May 26, 1953 A. M. LAZARO 2,640,025

ELECTROPLATING BARREL

Filed Dec. 14, 1949 2 Sheets-Sheet 1

Fig. 1

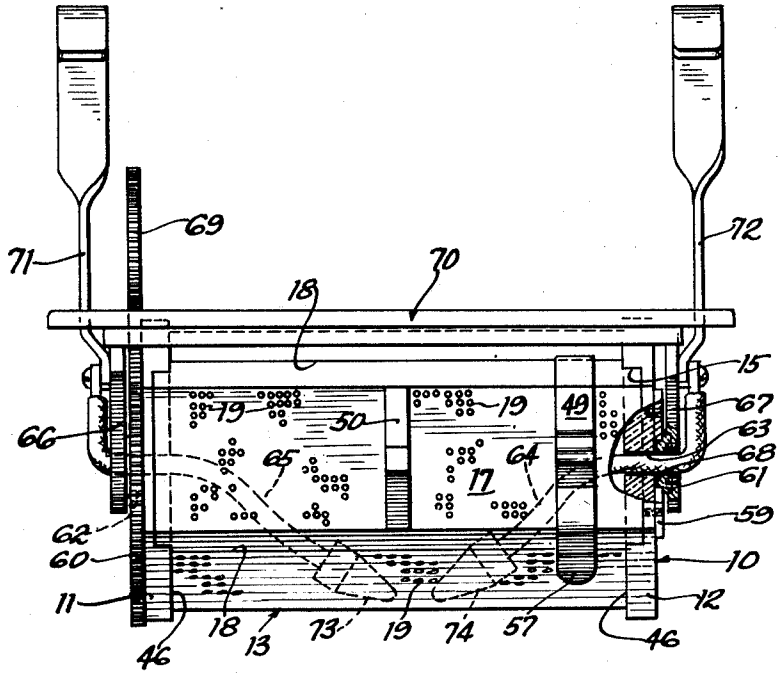
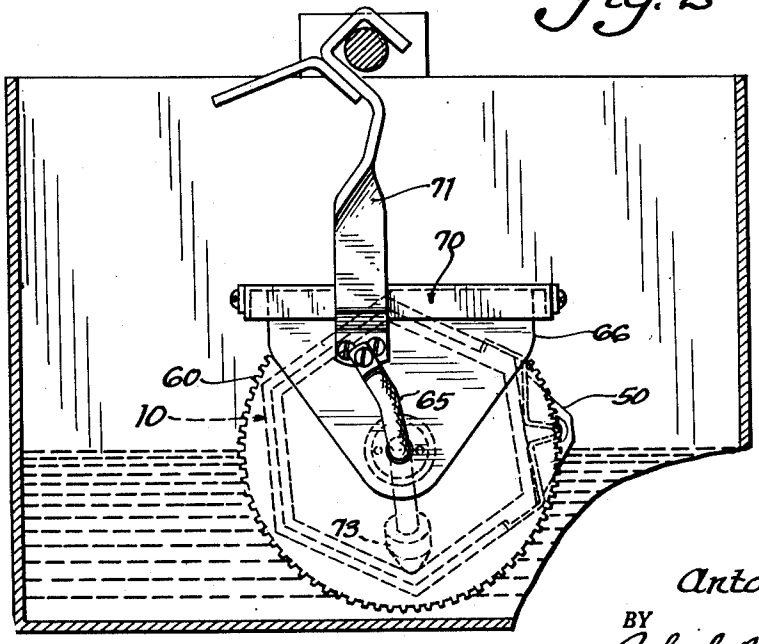


Fig. 2



INVENTOR.
Anton M. Lazaro
BY
Robert H. Wendt
Atty

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Filed Dec. 14, 1949 2 Sheets-Sheet 2

Fig. 3

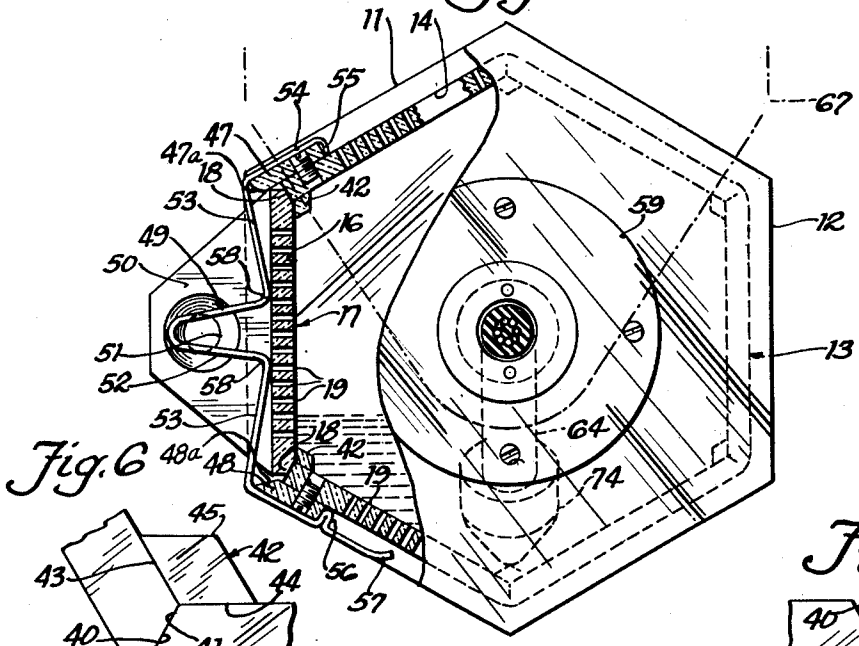


Fig. 6

Fig. 5



Fig. 4



Fig. 7

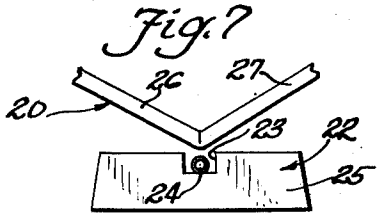


Fig. 8

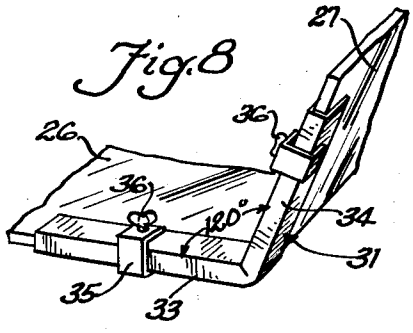
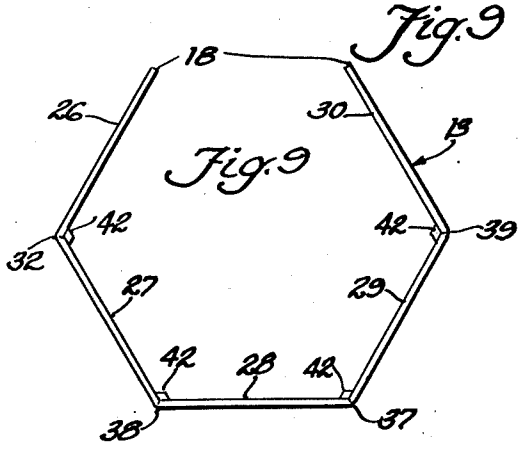


Fig. 9



INVENTOR.
Anton M. Lazaro
BY
Robert H. Vandt
atty

Patented May 26, 1953

2,640,025

UNITED STATES PATENT OFFICE

2,640,025

ELECTROPLATING BARREL

Anton M. Lazaro, Chicago, Ill.; Angelo Lazaro, administrator of said Anton M. Lazaro, deceased, assignor to Madelaine Lazaro, Chicago, Ill.

Application December 14, 1949, Serial No. 132,883

3 Claims. (Cl. 204—213)

1

The present invention relates to electroplating barrels and methods of making the same, and is particularly concerned with the making of polygonal electroplating barrels which are adapted to retain their shape even though they are subjected to heat in operation.

The present application is a continuation in part of my prior application, Serial No. 554,374, on Apparatus for Electroplating, filed September 16, 1944, now Patent No. 2,491,925.

The electroplating barrels to which the present invention relates are preferably made out of heat moldable plastic which is inert to the action of acids or alkalis, such as, for example, a plastic, produced by polymerization of the monomeric derivatives of acrylic and methacrylic acids, also known as methyl methacrylate.

The main body of the barrel is preferably made out of a single sheet which is bent under the influence of heat to a polygonal form, such as, for example, a barrel which is hexagonal in end elevation.

With the barrels of the prior art of this construction, it has been found when the barrels of heat moldable material are later subjected to heat in the cycle of electroplating, the flat sides of the barrel tend to become round and the angular corners of the barrel flatten out and become curved so that eventually the barrel becomes round, losing its polygonal shape which is originally provided for the purpose of tumbling the articles over and over in the electroplating solution.

I have discovered that the reason for this change from the polygonal to the round lies in the strain which is induced in the plastic sheets when they are bent to polygonal form by methods other than those practised according to the present invention. The heat applied permitted the bending at the corners but the sheets were still in a state of strain, and as soon as they became heated in the cycle of electroplating this strain equalized, and wherever the sheet was not confined the strains caused it to assume a circular form in which the strains are substantially equalized.

One of the objects of the present invention is the provision of an improved method of making electroplating barrels of heat deformable material, in which the barrels are adapted to retain their polygonal shape even though they are subjected to the amount of heat which is necessary in some of the processes of electroplating.

Another object of the invention is the provision of an improved electroplating barrel of heat

2

moldable plastic, which is inert to the action of acids or alkalis and which is also adapted to retain its polygonal form even though it is later again subjected to a certain amount of heat.

Another object is the provision of an improved electroplating barrel which is simple in construction and which includes a minimum number of separate parts, and which has a construction that is adapted to turn the articles in the barrel over and over as the barrel rotates.

Another object is the provision of an improved electroplating barrel of the class described, which is sturdy, capable of economical manufacture, and which permits a view of the articles while they are being electroplated so that the operator can observe when the plating is finished without necessity for opening the barrel to make sure that the electroplating has been satisfactorily completed.

Another object of the invention is the provision of an improved electroplating barrel which may be used for a much longer period of time than the barrels of the prior art without the barrels showing the effects of wear or action of acids to the extent that is present in the barrels of the prior art.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings, in which similar characters of reference indicate similar parts throughout the several views.

Referring to the two sheets of drawings accompanying the specification,

Fig. 1 is a front elevational view of an electroplating unit embodying the invention;

Fig. 2 is a side elevational view;

Fig. 3 is an end elevational view in partial section showing the details of construction of the electroplating barrel;

Fig. 4 is an end view of the blank after it has been prepared for the bending operation;

Fig. 5 is an enlarged fragmentary sectional view of the plastic sheet showing the shape at the point of bend;

Fig. 6 is an enlarged fragmentary sectional view showing the construction of the barrel at one of its corners after it has been completed;

Fig. 7 is a fragmentary end elevational view showing a portion of the plastic sheet during the act of bending or just after the bending has been finished at one corner;

Fig. 8 is a fragmentary view in perspective showing one of the angular templates which is employed for holding the bent sheet of the barrel in proper angular position until it has set; and

Fig. 9 is an end elevational view of the barrel sides, showing its appearance after it has been bent to proper shape but before it is secured to the end walls.

The electroplating barrels embodying the invention are preferably made mainly out of three parts. The barrels are indicated in their entirety by the numeral 10, and the most important parts comprise the hexagonal end walls 11, 12 and the one-piece side wall 13, shown in Figure 9.

The end walls comprise relatively thick plates of the plastic material which are provided on the inside with a groove 14, of rectangular cross section running parallel to the edges of the hexagonal plate and corresponding in size and shape to the edges of the side wall unit 13.

This groove 14 has its outer wall cut away at 15 on each end of the door opening, leaving a flat shoulder 16, Figure 3, on the inside of each end plate for engagement with the inside of the cover 17. The cover 17 may also consist of a flat rectangular plate of the plastic of sufficient size to fit in the opening 18, which is left at one side of the side wall unit 13, Figure 9.

The cover 17 and the side wall unit 13 have a multiplicity of regularly spaced apertures 19 for permitting the electroplating solution to flow into the barrel as it rotates, whenever the barrel is immersed in the solution, as shown in Figure 3.

The method of making the barrel is shown in Figures 4 to 9, and is described as follows:

The sheet of plastic material is cut to form a blank 20, Figure 4, which is of rectangular shape, its width being the length of the barrel between the bases of the grooves 14, and its length being sufficient to extend around five sides of a hexagonal barrel. This rectangular blank 20 is then formed with the V-shaped grooves 21, which are four in number in the present case, for a hexagonal barrel.

Each of the V-shaped grooves 21 is located at one of the corners of the proposed barrel unit of Figure 9, and the grooves 21 are at an angle of substantially 60 degrees so that when the walls of the groove 21 are brought together in a bending operation the adjacent sides will then extend at an angle of 120 degrees on the inside.

The bending operation is preferably accomplished by means of an electrical heating unit 22, Figure 7, which has a longitudinally extending groove 23 containing a helically wound wire heating unit 24. The base 25 of this heating unit may be a flat plate of refractory material which resists the effect of the heat from the heater 24, and by means of its groove localizes the heat when applied to the blank 20.

The blank 20 may be held with one of its grooves 21 turned upward and extending longitudinally of the heater element 24, close to the heater element. In a few seconds the heat will render the plastic bendable and it can be bent by hand until the sides of the groove 21 touch each other. Then the two sides 26 and 27 will be in the angular position shown in Figures 7 and 8, and an angular template 31 may be applied to each of the ends of the blank at the corner 32. The sides of the side wall unit may be indicated by the numbers 26—30.

The template 31 consists of a grooved metal member having a substantially rectangular U-shaped cross section, and consisting of two sections 33, 34, at an angle of 120 degrees to each other. Each section 33, 34, has secured to it a U-shaped member 35, with a set screw 36 that engages the inside of the plastic and holds it firmly against the opposed wall of the template. Thus each end of the blank may be clamped at an accurate angular position of 120 degrees as soon as it is bent.

The present templates occupy considerable space on the edges of the blank and, therefore, it is desirable to bend alternate corners 32 and 37 one after the other and secure them by templates. After they have set the templates may be removed and the corners 38 and 39 may be bent and secured by templates until they set.

The adjacent edges of the grooves 21, which are indicated by the numbers 40 and 41, Figure 6, are then preferably integrally welded together by applying a cement of the same material or using a suitable solvent for this material which dissolves the adjacent faces of the groove and causes them to become integrally welded together.

The corner is then preferably strengthened also by welding into each corner, by means of cement or solvent as described, a corner bracing member 42. These corner bracing members are made of the same plastic and are diamond shaped in cross section, being of a shape complementary to the inside of the barrel at the corners.

The sides 43, 44 of these corner braces are integrally welded to the inside of the plastic sheet at each corner, and the projecting corner 45 of the diamond shaped strip serves to accentuate the rolling action of the articles being electroplated.

The corner bracing strips 42 are preferably shorter than the width of the blank so that they terminate flush with the inside surface 46 of the end plates 11 and 12, and do not go into the grooves 14.

The edges of the side wall unit 13, Figure 9, are then provided with the keeper strips 47 and 48, which frame the opposite sides of the door opening and which may be cemented in place or secured in place by screws of the same plastic material.

Keeper strip 47 overlies the adjacent edge of cover 17 at its projecting edge 47*a*; but the projecting edge of the other keeper strip 48 is beveled at 48*a* to clear the cover 17.

These keeper strips 47, 48 are adapted to be engaged by a resilient door holding member 49. The door 17 preferably has a handle in the form of a trapezoidal plate 50, with its longest edge integrally welded to the door 17 and provided with a finger opening 51.

The resilient door holding member may consist of a flat strap of resilient noncorrodible metal which has a V-shaped spring portion 52 and a pair of laterally projecting arms 53, extending toward the keeper strips. Each arm 53 supports a keeper strip engaging flange 54 which engages the outside of the keeper strip.

The upper flange 54, Figure 3, has an inwardly turned end 55, engaging behind the keeper strip. The lower flange 54 has an inwardly extending U-shaped latching flange 56, and a finger extension 57, that is used to pull the spring off the barrel. The spring must be tensioned at its V-shaped portion 52 to get it on the barrel, and the corners 58 at the end of the V-shaped legs 52 engage the door and hold it shut.

The end plates of the barrels are each provided with a bearing plate 59 or 60, secured to the end of the barrel by means of plastic screw bolts or by integral welding; and the bearing plates have bearing apertures 61 or 62 which are in alignment as to their axes with the apertures 63 that

extend through the end plates and permit passage of the electrical conductors 64, 65.

The side wall unit 13 has its end edges integrally welded into the grooves 14, in the end plates, by use of cement of solvent, as described, and the barrel thus provided is preferably supported by means of hangers 66 and 67, of the same plastic material which is not affected by the acids.

The hangers 66, 67 support cylindrical trunnions 68, which engage in the bearing apertures 61, 62, and the bearing plate 60 may be a relatively large gear of the same material which is used for driving the barrel. This gear is preferably engaged by another acid resistant driving gear 69, which may be secured to the driving shaft of a motor unit.

The hangers 66, 67, depend from a frame 70, which is supported either on the walls of a container for the electrolyte, or the unit may be suspended by a pair of upwardly extending hooks 71, 72, which also serve as conductors for the electric current leading to the conductors 64, 65.

The conductors 64, 65 carry the electrodes 73, 74, which engage the articles being electroplated.

My method of making the electroplating barrels may be briefly summarized as follows:

A rectangular blank is provided of sufficient width to correspond substantially to the length of the barrel, and of sufficient length to cover five sides of the barrel. This blank is provided with V-shaped cuts located at each of the four proposed corners of the barrel on the inside of the side wall unit.

The blank is then bent successively at its proposed corners by holding the blank above a localized source of heat, such as an elongated electrical heating element, the heat of which is further localized by a confining groove. Heat is applied only to the outside of the blank opposite to the V-shaped groove where a bend is to be made; and as soon as the plastic has been suitably heated locally it is bent by hand until the walls of the V-shaped groove hit each other.

The V-shaped grooves being at an angle of 60 degrees, this provides a suitable bend of 120 degrees for a hexagonal barrel. After each bend is made the end edges of the two adjacent sides are secured at an angle of 120 degrees by an angular template which engages over each of the two adjacent sides at the end edge.

The blank is held in the template until the plastic sets by cooling and then the template is removed. When all of the corners have been bent, forming a side wall unit with five sides, the cement or solvent is applied to the inside of the corners, cementing and integrally welding the walls of the former V-shaped groove together; and also cementing or integrally welding a bracing strip in each corner, the bracing strip being complementary to the inside of the corner.

The bracing strips are shorter than the barrel unit, and end plates are provided which are suitably grooved with a groove that is hexagonal in plan and rectangular in cross section, being complementary to the end edges of the preformed side wall unit.

The end walls of the barrel are then placed on the side wall unit with the edges in said grooves, and these parts are integrally welded together by the use of solvent and/or cement. The assembly of the remaining parts of the complete device will be apparent from the preceding description.

When a plastic barrel of heat deformable material is made according to the present method the heat is locally applied and the flat sides are neither strained nor heated except at the corner of the barrel, where the barrel has been made thinner by the formation of a preliminary groove.

Sufficient plastic is left at each corner to serve as a hinge during the bending operation and to keep the side wall unit all one integral piece. Such a barrel has no strains induced by the bending operations, and it is found that such a barrel never changes its polygonal shape, even though subjected to heat below the temperature which might melt the barrel.

Barrels constructed according to the present method may be subjected to heat in the cycle of operations without damage, and have been used for a long period of time under the most adverse conditions without getting round as some of the barrels of the prior art.

While I have illustrated a preferred embodiment of my invention, many modifications may be made without departing from the spirit of the invention, and I do not wish to be limited to the precise details of construction set forth, but desire to avail myself of all changes within the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:

1. An electroplating integral barrel member of heat deformable material consisting of methyl methacrylate adapted to maintain its shape through cycles involving the application of heat, comprising a pair of hexagonal end plates, each end plate having a groove on its inner surface and the said grooves being located adjacent the edges of but spaced from the edges of each end plate and extending parallel to the edges of the end plate, the inner side of each end plate having its face cut away on one side from the periphery to said groove to receive a cover, said end plates being arranged with their grooves facing each other and containing the end edges of an integral hexagonal barrel member of said material having one open side located at the cover side of said end plates, said barrel member having its end edges integrally welded in said grooves of said end plates, the side walls of said barrel being provided with a multiplicity of through apertures for passing electroplating fluid, a cover for the open side of said barrel member engaging the side edges of said barrel member, and means for securing the cover in place, each of the corners of said hexagonal barrel member being provided with a reinforcing complementary filling strip of methyl methacrylate diamond shaped in cross section integrally welded on the inside of said corners to both of the adjacent sheet portions forming the corners thereof substantially throughout the length of said barrel member and terminating at the inside surfaces of said end plates, the projecting apexes of said diamond shaped strips projecting inwardly of the corners to accentuate tumbling action of articles placed within the barrel for electroplating.

2. An electroplating integral barrel member of heat deformable material consisting of methyl methacrylate adapted to maintain its shape through cycles involving the application of heat, comprising a pair of hexagonal end plates, each end plate having a groove on its inner surface and the said grooves being located adjacent the edges of but spaced from the edges of each end plate and extending parallel to the edges of the end plate, the inner side of each end plate having

its face cut away on one side from the periphery to said groove to receive a cover, said end plates being arranged with their grooves facing each other and containing the end edges of an integral hexagonal barrel member of said material having one open side located at the cover side of said end plates, said barrel member having its end edges integrally welded in said grooves of said end plates, the side walls of said barrel being provided with a multiplicity of through apertures for passing electroplating fluid, a cover for the open side of said barrel member engaging the side edges of said barrel member, and means for securing the cover in place, each of the corners of said hexagonal barrel member being provided with a reinforcing complementary filling strip of methyl methacrylate diamond shaped in cross section integrally welded on the inside of said corners to both of the adjacent sheet portions forming the corners thereof substantially throughout the length of said barrel member and terminating at the inside surfaces of said end plates, the projecting apexes of said diamond shaped strips projecting inwardly of the corners to accentuate tumbling action of articles placed within the barrel for electroplating, said barrel having its edges adjacent said cover opening each provided with a longitudinally extending keeper strip of said material secured to the outside of said barrel from end to end terminating at said end plates and projecting from the edges of said cover opening in said barrel.

3. An electroplating integral barrel member of heat deformable material consisting of methyl methacrylate adapted to maintain its shape through cycles involving the application of heat, comprising a pair of hexagonal end plates, each end plate having a groove on its inner surface and the said grooves being located adjacent the edges of but spaced from the edges of each end plate and extending parallel to the edges of the end plate, the inner side of each end plate having its face cut away on one side from the periphery to said groove to receive a cover, said end plates being arranged with their grooves facing each other and containing the end edges of an integral hexagonal barrel member of said material having one open side located at the cover side of said end plates, said barrel member having its end edges integrally welded in said grooves of said end plates, the side walls of said barrel being provided with a multiplicity of through apertures for passing electroplating fluid, a cover for the open side of said barrel member engaging the side edges of said barrel member, and means for securing the cover in place, each of the corners of said hexagonal barrel member being provided with a reinforcing complementary filling strip of methyl methacrylate diamond shaped in cross section integrally welded on the inside of said corners to both of the adjacent sheet portions forming the corners thereof substantially throughout the length of said barrel member and terminating at the inside surfaces of said end plates, the projecting apexes of said diamond shaped strips projecting inwardly of the corners to accentuate tumbling action of articles placed within the barrel for electroplating, said barrel having its edges adjacent said cover opening each provided with a longitudinally extending keeper strip of said material secured to the outside of said barrel from end to end terminating at said end plates and projecting from the edges of said cover opening in said barrel, the projecting edge of one of said keeper strips overlying one edge of said cover, and the projecting edge of the other keeper strip being beveled to clear the opposite edge of said cover.

ANTON M. LAZARO.

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