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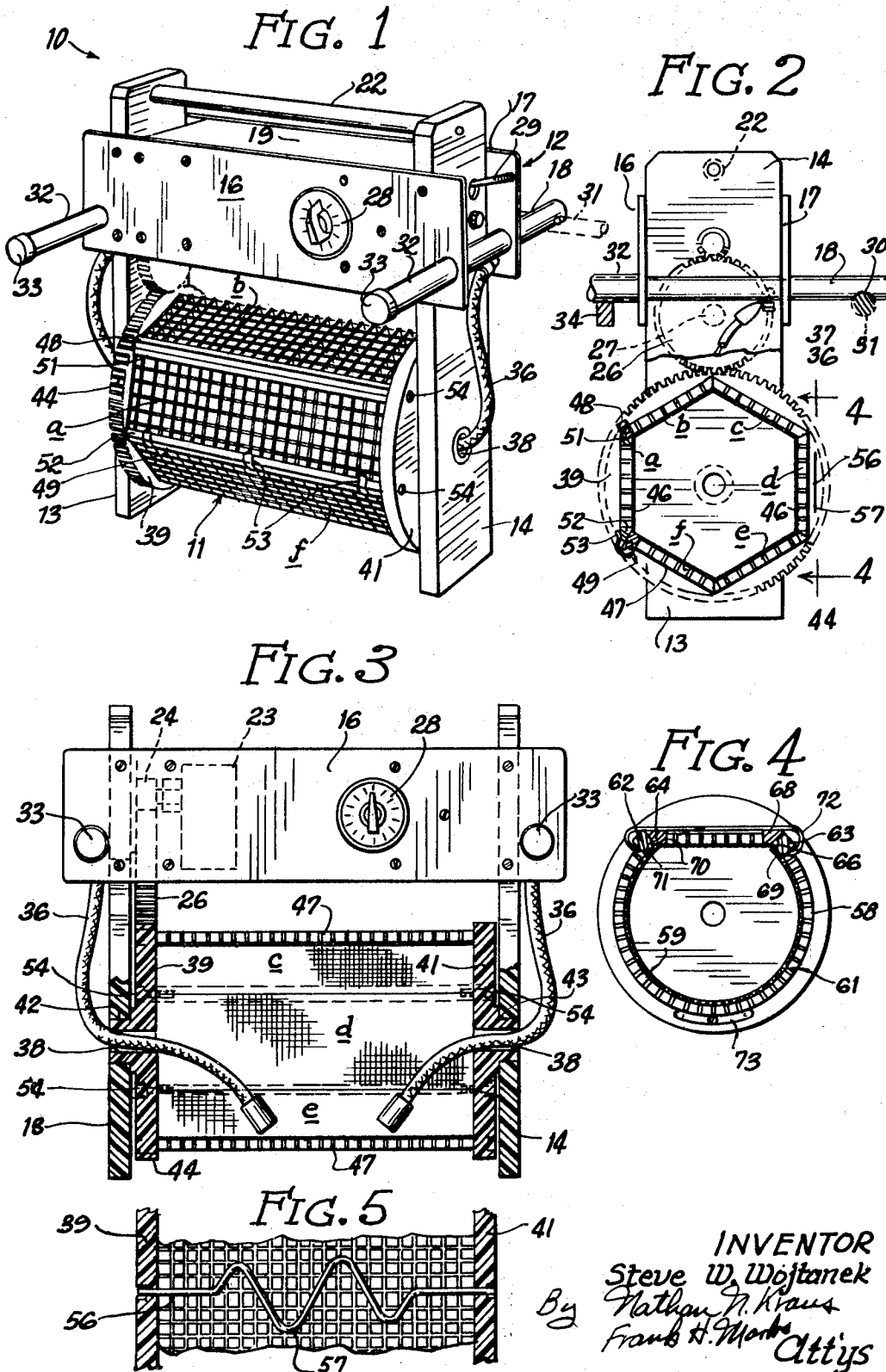
S. W. WOJTANEK

3,498,902

PORTABLE UNITARY ELECTROPLATING ASSEMBLY

Filed March 27, 1967

2 Sheets-Sheet 1



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

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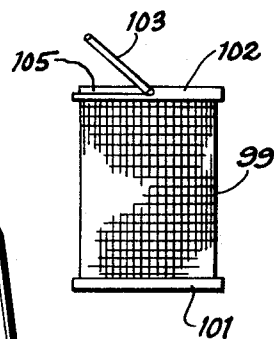
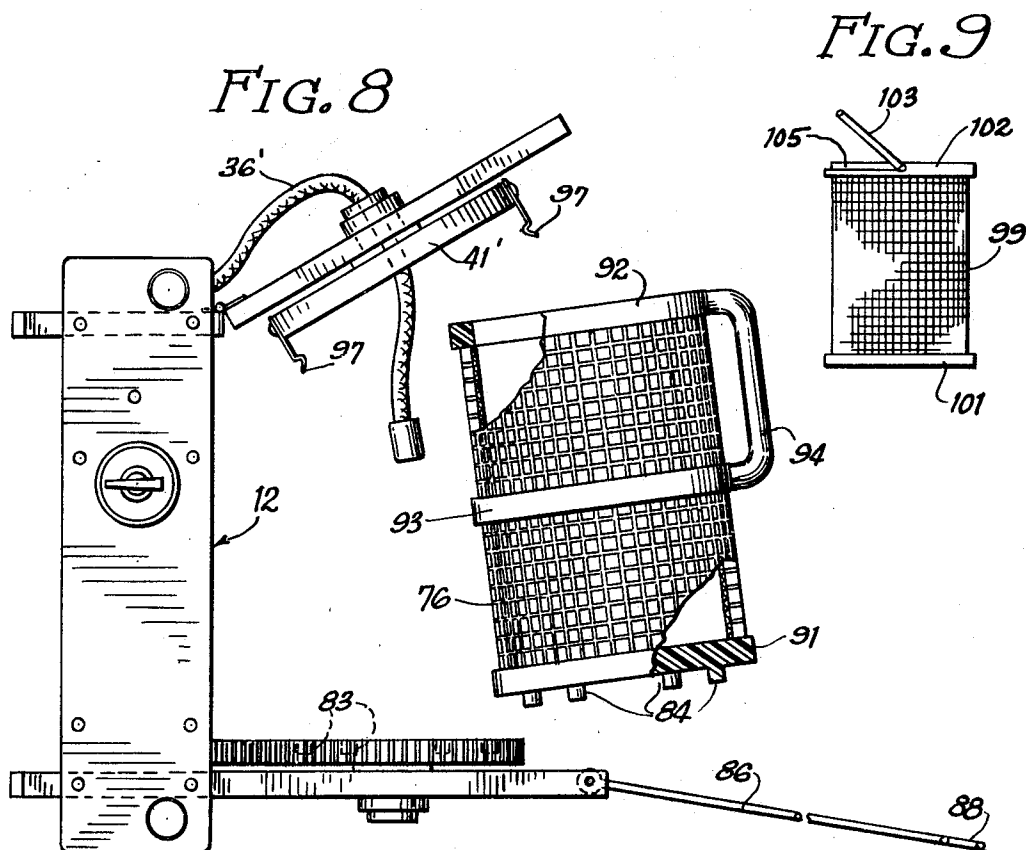
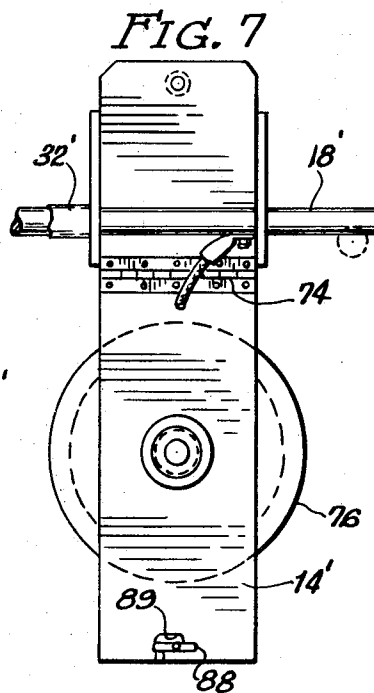
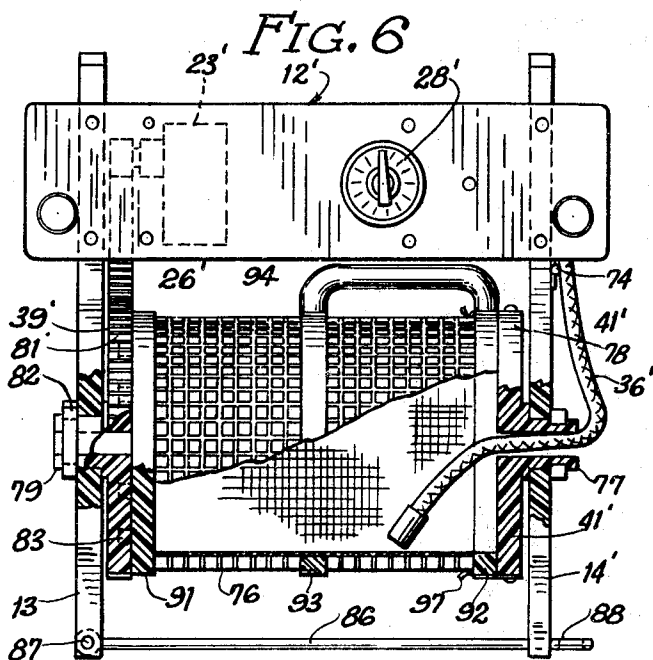
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2 Sheets-Sheet 2



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3,498,902

## PORTABLE UNITARY ELECTROPLATING ASSEMBLY

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

### ABSTRACT OF THE DISCLOSURE

A portable unitary assembly for use with an electroplating tank, said assembly including a frame for rotatably supporting a plating barrel and having means for driving the barrel. The assembly is adapted for ready positioning on the tank for operation and is readily removable therefrom for loading or unloading of articles to be plated, or other treatment of said articles. This permits substantially continuous use of all available positions on the tank resulting in maximum efficiency in the use of the plating equipment.

The plating barrel is mounted in a frame having two downwardly extending legs, one of which is hinged to allow the leg to swing outwardly for quick interchange at different barrels. The barrel also has its own bail. The barrel may also be provided with projections on one end to attach the barrel to a rotating means, usually a gear mounted on one leg at the frame.

This invention relates to a portable unitary assembly of electroplating barrel and support and drive means therefor.

### BACKGROUND OF INVENTION

The present invention is particularly concerned with the provision of improved means for electroplating small articles, for example, electronic components and the like. Such means comprises a portable unitary assembly including a novel barrel supported on novel support means incorporating suitable drive means for rotating the barrel. The unitary assembly is intended to be positioned on a tank containing electroplating fluid in which the barrel is intended to be submerged. The assembly may be removed from the tank and replaced by another like assembly so that the tank and plating equipment may be continuously utilized with a minimum of lost time while barrels are being loaded or emptied, or the parts within a barrel are being further treated.

In a modified embodiment of the invention, the barrel is adapted to be removable from its support means and may be utilized for storing the parts for subsequent operations, such as washing or drying. During such intervals another similar barrel loaded with other parts to be plated may be mounted on the support means which is then operatively positioned on the plating tank, thereby permitting more economical and efficient use of the plating equipment.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of unitary assembly comprising a plating barrel and support and drive means therefor, in accordance with my invention;

FIG. 2 is an end elevational view thereof, partly in cross section;

FIG. 3 is a front elevational view, partly in cross section, of the embodiment illustrated in FIG. 1;

FIG. 4 is a fragmentary elevation view, partly in cross-section, taken on line 4—4 of FIG. 2;

FIG. 5 is a vertical cross-sectional view of a modified embodiment of barrel construction;

FIG. 6 is a front elevational view partly in cross-section, of another modified embodiment, of my invention; FIG. 7 is an end elevational view of the embodiment illustrated in FIG. 6;

FIG. 8 is an elevational view of the embodiment of FIG. 6, rotated 90°, and illustrating the manner in which the barrel may be mounted on the support means; and

FIG. 9 is an elevational view of another modified embodiment of barrel construction.

Referring to the drawings, particularly to FIGS. 1 to 4, the numeral 10 indicates generally a unitary assembly comprising a plating barrel 11 and support and drive means 12 for said barrel. Said support means comprises a pair of vertical members 13 and 14 joined together in spaced relation at their upper ends by a pair of front and rear panels 16 and 17, respectively. Said panels, at each end, extend beyond the members 13 and 14, with corresponding extending portions having registering openings to receive electrical conductor bars 18, hereinafter to be described. The panels 16 and 17 provide the front and rear walls of an enclosure which includes a top wall 19. A bar 22 has its ends anchored in the vertical members 13 and 14 and affords handle means for carrying the assembly 10.

Contained within the enclosure is an electric motor 23 having on its shaft a drive pinion 24 which is in meshing engagement with an intermediate idler gear 26 rotatably supported on a stub shaft 27 anchored in the member 13. Also contained within the enclosure is a conventional adjustable timing mechanism 28 in electrical circuit with the motor 23. Said timing mechanism includes a dial mounted on the outer wall of the panel 16 and a rotatable knob adapted to be rotated to adjust the device for a desired time interval.

A switch, not shown, is provided with an actuating lever 29 which extends through an aperture in the member 14, the switch being in electrical circuit with the timing device 28 and motor 23 for controlling the same.

The conductor bars 18 are formed preferably of tubular copper sections, with the rear end portion of each bar being machined as at 30 to snugly engage and effect complete electrical contact with the cylindrical bus bar 31 suitably supported above the tank, not shown, containing the plating fluid. The forward end portion of each conductor bar 18 is covered by a suitable insulating sleeve 32 having an insulating cap 33. The insulated portions of the conductor bars 18 are adapted to rest on a suitable support member 34 provided on the electroplating tank. A conventional insulated flexible electrical conductor or dangle 36 is secured to each of the conductor bars 18 by a lug 37, with each of the conductors passing through a respective axial opening 38 of the plating barrel 11, hereinafter to be described. The current supply for the motor 23 and timer 28, of course, is independent of the current carried in the bus bar 31 utilized in the plating function.

The structural members, hereinabove described, including the gears 24 and 26 and insulating sleeves 32 are preferably formed of polypropylene or any other suitable material which is inert to the action of the plating fluids.

The barrel, indicated generally by the numeral 11, comprises a pair of end disc members 39 and 41, formed of polypropylene or other suitable material and having axial shaft portions 42 and 43 respectively, received in bearing apertures provided in the members 13 and 14 respectively. Each of the end discs 39 and 41 is provided with an axial opening 38 through which pass the conductors 36. The disc 39 is provided on its periphery with gear teeth 44 adapted to engage with the teeth of the idler gear 26. The body of the barrel 11 may be of any suitable cross-sectional form, that illustrated being hexag-

onal in form. Said body is formed or a plurality of panels *a*, *b*, *c*, *d*, *e* and *f*, each of which comprises a sheet of woven fabric 46 of any suitable inert material which is unaffected by electroplating fluids, said fabric may be woven from polypropylene filaments and may have any desired size mesh, depending upon the character of the articles being plated, so as to avoid penetration of any parts of the articles into the mesh openings. Preferably, the fabric sheet 46 of five of the panels *b*, *c*, *d*, *e* and *f* should be integral so as to afford a continuous surface, thereby to avoid the possibility of any of the articles being plated from lodging in any joint between adjacent panels. Suitably bonded to the woven fabric 46 are five rectangular grid sections 47 formed of a suitable inert plastic material, such as acrylic resin. The panel structure is similar to that described in my co-pending application Ser. No. 563,517, filed July 7, 1966.

Panels *b* and *f* are provided with longitudinally extending solid rigid edge members 48 and 49, respectively, shaped in cross-section substantially as illustrated in FIG. 2. Said members are formed of polypropylene, acrylic resin or any other suitable material and are suitably bonded to the fabric 46 and respective grid sections 47.

The removable closure panel *a* includes upper and lower longitudinal rigid edge members 51 and 52, respectively, shaped in cross-section substantially as illustrated in FIG. 2, and adapted to cooperate with the edge members 48 and 49, respectively. One or more spring clamps 53 mounted on edge member 49 serve to secure the closure panel *a* in closed position.

The barrel components are held in assembled relation by screws 54 which secure corresponding ends of the edge members 48 and 49 to respective disc members 39 and 41. Additionally, one or more tie rods 56, shaped substantially like that illustrated in FIG. 3, and having threaded ends passing through registering openings in the end disc members 39 and 41 serve to clamp said disc members to the body portion of the barrel. Preferably, the tie rod 56 is provided with an intermediate sinuous portion 57 or a suitable loop to automatically compensate for axial expansion and contraction of the barrel which occurs as a result of its being exposed to differentials in temperature between the plating fluid in the tank and the ambient air, as when the barrel is removed from the plating tank. As seen in FIG. 2, the sinuous portion 57 of the tie rod 56 is adapted to lie flat against the outer surface of one of the panels. The tie rods, of course, are secured by nuts which effect clamping of the body panels between the end disc members 39 and 41 to provide a rigid structure. I have found that tie rods and nuts formed from titanium metal are highly suitable for the instant application. This metal is unaffected by plating fluids and provides the desirable machining, forming and service characteristics required.

The particular structural arrangement above described permits salvaging or the relatively costly end disc members 39 and 41, in the event that the fabric or grid of the panels is damaged or worn through, as a result of extensive use. Thus, it will be apparent that only the body portion of the barrel need be replaced should it become defective.

In use, a plurality of unitary assemblies 10, as above described, is employed in connection with a plating tank, the said assemblies, when on the tank, each being supported by their respective bars 18, at their rearward ends, on a bus bar 31, and, at their forward ends, on a support member 34, both bar 31 and member 34 extending longitudinally of the tank. In such position, the barrel 11 is completely submerged in the tank fluid, while the super structure of the support and drive means 12, of course, is disposed above the level of the fluid.

The barrel 11 is loaded through the opening thereof with parts to be plated while the assembly is removed from the plating tank. After loading, the closure panel *a* is replaced and locked in closed position and the entire assembly 10 may then be lifted by the carrying bar 22

and moved to operative position on the plating tank, as above described. Upon effecting a separate connection with a source of electrical current for the motor 23 and timer 28, through a conventional plug and socket arrangement, the assembly 10 is rendered operative. The timer 28 is adjusted to record a desired time interval, the end of which is signaled by suitable audible or visual means to inform the operator that the plating interval is completed. It will be apparent that loading or unloading of the barrel, or other processing of the parts within the barrel, is intended to be effected while the assembly is removed from the plating tank and, during such interval, a different assembly may occupy a particular space on the plating tank for plating a different load of articles. Thus, maximum efficiency in the operation of a plating tank is achieved, with each available space on the tank being substantially continuously occupied by an assembly in operating condition.

It will be understood that while the barrel 11 is a permanent compound of the unitary assembly 10, in the event the barrel 11 becomes defective, it may readily be replaced by a substitute barrel without any difficulty. Thus, a user may salvage the major part of the assembly, with a minimum of cost.

In the modified embodiment illustrated in FIG. 5, the body 58 of the barrel is generally cylindrical in shape, being formed of a unitary fabric section 59 bonded to a unitary grid section 61. The opposed longitudinal edges of the body are spaced apart and are provided with solid rigidifying edge members 62 and 63. The edge member 62 includes a longitudinally extending semi-cylindrical bead 64 while the opposite edge member includes a corresponding longitudinally extending recess 66. A removable closure member 67 which may be planar or arcuate in shape includes a panel which like the body 58 is formed of a fabric section bonded to the grid section and which is provided along a longitudinal edge with a solid rigid edge member 68 having a bead 69 adapted to snugly engage in the recess 66 and having along the opposite edge a ridge member 70 having a recess 71 adapted to snugly receive the bead 64. A removable spring clamp 72, shaped substantially as shown, serves to secure the closure member 67 to the body.

The body 58 is secured to the end disc members 39 and 41 by screws, and one or more tie rods 73, similar to the tie rod 56, serve to clamp the body 58 to said end disc members 39 and 41, in the same manner, as hereinabove explained. Preferably, the tie rod 73, in this instance, is transversely arcuate in form, as illustrated.

Referring to FIGS. 6 through 8 wherein is shown another modified embodiment of my invention, the support and drive means for the barrel is substantially identical to that hereinbefore described and, accordingly, corresponding primed numerals will be employed to identify corresponding parts. In the modified embodiment the vertical member 14' is formed in two sections connected by a hinge 74 so that the free end of the member 14' may be swung outwardly, as illustrated in FIG. 6, to afford clearance for the positioning of the barrel 76 hereinafter to be described. A disc member 41' provided with an axial stub shaft 77 is rotatably supported in an aperture provided in the member 14' and is secured against axial displacement by a locking ring 78. The disc member 41' and shaft 77 are axially bored to receive a conductor 36' which dangles into the barrel 76. The disc member 39' similarly is provided with a bearing aperture rotatably receiving the stub shaft 79 and is provided on its periphery with gear teeth 81 adapted to mesh with the idler gear 26'. A locking ring 82 in engagement with the stub shaft 74 affords means for preventing axial displacement of the disc member 39'. Said disc member is provided with a plurality of sockets 83. It will be noted that the disc members 39' and 41' constitute permanent parts of the support means 12', although each may be removed from the support means for replacement, if desired. A locking bar 86 is pivotally secured to the lower end of

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the vertical member 13', as at 87, while its distal end may be bent in the form of a loop 88 to provide a shoulder cooperating with bayonet slot 89 in the vertical member 14', as illustrated clearly in FIGS. 6 and 7 to lock the barrel 76 in operative position.

The barrel, 76, includes a base 91 provided with a plurality of projections 84 adapted to engage in the recesses 83 provided in the disc member 39' to provide driving engagement for the barrel. The barrel 76 includes top and intermediate annular rings 92 and 93, respectively, integrally formed with a handle portion 94. The cylindrical wall 96 of the barrel is comprised of a woven fabric bonded to a rigidifying grid, similar to that hereinbefore described.

The barrel 76 is intended to be supported on the support means 12' in the manner illustrated in FIG. 6, the disc member 41' affording a closure member for the open end of the barrel. As seen clearly in FIGS. 6 and 8, the disc member 41' may be provided with a plurality of circumferentially spaced resilient clamping elements 97 or other suitable means which are adapted to engage the annular ring 92 of the barrel to secure the barrel to the disc member 41' for effective closure and proper alignment of the barrel in relation to the disc member 41'. When the barrel is disposed in the operative position illustrated in FIG. 6 the conductor 36' which is passed through the axial aperture in the disc member 41' dangles into the interior of the barrel.

The last described modified embodiment, in use, affords somewhat more flexibility than that first described. Here the entire assembly may be moved from an operative position on the plating tank to a place remote therefrom for loading of a batch of articles to be plated, similarly as in the first described embodiment. Additionally, the barrel 76 is easily removable from the supporting means 12' so that another similar barrel may be substituted therefor. Thus, it is possible to have a plurality of barrels 76 already loaded with batches of articles to be plated, standing by prepared for mounting on the support means 12' which is then readily positioned on the plating tank, in the manner hereinbefore described. Correspondingly, a barrel 76 may be readily removed from the support means, immediately after a plating interval as illustrated in FIG. 8, and another barrel containing a new batch of articles to be plated may be substituted therefor, so that the assembly may be returned to operative position, as soon as possible, thereby minimizing the inoperative time of each assembly so as to utilize the plating tank and related equipment to maximum advantage. It will be understood that if additional operations are required to be performed on the plated articles, such as washing, rinsing and other operations, these may be effected while the articles are still contained within the barrel, thereby minimizing handling of the articles.

FIG. 9 illustrates another modified barrel construction in which the body 99 is cylindrical and is provided with a closed bottom 101. The top of the barrel is open and is surrounded by an upper rim 102 which is recessed for

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about one-half of its diameter as at 105, to accommodate a bail 103 pivotally anchored in the recess. It will be understood that the bail 103 when received in the recess 105 affords with the balance of the rim 102 a substantially continuous planar end surface to engage and seal against the disc member 41', in the manner illustrated in FIG. 4. It will be understood that intermediate reinforcing ribs, not shown, may be provided on the barrel body 99.

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.

What is claimed is:

1. A portable unitary assembly for use with an electroplating tank comprising, a support frame having a pair of spaced depending legs with one of said legs being fixed and the other hinged, a first disc member rotatably supported on said fixed leg, a second disc member rotatably supported on said hinged leg, said disc members being coaxially disposed when said leg members are in parallelism, a barrel having a closed end and an open end and adapted to contain articles to be plated, said barrel being removably supported between said disc members and in coaxial registration therewith with one of said disc members providing a closure for the open end of said barrel, said hinged leg being swingable out of parallelism to permit removal or insertion of the barrel between said legs.

2. The invention as defined in claim 1 in which said first disc member and the closed end of said barrel have interengaging means to effect simultaneous rotation of said barrel with said disc member.

3. The invention as defined in claim 1 including means for releasably tying said legs together.

4. The invention as defined in claim 1 in which the barrel includes a carrying handle.

5. The invention as defined in claim 1 including a carrying bail adjacent the open end of said barrel.

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JOHN H. MACK, Primary Examiner

W. B. VANSISE, Assistant Examiner

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