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H. L. HENIG

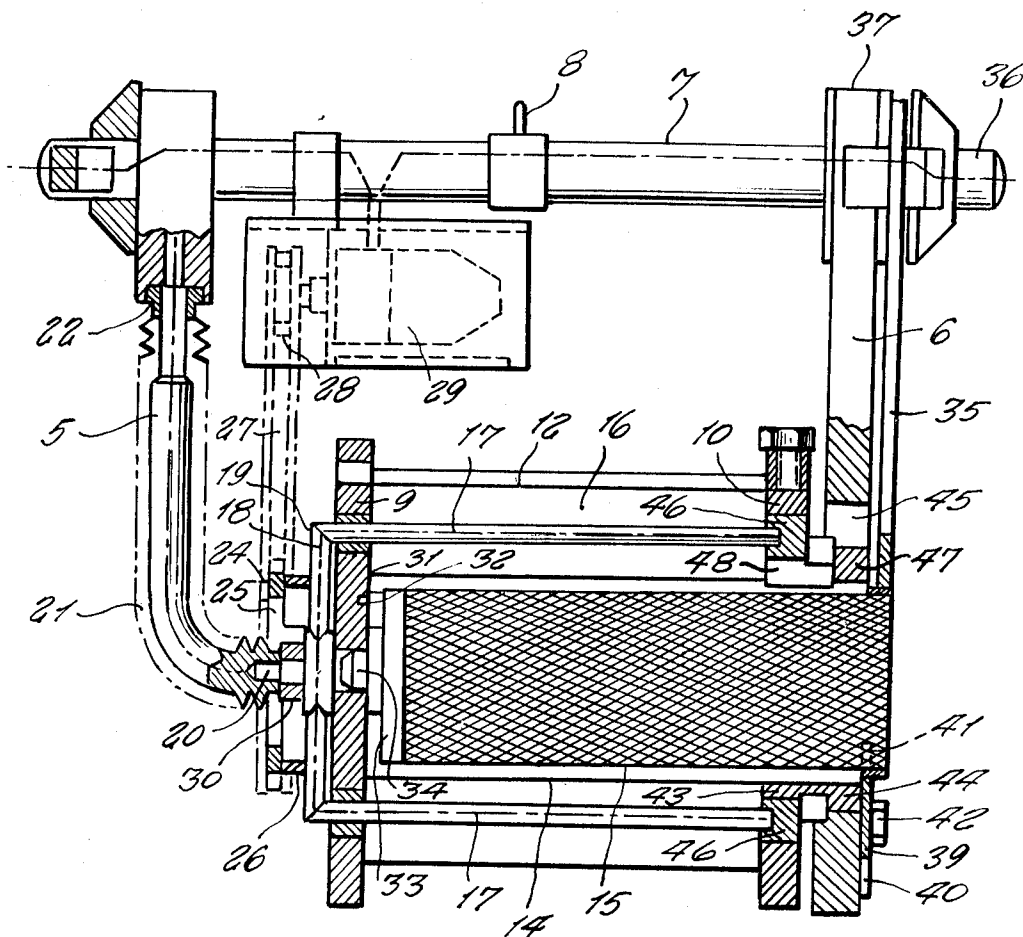
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PLATING BARREL ASSEMBLY

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Fig. 1



INVENTOR
HANS HENIG
BY Joseph F. Hallon
ATTORNEY

March 21, 1972

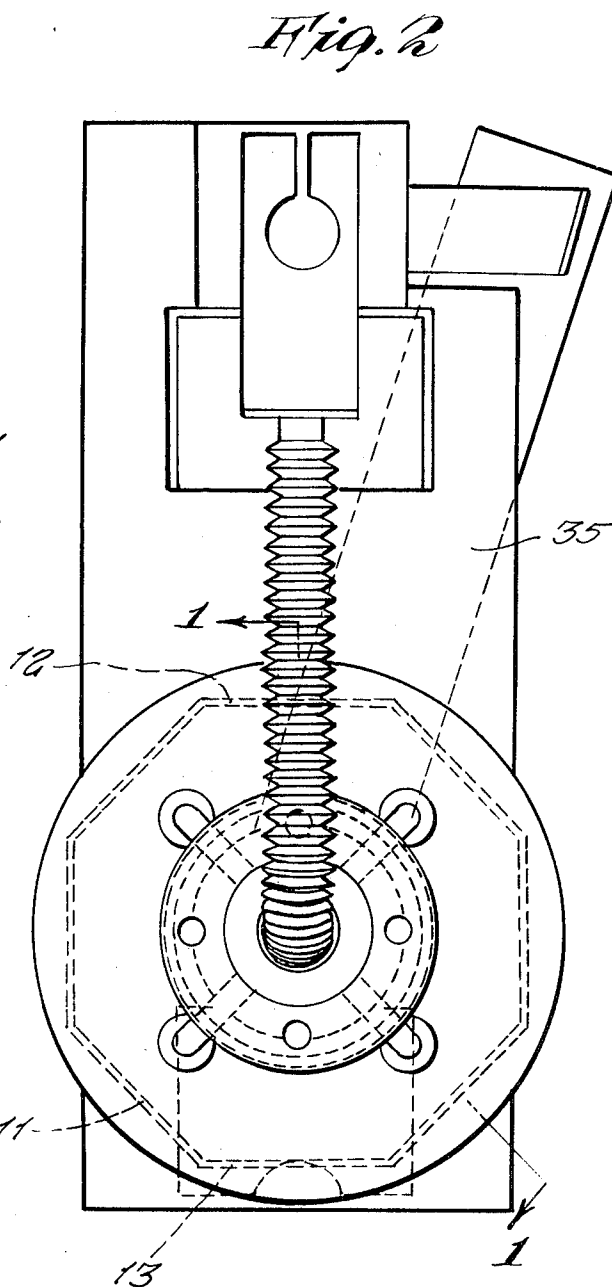
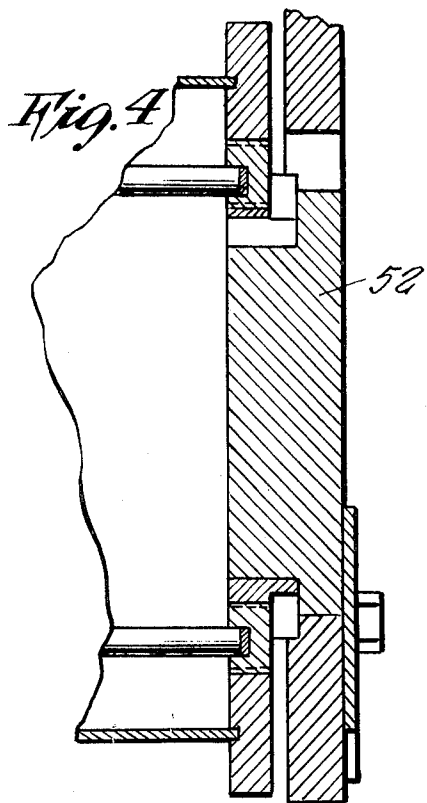
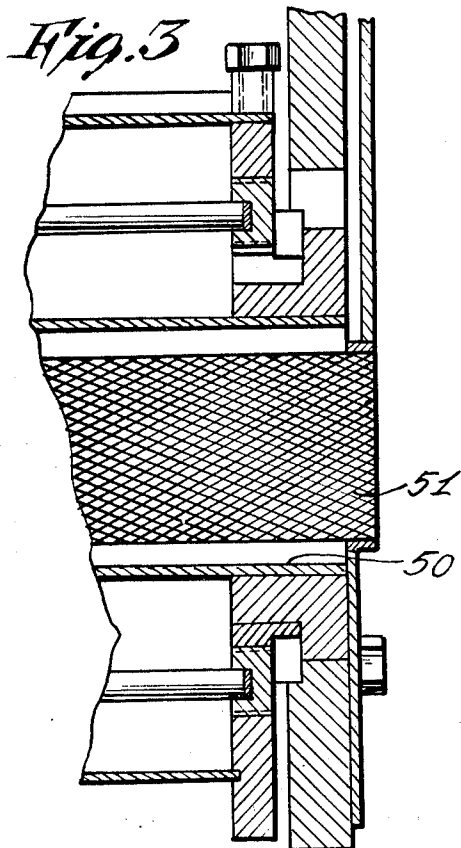
H. L. HENIG

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2 Sheets-Sheet 2



INVENTOR
HANS HENIG
BY *Joseph F. Adlon*
ATTORNEY

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PLATING BARREL ASSEMBLY

Hans L. Henig, Nuremberg, Germany, assignor to Schering AG, Berlin and Bergkamen, Germany

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12 Claims

ABSTRACT OF THE DISCLOSURE

A plating barrel is suspended from hangers one of which has an opening coaxial with a corresponding opening in one end wall of the barrel. A tubular perforated partition is coaxially arranged in the barrel and conformingly received in the openings of the end wall and of the hanger for providing support to the barrel at one axial end. The other axial barrel end is supported by means of four contact rods which axially pass through the other end wall into the annular compartment between the barrel shell and the partition. The rods are connected by a coaxial spider outside the barrel cavity, and the spider is journaled in the other hanger which is metallic. The barrel is turned by a chain trained over a sprocket on the spider. The capacity of the annular plating compartment can be changed by replacing the partition by another one of different diameter. A perforated, tubular, insoluble anode of smaller diameter than the partition is coaxially arranged in the same.

SUMMARY OF THE INVENTION

This invention relates to the bulk surface treatment of small conductive objects, and particularly to an improved horizontal plating barrel.

The cathode current efficiency and the properties of the electrodeposits obtained in a conventional plating barrel are affected by the amount of objects plated and by their configuration. Each conventional barrel operates best in a narrow load range with any specific type of object. If the load is heavier, the plating is slow and losses of electrodeposited metal by abrasion and dissolution due to bipolar effects are relatively high. If the load is too light or small, much metal is deposited on the cathode contacts of the barrel and thereby lost, and additional metal is lost by dissolution from plated objects not being held firm and continuous in contact with the cathode because of the light weight of the load.

The primary object of the invention is the provision of a barrel which can be adapted to optimum performance with loads of different bulk in a very simple manner.

SUMMARY OF THE INVENTION

According to this invention, a plating barrel of the type described is provided with a set of interchangeable partitions each of which may be mounted in the barrel cavity in a position in which the mounted partition and the shell of the barrel define therebetween a plating compartment of annular section about the axis of rotation of the barrel. The several partitions differ from each other in such a manner that their cross-sectional area at right angles to the barrel axis is different in the mounted position, whereby the radial width of the plating compartment may be varied by interchanging the partitions.

The partitions are preferably cylindrical perforated tubes axially coextensive and coaxial with the barrel shell when in the mounted condition. The partition may be used for rotatably supporting one end of the barrel in a hanger if the hanger and an adjacent end wall of the barrel are

formed with axially aligned openings in which respective annular bearing elements of the partition are conformingly received.

The exact nature of this invention as well as other objects and advantages thereof will be readily apparent from consideration of the following specification relating to the annexed drawing.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing forming a preferred embodiment of the invention,

FIG. 1 shows a plating barrel of the invention in front-elevation section taken on the line 1—1 in FIG. 2;

FIG. 2 shows the barrel of FIG. 1 inside elevation;

FIG. 3 shows the same barrel in fragmentary front elevation but equipped with a partition different from that of FIG. 1;

FIG. 4 illustrates the barrel without partition and equipped with a closure in a view corresponding to that of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIGS. 1 and 2 herein is seen a plating barrel assembly whose normally stationary structure includes a heavy metallic hanger 5 and a plate-shaped plastic hanger 6 depending from a cross-bar 7 conductively connected to the hanger 5 and having exposed ends for engagement with non-illustrated current carrying saddles on a plating tank, as is customary. An eye 8 on the bar 7 permits the barrel to be moved by a traveling hoist.

The plating barrel proper has radial end walls 9 and 10 and a perforated axial shell 11 of regular octagonal cross section and consists preferably of plastic. Two diametrically opposed panels 12, 13 of the shell 11 may be removed by sliding them axially through apertures in the end wall 9, and the barrel may be filled or emptied through the openings so formed in the shell.

The space within the shell 11 is divided into an outer compartment 16 of annular cross section and an inner space near the axis, by a perforated, plastic partition 14 releasably mounted in the barrel. The partition 14 is a generally cylindrical tube coaxial with the barrel shell 11. An internal anode 15 is coaxially arranged with the partition 14. It mainly consists of a screen of cylindrical shape spacedly adjacent the partition 14.

Four metallic contact rods 17 extend through the end wall 9 into the compartment 16. They are parallel to the barrel axis and equiangularly spaced about the axis. One end of each rod 17 projects axially outward from the wall 9, and the projecting ends are connected by a metal spider centered in the barrel axis to which they are releasably fastened in a manner not illustrated. The metallic surfaces of the spider and of the projecting bar ends are coated with an insulating stop-off 19. A trunnion-like bearing pin 20 on the spider 18 is partly covered by a ring 30 of insulating material, and otherwise rotatably received in a conforming opening of the hanger 5.

An accordion-pleated rubber sleeve 21 is sealingly attached to the ring 30 and loosely envelops the hanger 5. The sleeve 21 turns with the barrel and protects the hanger 5 against contact with the electrolyte. The bar 7, hanger 5, spider 18, and rods 17 connect conductive work pieces in the barrel compartment 16 with the negative pole of a rectifier or generator when the barrel is used for plating. The anode 15 consists of a metal not significantly attacked by the electrolyte titanium being suitable in many conventional plating solutions. This anode normally is connected to the positive pole of the current source, as will presently be described.

A sprocket 25 is coaxially attached to the spider 18

by screws 24, a spacer ring 26 being axially interposed between the sprocket and the spider. A plastic drive chain 27 is trained over the sprocket 25 and over a sprocket 28 on the output shaft of an electric motor 29 suspended from the bar 7. The sprockets may be replaced by pulleys, and the chain by a belt. The left side of the barrel, as viewed in FIG. 1, is thus supported on the spider 18 which also transmits rotary movement to the barrel from the motor 29.

The inner face of the end wall 9 has two concentric circular grooves 31, 32. A free circular rim of the partition 14 is releasably received in the groove 31 of greater diameter. The groove 32 is empty in the condition of the apparatus shown in FIG. 1. The left end of the auxiliary anode 15 is supported on a disc-shaped conforming, plastic plug 33. A central pin 34 on the plug is journaled in a coaxial aperture of the end wall 9. The partition 31 and the anode 15 may be released from the wall 9 by axial sliding movement to the right.

The right end of the anode 15 projects axially outward through oversized openings carries a flat and rigid bar 35 of the same metal which extends upward above the electrolyte and is releasably attached to the hanger 6 in a slot of horizontal arm 37 of insulating material. A contact pin 36 on the arm 35 is normally connected to the current source by a matching clip and cable. The arm 35 and the right end of the anode 15 are supported by a plate 39 reversibly mounted on the hanger 6 by end wall 10 and the hanger 6. The projecting portion of the anode 15 screws 42. Opposite edges of the plate 39 have crescent-shaped recesses 40, 41. The upwardly open recess 41 conformingly cradles anode 15, and the bar 35 prevents the anode from being withdrawn from the plating barrel through the hanger 6 unless the bar is turned about the barrel axis so as to be released from the arm 37. The radius of curvature of the recess 40 is smaller than that of the recess 41.

The right end of the partition 14 carries two axially spaced bearing rings 43, 44. The inner ring 43 is movably received in the central opening of the end wall 10. The outer ring 44 is similarly received in the ring segments 47 of hanger 6 square cross section are partly received in a groove of the hanger 6 opposite the end wall 10, and are circumferentially spaced from each other as needed to permit axial insertion and removal of the contact rods 17.

A key 48 is normally secured in associated grooves of the ring 43 and of the end wall 10 so that the partition 14 rotates with the barrel. An opening 45 in the hanger 6 can be axially aligned with the contact rods 17 by turning the barrel, and permits replacement of the rods and recovery of metal cathodically deposited on the same. The rods are received in blind bores of plugs 46 threadedly mounted in the end wall 10 and pass axially through similar plugs in the end wall 9.

During normal operation of the barrel shown in FIGS. 1 and 2, the bulk material to be plated is introduced into the compartment 16 through an opening temporarily uncovered by removal of one of the panels 12, 13. The barrel assembly is then transferred by a hoist to the plating tank, and the ends of the bar 7 are set in cathode contact saddles on the tank, as is conventional. The pin 36 is connected to the positive pole of the current source, and the motor 29 is energized by means of a connecting cable, conventional in itself and not shown.

Metal is deposited on the objects in the barrel from the electrolyte, and the latter may be replenished with metal from soluble anodes hung in the tank from an anode bar. If so desired the solution may be replenished by adding salts of the metal and the insoluble anode 15 may provide the only connection between the electrolyte and the positive pole of the current source. The anode 15 and the plug 33, in effect, constitute a basket which may be filled with anode scrap or balls of the metal to be plated and closed by insertion of a cover in the open

right end in a manner obvious from FIG. 4. Necessary measures may be taken to apply different positive potential to the anode 15 and to external anodes.

If it is desired to plate a batch of parts greater than can be accommodated in the compartment 16, the partition 14 and the anode 15 are replaced. For this purpose, the flat bar 35 is released from the arm 37, swung out of the notch in the arm, and pulled axially to thereby withdraw anode 15. The plate 39 is removed next, and the partition 14 is withdrawn thereafter. The ring segments 47 axially abutting against the end wall 10 provide adequate support for the right end of the empty plating barrel at this stage.

A cylindrical partition 50 of smaller diameter may then be inserted axially FIG. 3 and its leading circular rim inserted in the afore-mentioned circular groove 32. The plate 39 is next attached with its smaller recess 40 facing upward, and a tubular, perforated anode 51 of smaller diameter than the anode 15 carrying a bar 35 and equipped with a non-illustrated plug corresponding to the plug 33 and with a pin 34 is attached to the arm 35 and inserted through the partition until the pin 34 engages the central opening in the end wall 9 and the outer surface of the anode is cradled in the recess 40.

The anode 51 is locked in place by inserting the free end of the bar 35 in the slot of the arm 37, and there securing the bar. The diameter of the anode 51 is chosen such that the radial spacing of the partition 50 from the anode 51 is the same as that of the partition 14 from the anode 15, and as small as is consistent with proper electrolyte flow.

The afore-described barrel assembly may also be used in a conventional manner without a partition of an internal anode by removing the partition and anode, as described above, and by sealing the openings in the end wall 10, and the hanger 6 by means of a cover 52 of stepped cylindrical shape which is retained in its sealing position by the panel 39, as is shown in FIG. 4 the cover provides a bearing for the associated barrel end. The entire space within the barrel is then available for loading with goods to be plated.

The barrel is preferably emptied of plated articles by removing both panels 12, 13, positioning the barrel so that the two openings in the shell 11 are located, one above the other, and flushing the articles from the barrel by a stream of water discharged from a hose introduced from above.

While the barrel assembly of the invention has been described with reference to its use in electroplating small conductive objects, those skilled in the art will find other applications to which the assembly obviously lends itself. Its use in electrocleaning in a detergent solution by means of direct or alternating current, or in the anodizing of aluminum articles is specifically contemplated. The necessary minor modifications are too obvious to require explicit description. It should be understood therefrom that the terms "cathode contact rod" and "anode," as used herein do not limit the illustrated embodiment to specific connections between a current source and the illustrated apparatus, such connections and the current source itself not being directly relevant to the invention.

What is claimed is:

1. In a barrel assembly for the bulk surface treatment of small conductive objects, the assembly including a barrel having a perforated tubular shell having an axis, two end walls axially bounding a cavity in said shell, hanger means for suspending said barrel in an electrolyte, while said axis extends in a horizontal direction drive means for rotating said barrel about said axis and conductive means for electrically connecting small conductive objects in said cavity with one pole of a source of electric current, the improvement which comprises: an interchangeable partition member substantially coaxial with said barrel in said cavity; and mounting means for mounting said partition member in said cavity in a respective position in which the mounted partition member of said shell defines there-

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between a compartment of annular cross section about said axis, said partition member being removable and reinsertable through said mounting means while retaining said barrel in assembled structural configuration, said mounting means comprising arm means carried by said partition member at one end thereof, and engageable with said hanger means at the other end thereof, supporting means at said end of said partition member for supporting said partition member and said arm means, and end wall means substantially at said end of said partition member and surrounding said partition member, said partition member being interchangeable with other partition members of differing cross sectional area at right angles to said axis, whereby the radial width of said compartment may be varied by interchanging said partitions to vary the capacity of said barrel assembly for treating said conductive objects.

2. In an assembly as set forth in claim 1, said partition being substantially axially co-extensive with said shell.

3. In an assembly as set forth in claim 2, said partition members being of cylindrically tubular shape and substantially, each partition member being formed with a multi-tially coaxial with said shell when in the mounted condition of radial perforations therethrough.

4. In an assembly as set forth in claim 3, one of said end walls being formed with an opening therethrough, said mounting means including annular bearing means on an axially terminal portion of each of said partition members, said bearing means being conformingly received in said opening of the end wall in the mounted condition of said partition member.

5. In an assembly as set forth in claim 4, said hanger means including a hanger member formed with an opening therein axially aligned with the opening of said one end wall, and additional annular bearing means on said axially terminal portion, said additional bearing means being conformingly received in the opening of said hanger member in the mounted condition of said partition member.

6. In an assembly as set forth in claim 5, said partition members being dimensioned for free axial movement through said openings in said one end wall and in said hanger member.

7. In an assembly as set forth in claim 6, the other one of said end walls having a face directed toward said cavity, said face being formed with a plurality of annular grooves about said axis, and said partition members having respective axially terminal rim portions conformingly received in respective grooves of said face in the mounted condition of said partition members.

8. In an assembly as set forth in claim 3, a tubular electrode coaxially secured in said cavity, the outer diameter

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of said electrode being smaller than the inner diameter of one of said partition members simultaneously mounted in said cavity by said mounting means, and conductor means for connecting said electrode to another pole of said source of electric current.

9. In an assembly as set forth in claim 8, said simultaneously mounted partition member being axially open adjacent one of said end walls, said conductor means including a rigid member attached to said electrode adjacent one of said end walls, said conductor means including a rigid member attached to said electrode adjacent said one end wall and upwardly extending beyond said barrel, and fastening means releasably fastening said rigid member to said hanger means and thereby axially securing said electrode in said cavity.

10. In an assembly as set forth in claim 9, trunnion means on an axial end portion of said electrode remote from said rigid member, said trunnion means being journaled in the other end wall.

11. In an assembly as set forth in claim 3, said conductive means including a plurality of rod members of conductive material axially extending through one of said end walls, into said compartment in circumferentially spaced relationship, a spider member conductively connecting said rod members outside said cavity, said hanger means including a hanger member of conductive material, said spider member being journaled in said hanger member.

12. In an assembly as set forth in claim 11, said drive means including pulley means coaxially mounted on said spider member and axially spaced from said one end wall, a flexible motion transmitting member extending in a continuous loop being trained over said pulley means, and motor means for moving said motion transmitting member.

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JOHN H. MACK, Primary Examiner

R. J. FAY, Assistant Examiner

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