a similar groove along their lower edges only since their upper edges are adjacent to the door panel (not shown) and are not interlocked by corner structures. Tumbling ribs 64 which are preferably formed of "Tempron," are of substantially rhombic-shape in cross section and are provided on their mating surfaces with a pair of symmetrical, raised portions 68 adapted to fit flush within the grooves 66, in an interlocking manner. It will be noted that the inwardly facing surfaces of the ribs 64 slope downwardly from an apex and meet the panels 60 at an obtuse angle. Because of this construc-

tion, articles being electroplated impinge against the inwardly projecting ribs and are deflected towards the interior of the cylinder, and cannot be trapped in the corners of the cylinder.

The corner supports for the cylinder comprise an outer frame member **62** having an inner support **70** of high strength material. Support **70** is formed with its inner side having an inwardly sloped V-groove **72** which defines a complementary surface with the slanting edges of adjoining panels. The extreme ends of the supports **70** are suitably secured to oppositely disposed heads (not shown) and to the ribs **64** by steel bolts **74** spaced along the length of the support **70**. These bolts **74** are received in aligned bores **76** formed in supports **70**, adjoining edges of the panels **60** and ribs **64**, with the head of the bolt **74** being recessed within an enlarged aperture **77** in support **70**. Preferably, support **70** is protected against corrosive action by a coating of suitable material **78** such as a vinyl resin dispersion, while the bolt is protected by a protective putty **80** inserted above the bolt in bore **77**. As in the embodiment of Fig. 1, a seal **82** of Teflon or Koroseal is interposed between the panels **60** and bolt **74** to prevent "treeing."

It will be noted that in each of the embodiments disclosed thus far, the tumbling ribs are extended internally, throughout the length of the cylinders but preferably are not secured at their ends to the spaced heads. This construction allows the easy removal of the panels **30** and **60** during maintenance or the like.

Figs. 4 and 5 disclose another modification of the instant invention uniquely adapted for plating extremely small objects wherein the plating barrel cylinder is constructed with a one-piece, unitary, removable membrane or liner **100** to form the body of the container. In this embodiment, the frame of the cylinder includes a pair of polygonal-shaped, spaced end walls or heads **102** and **104** of suitable corrosive resistant materials with each head being provided with a bearing boss **106** on its outer side for rotatably supporting the cylinder in position. Removably secured at their ends to heads **102** and **104** and adjacent to the upper corners of the polygonal-shaped members are a pair of symmetrically spaced stay bolts **110** for rigidly tying the spaced heads together. Stay bolts **110** are suitably coated with a film of a vinyl dispersion, plastisol, material **114** or the like and are formed from wedge-shaped metal stock having one side lying in a horizontal plane and an adjacent side lying at an angle to the first side in a manner such that it follows the contour of a hexagon.

Stay bolts **110**, besides serving as braces for the cylinder, further act with a pair of door sills **116** and locking strips **120** for holding the ends of liner **100** in position and for supporting and locking a door panel **124** in position. Inasmuch as each of the opposing door sills and locking strips are identical in construction and coact in identical manners with the stay bolts, only one will be described in the description below. The door sill **116** is seated on stay bolt **110** to act as a securing member for holding the liner **100**, and extends the full length of the cylinder. The inner portion of sill **116** is provided with an integral inwardly extended lip **126** having a lower arc-shaped portion **128** that follows the contour of stay bolt **110** and cooperates with stay bolt **110** for securing one end of liner **100** therebetween as by compression. The upper portion of sill **116** is formed with a flat surface **130** which receives and seats an edge of door panel **124**.

Positioned upon the outer edge of flat surface **130** is the locking strip **120**. This strip which may also be formed of "Tempron," extends the full length of the cylinder and is provided with a longitudinally extending latching groove **136** that serves to slidably receive a suitable latch (not shown) to secure panel **124** in position on sills **116**. Locking strip **120**, and door sill **116** are secured together and to stay bolts **110** by a series of spaced

bolts **132** which are threaded in aligned holes **134** formed in each of these members. Preferably, bolts **132** are recessed in strip **120** and covered with a protective coating as at **135**.

It will be apparent that with this construction the ends of liner **100** are compressed between sills **116** and stay bolts **110** upon tightening of bolts **132** such that the liner is securely but removably locked in position. Moreover, the door sills and locking strips serve to support door panel **124**. The door panel, as in the embodiment, of Fig. 1, is of such a size as to cover one side of the polygonal-shaped member and fits snugly between locking strips **120** and heads **102** and **104**.

Spaced around the cylinder and forming the body framework therefor are a plurality of corner supports comprising elongated interlocking outer frame members **140**, each of which is securely fastened at its ends to heads **102** and **104**. Each one of the outer frame members **140** comprises an elongated rod member or support **142** of high strength material having a V-groove **143** on its inner side, and longitudinally extending portions **144**, and is completely encased by a suitable plastic sheath **146**. Positioned internally of liner **100** and extending longitudinally therein, in juxtaposed relation to longitudinal supports **142**, **144** is an inner frame member, or tumbling rib **148** of substantially rhombic-shape. The tumbling ribs **148** fabricated from Tempron or the like, are secured to the outer frame members **140** by a plurality of spaced bolts **150** extending through supports **142**, **144** and threaded into rib **148**. The ribs **148** and supports **142**, **144** serve to guide and support liner **100** which when passed therebetween constitutes the walls of the cylinder. Preferably, bolts **150** are recessed in supports **142** and covered with a protective putty-type material to prevent adverse corrosive action thereon.

Liner **100** which is wrapped around the cylinder framework to form the side walls of the cylinder may be satisfactorily and preferably is formed of a thin sheet of fluorinated ethylene material such as, for instance, is sold commercially under the trade names of Teflon and Kel-F. These materials, while possessing excellent heat, abrasion, and corrosion resistance, are readily adapted to perforation by punching methods. By punching, the liner may be provided with much smaller perforations than have been heretofore feasible and which would otherwise be exceedingly difficult and expensive to duplicate by drilling, these perforations being small enough to prevent the passage therethrough of extremely small articles such as needles or pins. Moreover, the linear material is exceptionally strong so that the liner may be made thinner than with materials previously employed. The electrical voltage drop in the electrolyte held in the perforations is decreased when the material is made thinner, thereby providing an increased efficiency of the barrel plating unit.

In the event that the cylinder need be strengthened for heavy loads, reinforcing straps **154** may be inserted at spaced locations along the length of the cylinder, positioned between individual supports **142**, **144** and secured thereto. These straps may be made from expanded metal having a series of symmetrically arranged, diamond-shaped apertures therein as shown in Fig. 4, or other types of apertures may be provided. If desired, several straps spaced along their length of the cylinders may be used with the size and number being determined by the cylinder size and the load to be carried. It will be noted that the outer frame members **140** are rigidly interlocked together by a series of metal inserts **156** fitted within a rectangular groove (not shown) formed on the inner surface of head **104**. The inserts **156** serve to reinforce the connections between the outer frame members **140** and the heads **102** and **104** and to enable the cylinder to stand up under relatively heavy loads.

Fig. 6 discloses a modification of the present invention which is substantially the same as that disclosed in Figs. 1 and 2 except that the inner surface of the cylinder is pro-

vided with an additional unitary liner. Inasmuch as the two embodiments are otherwise identical, the reference characters designating common individual components in Figs. 1 and 2 have been retained in Fig. 6.

Referring more particularly to Fig. 6, there is shown a plating barrel cylinder **200** including a series of interlocked, perforated side wall panels **30**, interposed between tumbling ribs **28** and outer frame members **26**. The cylinder further includes a door panel **31** resting upon the upper panels **30** and adapted to be secured in position by locking strips **32** and a latch member (not shown). A unitary perforated liner membrane **202** is wrapped around the cylinder and forms the inner surface of cylinder **200**. This liner which is preferably formed from a suitable material such as "Teflon" or "Kel-F," has its ends interposed and secured between locking strips **32** and the upper panels **30** by bolts **39** which compress the liner therebetween. The intermediate portions of liner **202** are wrapped around tumbling ribs **28** and secured thereto by bolts **43** that pass through the outer frame members **26**, the removable panels **30** and into the ribs **28**, such that the liner is compressed therebetween. As such, it will be seen that the liner **202** and panels **30** are secured together by the cylinder frame to form an integral cylinder wall. The combination of the panels **30** and the liner membrane **202** is desirable in instances where the load carried by the cylinder is unusually heavy and additional strength is necessary. In this modification, all the advantages above enumerated in connection with the one-piece liner and replaceable panels **30** are realized. It will be appreciated that a barrel of the type shown in Figs. 1 and 2 may be readily converted into one capable of handling much smaller parts by simply adding a liner **202**.

It will be apparent from the foregoing that an improved barrel plating cylinder is provided that is fully capable of withstanding heavy physical and chemical punishment to which such cylinders are subjected during an electroplating operation. Moreover, the electrical characteristics of the cylinders, with respect to power losses suffered in the side wall panels or liners are superior to heretofore known constructions and the overall operating efficiency of the unit is increased. It will be appreciated also that the use of removable panels and liners greatly simplifies the maintenance of the cylinders.

While it will be apparent that the preferred embodiment of the invention herein disclosed is well calculated to fulfill the objects above stated, it will be appreciated that the invention is susceptible to modification, variation and change without departing from the proper scope or fair meaning of the subjoined claims.

What is claimed is:

1. In an electroplating cylinder for carrying articles through an electroplating operation, a pair of spaced end walls, a pair of circumferentially spaced external spacer members extending between and secured at their ends to said end walls, a pair of elongated securing members each removably fastened to a different one of said spacer members and disposed exteriorly of said cylinder, said securing members being shaped to conform to surfaces of said spacer members, a unitary perforated membrane extending circumferentially from one of said spacer members to the other one thereof and having its ends secured between said spacer members and said securing members, a plurality of corner supports circumferentially spaced around said cylinder between said spacer members, each one of said corner supports including an outer member disposed exteriorly of said cylinder and extending between and secured to said end walls, and an inner member disposed within said cylinder and removably secured to said outer member, said membrane extending between the inner and outer members of each one of said corner supports and being retained thereby in a predetermined position.

2. In an electroplating cylinder construction of the type having side and end walls defining a chamber of polygonal cross-sectional shape, and rigid frame members mounted in pairs on and extending between said end walls, said side walls extending and being clamped between the two members of selected ones of said pairs, the improvement comprising an inner one of said frame members of generally rhombic cross-sectional shape disposed within said chamber at one of the longitudinal corners thereof, said inner frame member being positioned so that its inwardly facing surfaces meet the respective side walls immediately adjacent thereto at obtuse angles to prevent trapping of articles in said one longitudinal corner during operation of said cylinder.

3. An electroplating cylinder construction comprising end walls and a plurality of substantially flat side wall panels defining a chamber having longitudinal corners, one side of said chamber extending between one pair of said corners being completely open and being closable by a door panel, a plurality of rigid frame members mounted on and extending in pairs between said end walls at the other ones of said corners, selected ones of said panels extending and being clamped between the two members of each one of said pairs, a pair of rigid retaining members mounted on and extending between said end walls at said one pair of corners, said retaining members being disposed entirely exteriorly of said chamber, both of the corners of said one pair being completely clear and unobstructed on the interior side thereof to provide for unobstructed discharge of workpieces from said chamber, said retaining members being adapted to cooperate with a latch member for removably securing a door panel between said one pair of corners to close said chamber.

4. An electroplating cylinder construction of polygonal cross-sectional shape comprising a pair of rigid end walls, a pair of frame members rigidly mounted on and extending between said end walls at one corner of said construction, a pair of side wall panels extending between said frame members and positioned in edgewise abutting relationship therebetween, said panels and one of said frame members being complementarily shaped for interlocking engagement for positive retention of said panels by said frame members when said frame members are urged towards each other, and means for urging said frame members towards each other into clamping engagement with said panels.

5. An electroplating cylinder construction comprising end walls and a plurality of substantially flat side wall panels defining a chamber having longitudinal corners, a plurality of rigid frame members mounted on and extending in pairs between said end walls at selected ones of said corners, selected ones of said panels extending between and being clamped in position by the two members of each one of said pairs, said panels and selected ones of said frame members being shaped for tongue and groove interlocking retention of said panels by said pairs.

6. An electroplating cylinder construction comprising end walls and a plurality of substantially flat side wall panels defining a chamber having longitudinal corners, a plurality of rigid frame members mounted and extending in pairs between said end walls and selected ones of said corners, selected ones of said panels extending between and being clamped in position by the two members of each one of said pairs, each one of said selected panels having a longitudinal groove in its outer surface adjacent to one edge, the outer ones of said frame members having inwardly projecting longitudinal ribs fittingly positioned within said grooves, and means for clamping the members of each one of said pairs together with said selected panels therebetween so that said selected panels are firmly secured in position by interlocking engagement of said ribs in said grooves.

7. An electroplating cylinder construction comprising end walls and a plurality of rigid substantially flat side wall panels defining a chamber having longitudinal corners, a plurality of rigid frame members mounted on and extending in pairs between said end walls at selected

ones of said corners, selected ones of said panels extending between and being clamped in position by the two members of each one of said pairs, a foraminous membrane lining said cylinder and disposed upon the inner surfaces of said selected panels and also extending between and being clamped in position by said frame member pairs, the ends of said membrane extending exteriorly of said cylinder at two adjacent corners thereof, and means for clamping the ends of said membrane against selected ones of said panels exteriorly of said cylinder, each one of said panels being perforated to define apertures of a greater size than the apertures of said membrane.

8. In an electroplating cylinder for carrying articles through an electroplating process, a pair of spaced end walls, a pair of circumferentially spaced external stay members extending between and secured at their ends to said end walls, a pair of elongated securing members each removably fastened to a different one of said stay members and disposed exteriorly of said cylinder, said securing members being shaped to conform to the surfaces of said stay members, a unitary perforated membrane extending

circumferentially from one of said stay members to the other one thereof and having its ends secured between said stay members and said securing members, a plurality of corner supports circumferentially spaced around said cylinder between said stay members, each one of said corner supports including an outer member disposed exteriorly of said cylinder and extending between and secured to said end walls, and an inner member disposed within said cylinder and removably secured to said outer member, said membrane extending between the inner and outer members of each one of said corner supports and being retained thereby in a predetermined position, said inner members being of generally rhombic cross section and being positioned within said cylinder so that their inwardly facing surfaces meet said membrane at obtuse angles.

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