



(19) **United States**

(12) **Patent Application Publication**
Weng

(10) **Pub. No.: US 2002/0134673 A1**

(43) **Pub. Date: Sep. 26, 2002**

(54) **ANODIZING BARREL WITH PUMP ATTACHED**

(57)

ABSTRACT

(76) Inventor: **Evans Weng, Taipei City (TW)**

Correspondence Address:
ROSENBERG, KLEIN & LEE
3458 ELLICOTT CENTER DRIVE-SUITE 101
ELLICOTT CITY, MD 21043 (US)

(21) Appl. No.: **09/811,596**

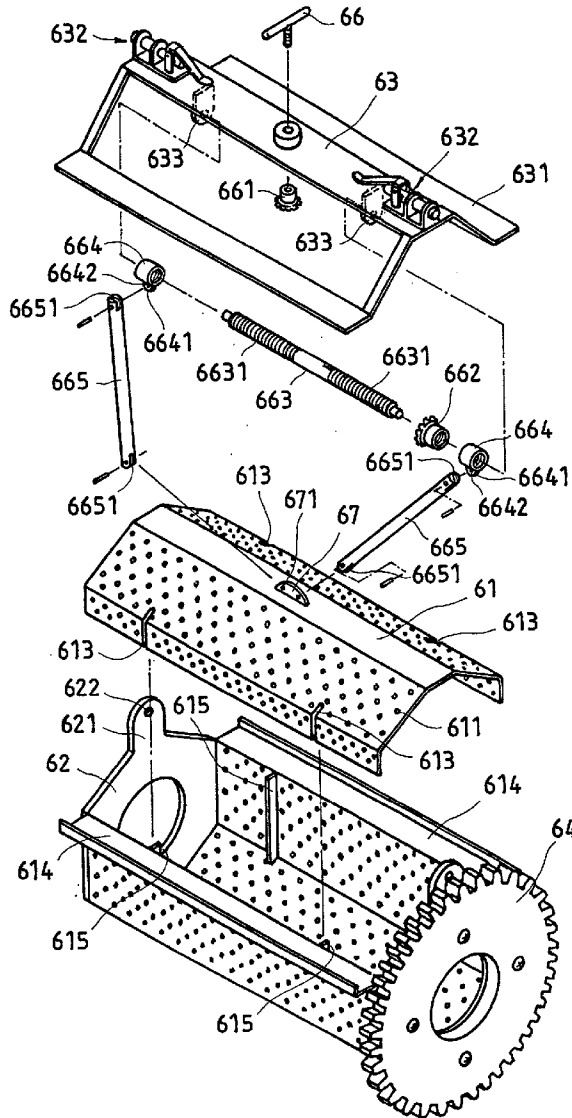
(22) Filed: **Mar. 20, 2001**

Publication Classification

(51) **Int. Cl.⁷ C25D 17/00**

(52) **U.S. Cl. 204/213; 204/284; 204/275.1**

The present invention relates to a anodizing barrel with pump attached and, more particularly to such a barrel that can be adjusted to change the desired volume subject to the processing flow when having small aluminum parts to receive an anodization treatment, enabling the anodization treatment to be performed in the same electroplating drum. When receiving pre-treatment or post-treatment, regular aluminum parts require a relatively larger space, at this time the full space of the drum is used. However, during anodization, the parts must be closely attached together. At this time, the volume of the inside space of the drum can be compressed to squeeze the aluminum workpieces against one another. Further, the motive of the drum is used to drive the pump head connected thereto, keeping electroplating solution to be well circulated through the drum.



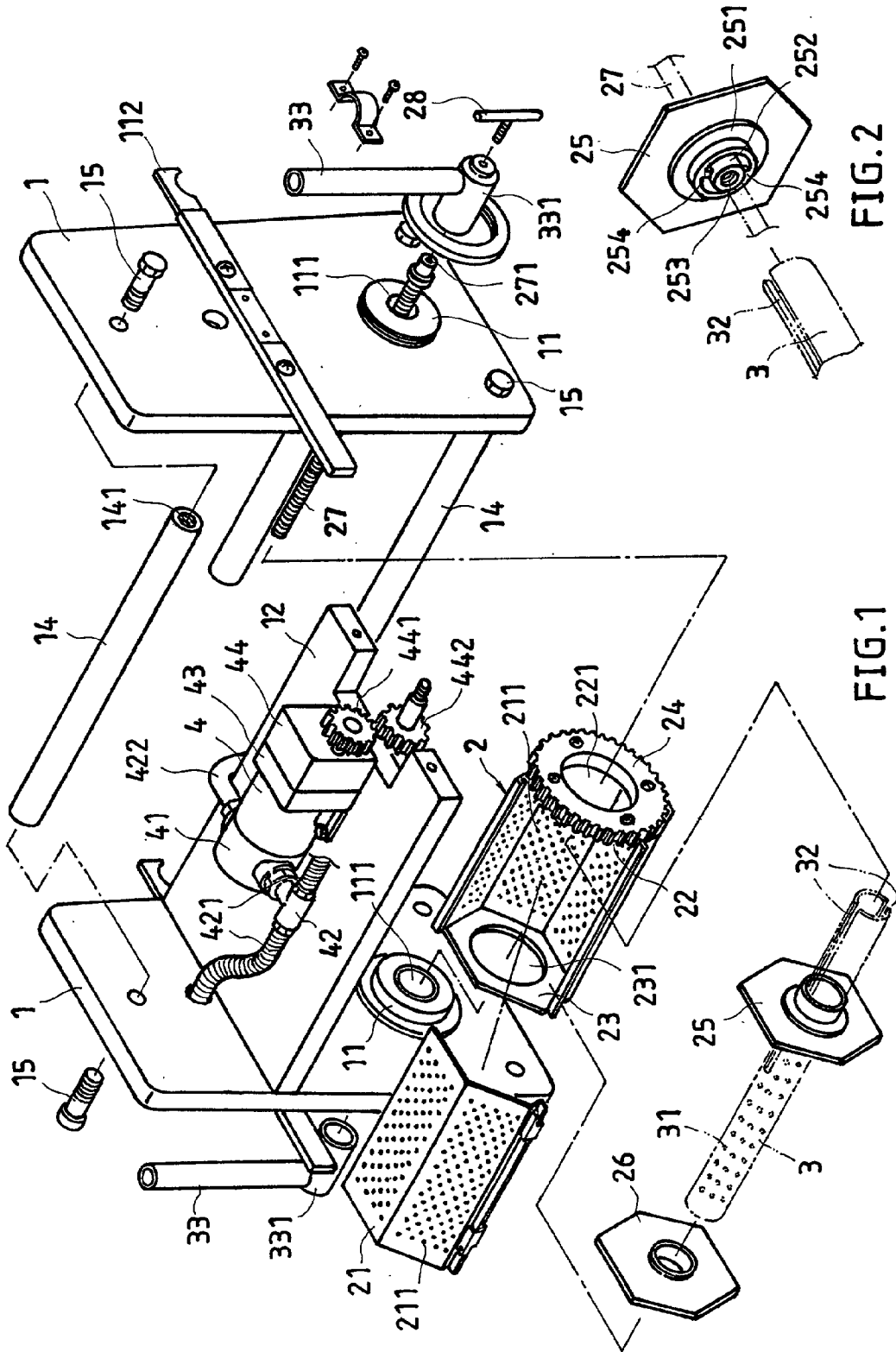


FIG. 2

FIG. 1

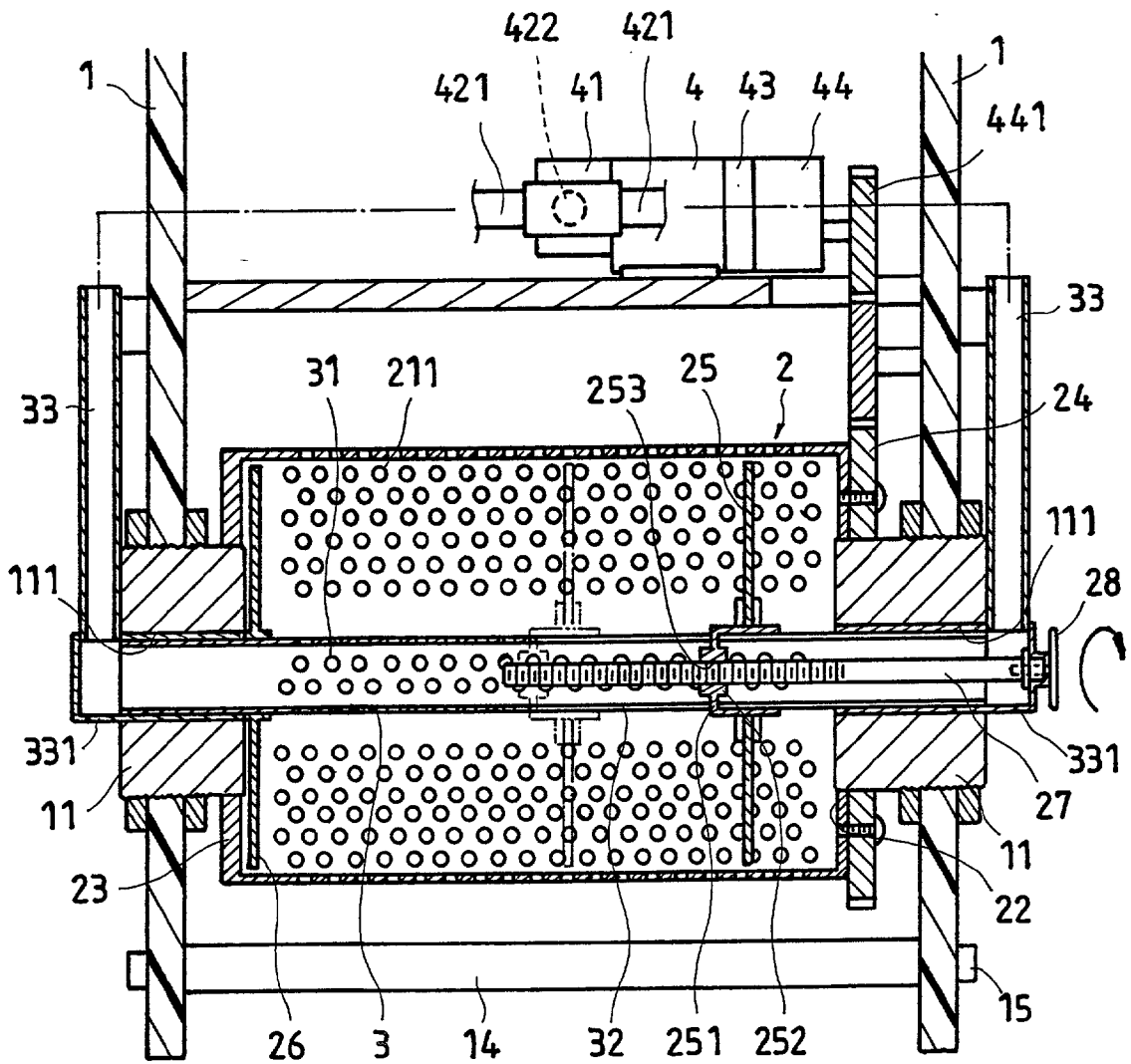


FIG. 3

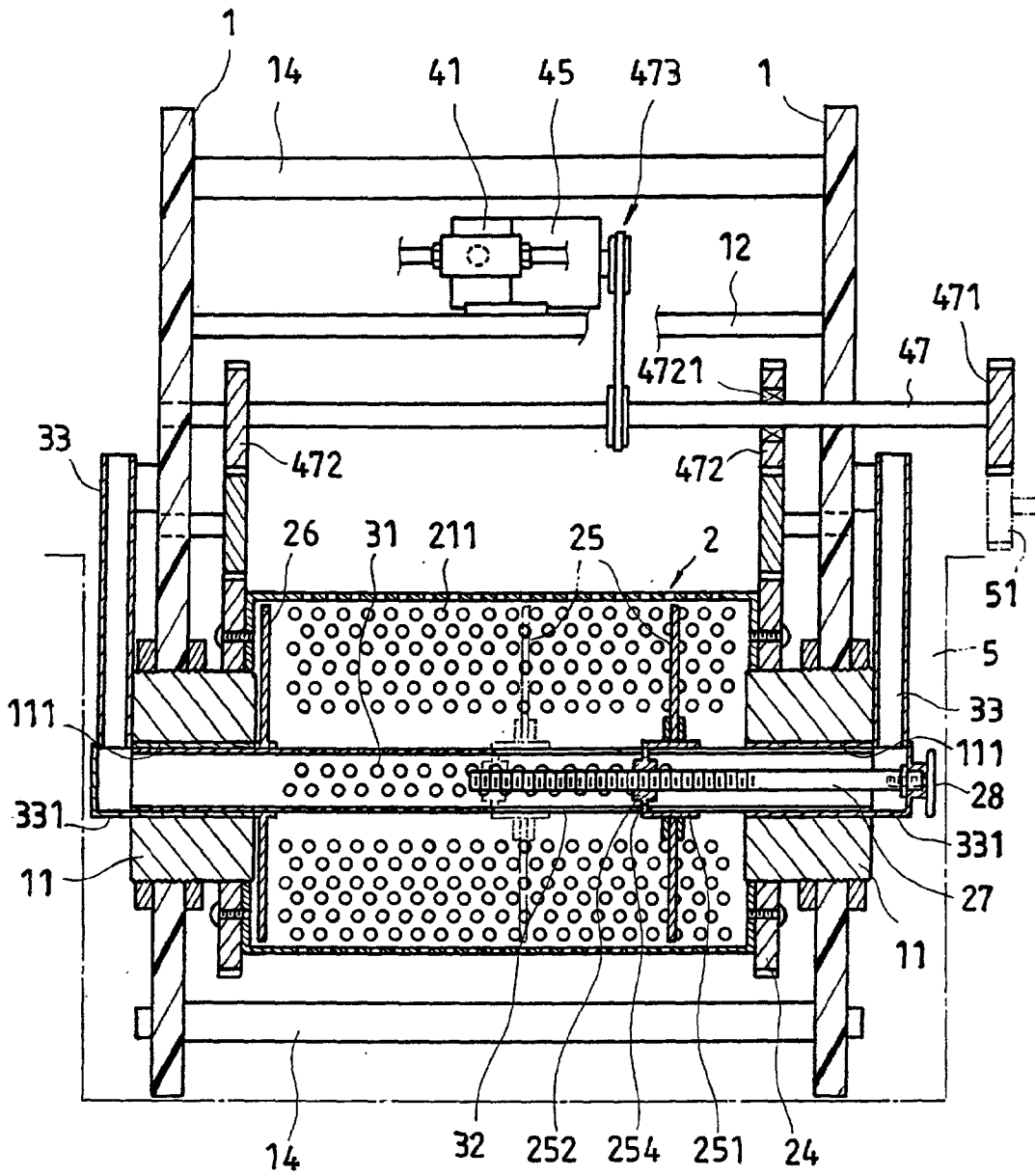


FIG. 4

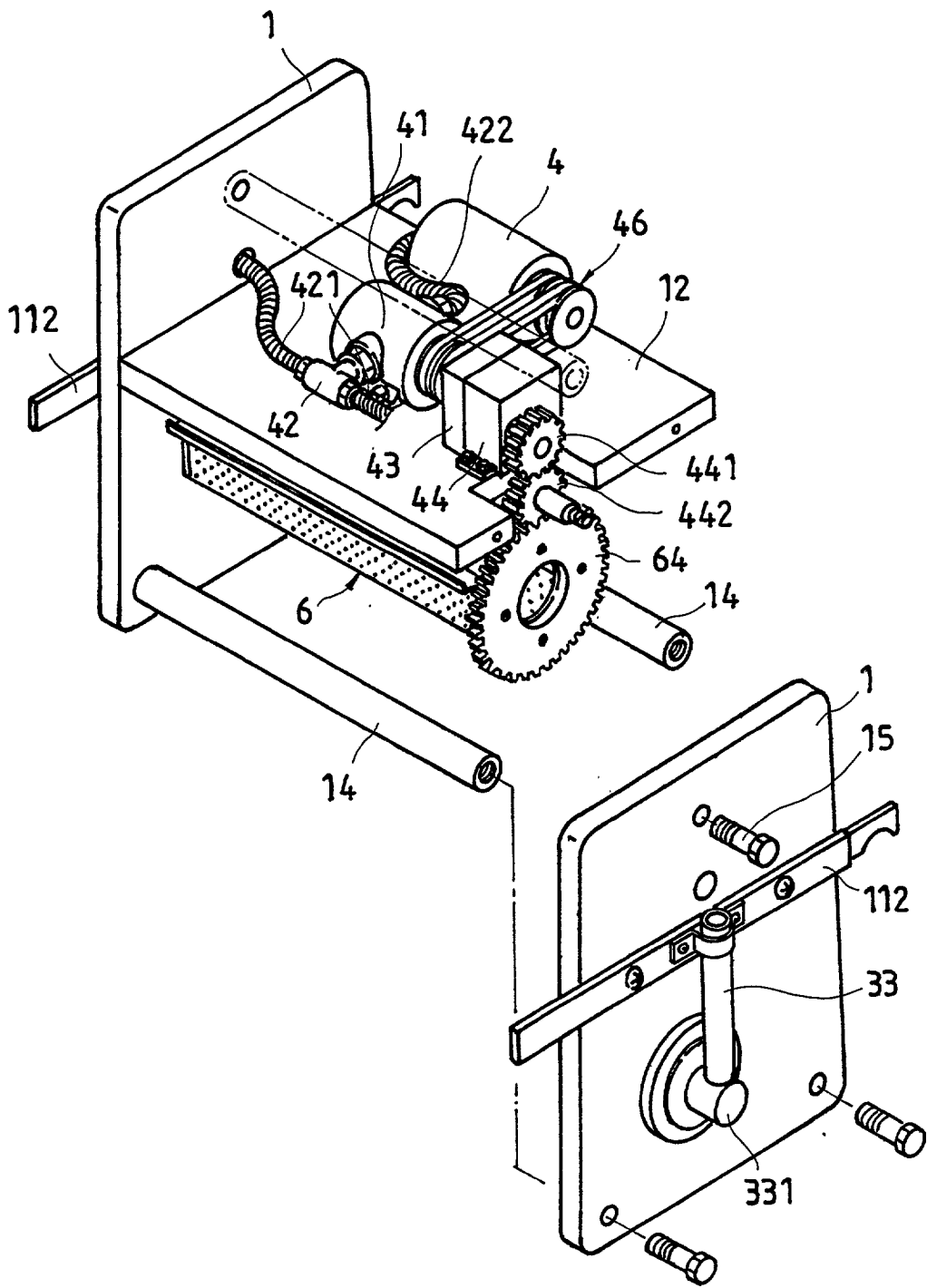


FIG. 5

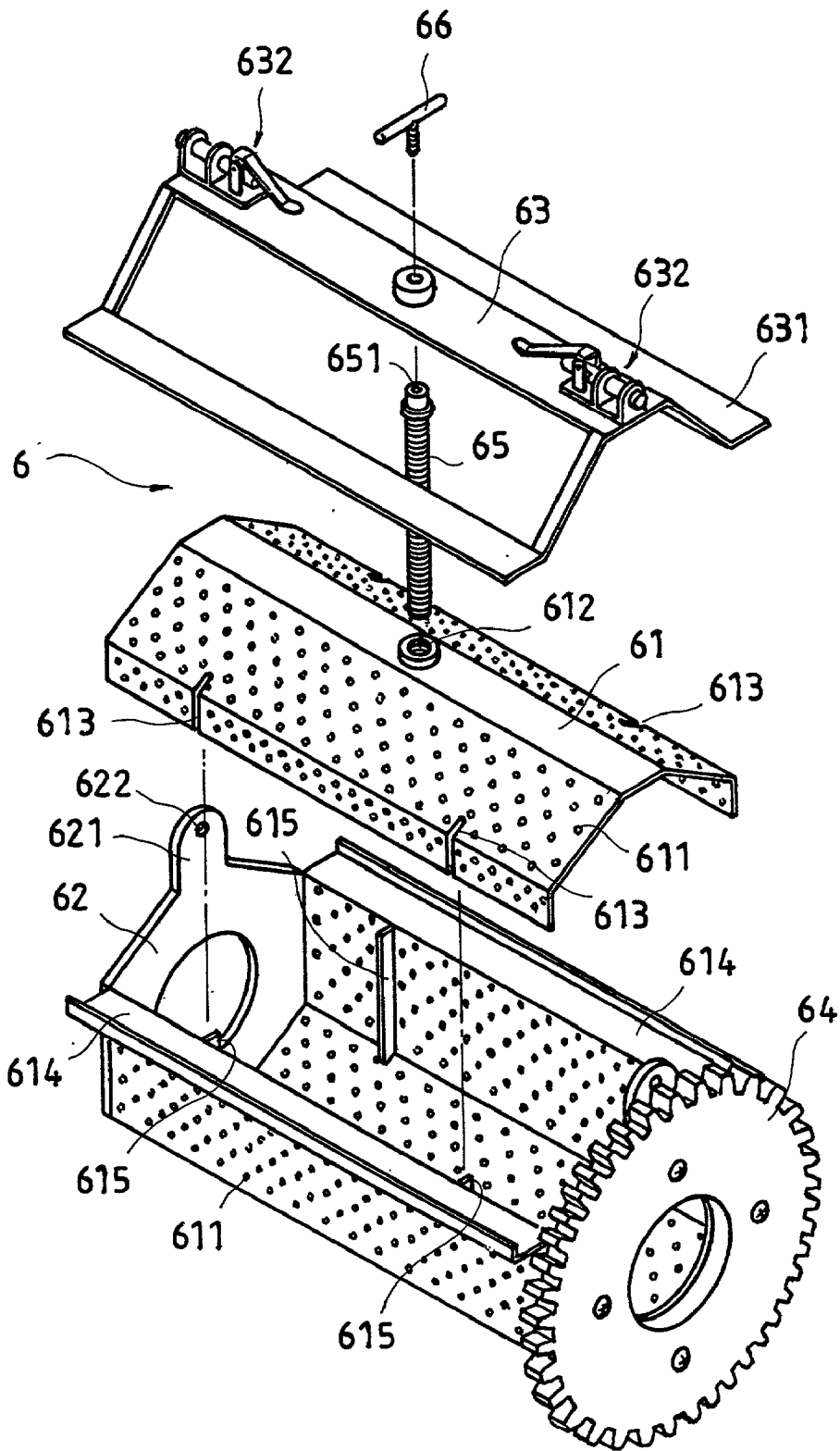


FIG. 6

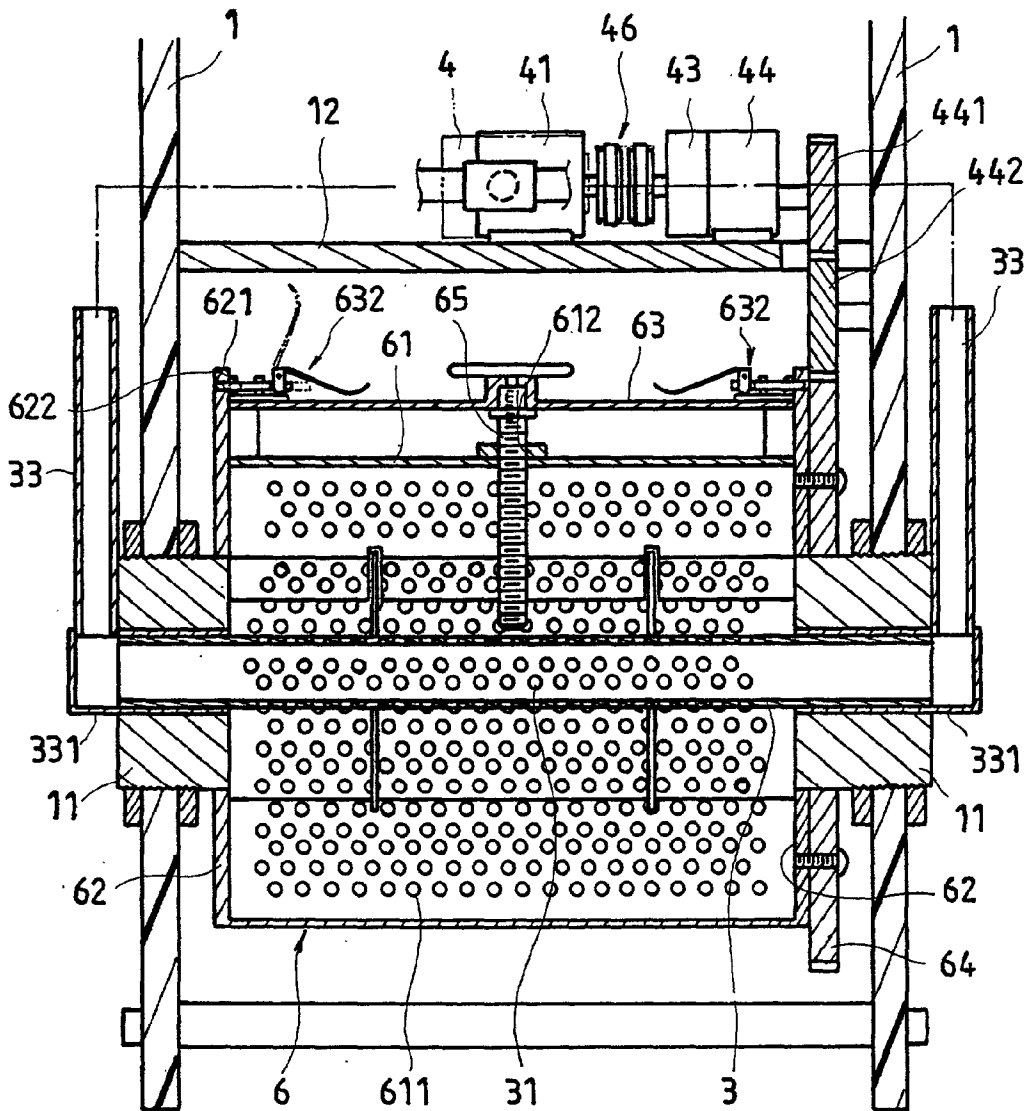


FIG. 7

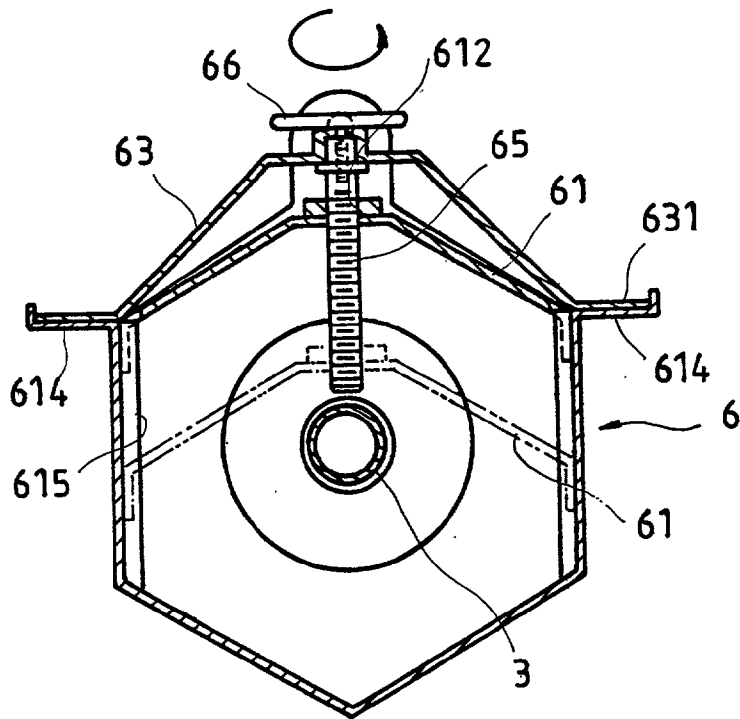


FIG. 8

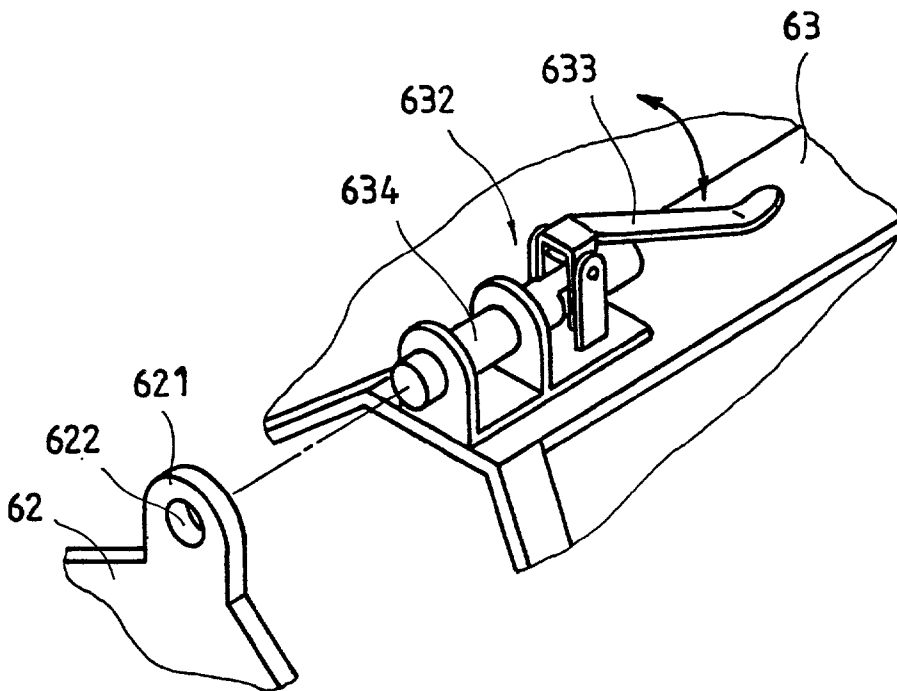


FIG. 9

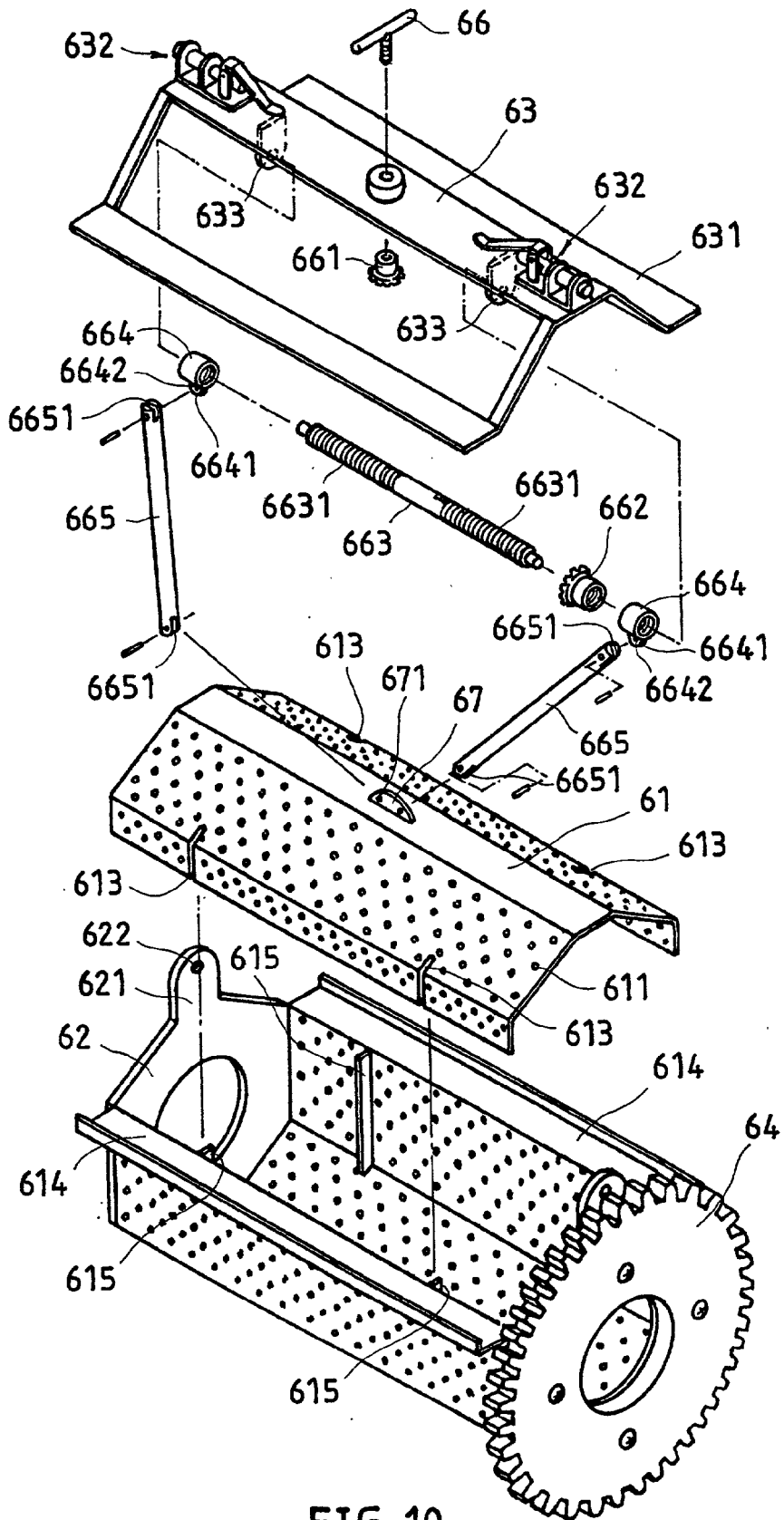


FIG. 10

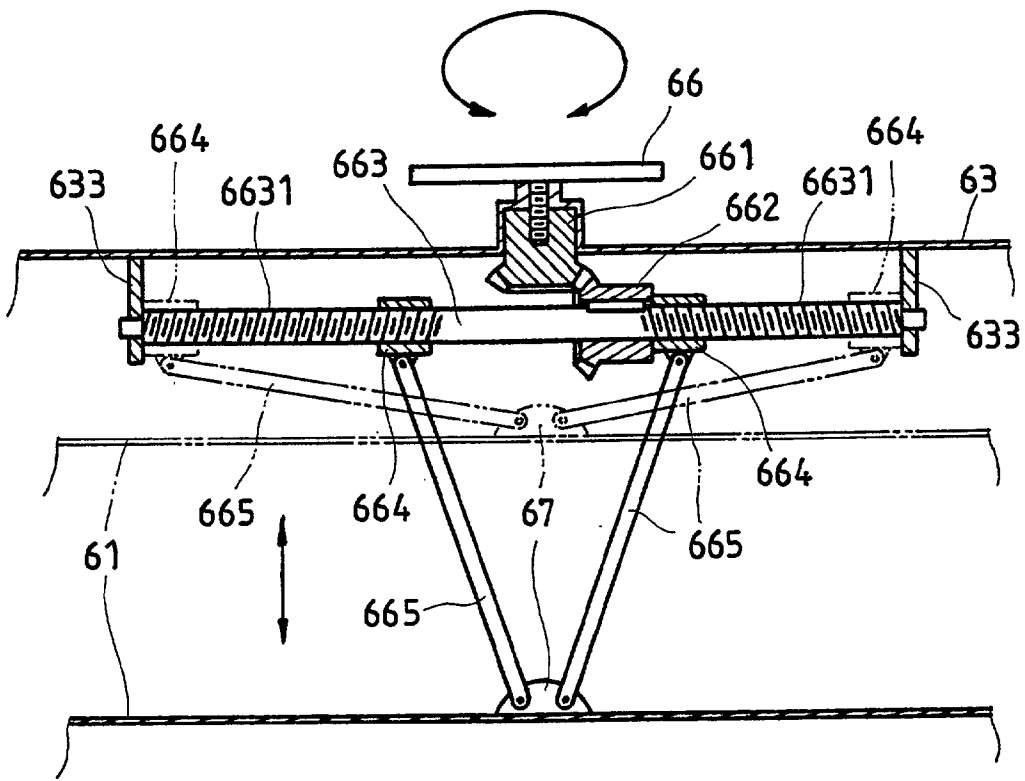


FIG. 11

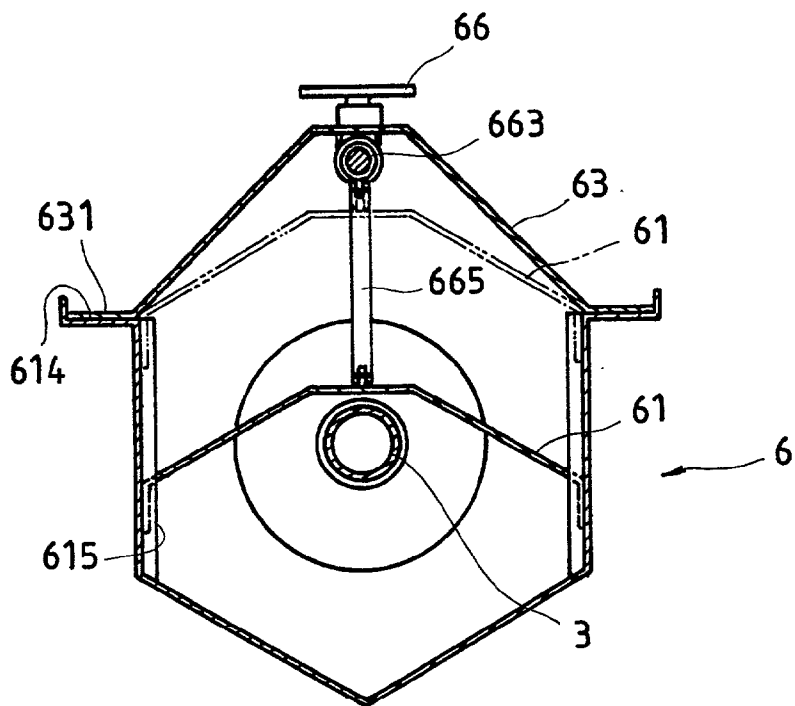


FIG. 12

ANODIZING BARREL WITH PUMP ATTACHED

BACKGROUND OF THE INVENTION

[0001] The present invention relates to an anodizing barrel with pump attached and, more particularly to such a barrel that can be adjusted to change the desired volume subject to the processing flow when having small aluminum parts to receive an anodization treatment, enabling the anodization treatment to be performed in the same electroplating drum. Further, the barrel plating process is to put the workpieces in a semi-closed drum. Either in the pre-treatment or post-treatment, during the electroplating or anodization process, solution is difficult to circulate between the drum and the bath. The invention makes use of the motive of the drum to drive a pump-drive unit, causing it to pump the solution for circulating through the drum and the bath.

SUMMARY OF THE INVENTION

[0002] The present invention is designed to improve two early inventions of the present inventor. The two inventions concerned have drawbacks. Because the pump of the invention of U.S. Pat. No. 4,946,573 has a low revolving speed; the flowrate of solution is low. The low flow rate problem has been eliminated in the other patent, namely, U.S. Pat. No. 5,391,277. However, because the accelerator is entirely immersed in working solution, it must be completely sealed, and maintenance work cannot be employed to the pump or the accelerator. If the pump or the accelerator is damaged, it must be thrown away and replaced with a new one. This arrangement is not economical. The present invention has been accomplished under the circumstances in view. The main object of the present invention is to use a self-priming pump instead of the previous design of pump. Therefore the maintenance work of the pump can be performed conveniently.

[0003] Anodization process of an aluminum part is an important surface treatment. After anodization, an aluminum part can be further treated with dyeing and sealing processes, forming a beautiful and corrosion-proof product. Conventionally, in the anodization process for aluminum parts is usually performed by means of the racking process. When workpieces are firmly attached to rack, the contact area between rack and workpieces will not form aluminum oxide, and allow for the passing of electric current; however the other areas instantly form non-conductive aluminum oxide; therefore if the workpieces are not fixed securely, causing the electric current to be stopped, and the desired anodization coating thickness will not be achieved, i.e., bad quality products will then be produced.

[0004] Conventionally, when processing small aluminum workpieces with anodization, aluminum workpieces are treated with a chemical polishing process in a heated acid solution in a larger basket or barrel. Polished aluminum workpieces are washed with water and divided into small batch, and then wrapped with cloth or meshed covering means for anodization. After the oxide film has reached the desired thickness, the aluminum workpieces are taken out of the packet and then put in a larger basket or barrel again for rinsing, dyeing, and sealing processes. Because workpieces must be frequently moved from one apparatus to another and the lot size of each anodize quantity is low, this manual method is not efficient.

[0005] A barrel is an important implement for surface treatment on small workpieces. Using a barrel for surface treatment on small workpieces is economical and efficient. However, an anodization process cannot be achieved in same electroplating barrel when treating small aluminum workpieces according to the conventional facilities. Because pre-treatment and post-treatment must be performed in a relatively large space and aluminum workpieces must be closely attached to one another during an anodization. Further, because aluminum workpieces must be tightly wrapped together during an anodization process, plating solution cannot easily pass to the interface between each workpiece. This limitation causes a high defective rate.

[0006] A barrel designed according to the present invention enables an anodization to be performed from the beginning to the end without changing the implement; therefore the productivity is greatly increased.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] The present invention will now be described by way of example, with reference to the annexed drawings in which:

[0008] FIG. 1 is an exploded view of an anodizing barrel with pump attached according to a first embodiment of the present invention.

[0009] FIG. 2 is an exploded view in an enlarged scale of a part of the first embodiment of the present invention, showing the structure of the slide.

[0010] FIG. 3 is a side view in section of the anodizing barrel with pump attached according to the first embodiment of the present invention.

[0011] FIG. 4 is a side view in section of an anodizing barrel with pump attached according to a second embodiment of the present invention.

[0012] FIG. 5 is an exploded view of an anodizing barrel with pump attached according to a third embodiment of the present invention.

[0013] FIG. 6 is an exploded view in an enlarged scale of a part of the third embodiment of the present invention, showing the structure of the drum.

[0014] FIG. 7 is a side view in section in an enlarged scale of the anodizing barrel with pump attached according to the third embodiment of the present invention.

[0015] FIG. 8 is a schematic drawing showing the handle rotated, the movable cover panel moved in the drums according to the third embodiment of the present invention.

[0016] FIG. 9 is an exploded view of a part of the third embodiment of the present invention, showing the structure of the quick-release lock.

[0017] FIG. 10 is an exploded view in an enlarged scale of a part of the fourth embodiment of the present invention.

[0018] FIG. 11 is a schematic drawing showing the volume compressible mechanism of the fourth embodiment of the present invention.

[0019] FIG. 12 is a schematic drawing showing the handle rotated, the movable cover plate moved in the drum according to the fourth embodiment of the present invention.

DETAILED DESCRIPTION OF THE
PREFERRED EMBODIMENT

[0020] Referring to FIGS. 1, 2 and 3, an anodizing barrel with pump attached in accordance with a first embodiment of the present invention is shown comprised of a volume-adjustable drum unit, a pump-drive unit, and a solution circulation unit.

[0021] The volume-adjustable electroplating drum unit is described hereinafter with reference to FIGS. from 1 through 3 again. Connecting rods 14 are connected between two upright support frames 1 to hold the upright support frames 1 in parallel. Screws 15 are respectively fastened to the upright support frames 1 and threaded into the end screw hole 141 in each end of each connecting rod 14 to fixedly secure the upright support frames 1 and the connecting rods 14 together. A horizontal partition plate 12 is fixedly connected between the upright support frames 1. Two hollow, cylindrical holder members 11 are respectively installed in the upright support frames 1 at an elevation below the partition plate 12. The hollow, cylindrical holder members 11 each have a center axle hole 111. A perforated drum 2 is revolvably coupled between the hollow cylindrical holder members 11. The perforated drum 2 comprises two end walls 22 and 23, a perforated cover panel 21 hinged thereto and adapted to close an opening thereof. The perforated cover panel 21 has pores 211. The end walls 22 and 23 each have a center coupling hole 221 or 231 respectively coupled to the hollow, cylindrical holder members 11. A perforated titanium center contactor or conduit 3 is inserted through the center axle hole 111 of each hollow, cylindrical holder member 11. The center contactor or conduit 3 has pores 31 extended through the peripheral wall thereof, and two sliding slots 32 longitudinally and bilaterally extended to one end thereof. Two plate electrodes, namely, the first plate electrode 25 and the second plate electrode 26 are respectively mounted on the center contactor or conduit 3 and disposed inside the perforated drum 2. The second plate electrode 26 is fixedly fastened to one end wall 23 of the drum 2. The first plate electrode 25 is mounted on a slide 251, which is slidably mounted on the center contactor or conduit 3. The slide 251 comprises a center shaft 252 inserted into the center contactor or conduit 3, a screw hole 253 axially extended through the central axis of the center shaft 252, and two radial ribs 254 radially extended from the periphery of the center shaft 252 at two sides and respectively perpendicularly inserted through the longitudinal sliding slots 32. Because the radial ribs 254 of the slide 25 are respectively perpendicularly inserted through the longitudinal sliding slots 32, the slide 251 can only be moved back and forth on the center contactor or conduit 3 along the sliding slots 32. Two titanium coupling tubes 331 are respectively connected to the two distal ends of the center contactor or conduit 3. Two vertical titanium conduct pipes 33 are respectively perpendicularly connected to the titanium coupling tubes 331. Two metal conductive arms 112 are respectively fastened to the upright support frames 1 and the titanium conduct pipes 33 connected to it to transmit DC power to the center contactor or conduit 3 in the drum 2. A guide screw rod 27 is inserted through one titanium coupling tube 331 and the center contactor or conduit 3, and threaded into the screw hole 253 of the center shaft 252. A hand bar 28 is fixedly fastened from the outside of coupling tubes to one end of the guide screw rod 27. Rotating the hand bar 28 causes the first plate electrode 25 to be moved with the slide

251 along the center contactor or conduit 3 to adjust the operative volume of the drum 2 and to compact aluminum work pieces in the drum 2.

[0022] The pump-drive unit and the solution circulation unit are described hereinafter with reference to FIGS. from 1 through 3 again. A self-priming pump 41 is mounted on the partition plate 12. Two intake pipes 421 are respectively connected between the vertical titanium conduct pipes 33 and the suction port 42 of the self-priming pump 41. A motor 4 is mounted on the partition plate 12 and coupled to the self-priming pump 41. A speed reduction gear 44 is mounted on the partition plate 12 and coupled to the motor 4 by an electromagnetic clutch 43. A driven gear 24 is fixedly mounted on one end wall 22 of the drum 2. A drive gear 441 is coupled to the speed reduction gear 44. A transmission gear 442 is meshed between the drive gear 441 and the driven gear 24. When starting the motor 4 to turn the speed reduction gear 44, the drum 2 is rotated with the driven gear 24 by the drive gear 441 through the transmission gear 442, and at the same time, the self-priming pump 41 draws electroplating solution from the inside of the electroplating apparatus through the pores 31 of the center contactor or conduit 3, the coupling tubes 331, the vertical conduct pipes 33 and the intake pipes 421 into the intake port 42, and then drive electroplating solution out of the electroplating apparatus through an output pipe 422 for further circulation. During anode processing procedure, the electromagnetic clutch 43 is controlled to disconnect the speed reduction gear 44 from the motor 4, preventing rotation of the drum 2 during operation of the self-priming pump 41.

[0023] FIG. 4 shows a side gear driving pump-drive unit of the present invention. According to this alternate form, a drive gear 51 is installed on the processing trough 5 of the electroplating apparatus, and driven by an external motor (not shown) to rotate a driven gear 471 at one end of a transmission rod 47, which is supported between the upright support frames 1. The transmission rod 47 is fixedly mounted with a plurality of transmission gears 472 and 474, which are meshed with fixed gears 24 at the two distal ends of the drum 2. A belt transmission mechanism 473 is coupled between the transmission rod 47 and a speed increaser 45, which is mounted on the partition plate 12 and driven to drive the pump 41. Therefore, when rotating the drive gear 51, the drum 2 is rotated, and the pump 41 is operated to suck electroplating solution for circulation. Further, a one-way axle bearing 4721 is provided at the transmission gear 472. When rotating the transmission gear 471 in the reversed direction, the transmission gear 472 runs idle without rotating the drum 2.

[0024] Referring to FIGS. 5, 6, 7, 8, and 9, there is shown a third embodiment of the present invention. According to this embodiment, a drum 6 is shafted between the hollow cylindrical holder members 11 at the upright support frames 1. The drum 6 comprises two locating flanges 614 longitudinally connected between the end walls 62 at two sides of the top opening thereof, a plurality of vertical rails 615 symmetrically bilaterally disposed on the inside, a cover beam plate 63 covered over the locating flanges 614, and a movable cover panel 61 connected to the cover beam plate 63 and moved along the vertical rails 615 to adjust the operation volume of the drum 6. The movable cover panel 61 comprises a top center screw hole 612, a plurality of coupling slots 613 symmetrically disposed at two sides

thereof and respectively coupled to the vertical rails 615. A screw rod 65 is mounted in the cover beam plate 63 and threaded into the top center screw hole 612 of the movable cover panel 61. A handle 66 is fastened to a screw hole 651 at the top end of the screw rod 65. When rotating the handle 66 in one direction, the screw rod 65 is rotated, thereby causing the movable cover panel 61 to be moved along the vertical rails 615 to adjust the operation volume of the drum 6. Further, the end walls 62 of the drum 6 each comprise an upright lug 621 and a lock hole 622 in the upright lug 621. The cover beam plate 63 comprises two locating flanges 631 disposed at two sides and respectively fitted over the locating flanges 614 of the drum 6, and two quick-release locks 632 at two ends thereof. The quick-release locks 632 each comprise a locking rod 634, and a locking lever 633 turned to move the locking rod 634 in and out of the lock hole 632 in the upright lug 621 of each end wall 62. A motor 4 is mounted on the partition plate 12 between the upright support frames 1. A self-priming pump 41 is coupled to the motor 4 by a belt transmission mechanism 46. A speed reduction gear 44 is mounted on the partition plate 12 and coupled to the motor 4 through an electromagnetic clutch 43 and the belt transmission mechanism 46. The speed reduction gear 44 is driven to rotate the drum 6 through gears 441, 442 and 64. The other structure of this alternate form is same as that shown in FIGS. from 1 through 3.

[0025] Referring to FIGS. 10, 11 and 12, there is shown a fourth embodiment of the present invention, using an upside down jack mechanism to adjust the volume of drum. As shown in the drawings, a bevel gear 661 is assembled with a handle bar 66 onto the opposite side of the central of the cover beam plate 63. A pair of stands is disposed at two sides of bevel gear 661 under the cover beam plate 63 for mounting screw rod 663, the bevel gear 661 meshed with another bevel gear 662. The bevel gear 662 is assembled in alignment with screw rod 663 and settles between a couple of screws 6631. The screw 6631 lies to both sides of the screw rod 663, one in right screw, another in left screw, each one of screws 6631 coupling with a cylindrical nut 664, the cylindrical nut 664 having a lug 6641 and a joint hole 6642 on lugs 6641. A lug 67 with two joint holes 671 is disposed on the middle of the movable cover plate 61. Two levers 665 are flexible joint between lug 67 of movable cover plate 61 and lugs 6641 on the cylindrical nuts 664 by both end of ribs 6651 of levers 665. When rotating the handle bar 66 on cover beam plate 63 in either direction, the primal bevel gear 661 will be driven to synchronously rotate the passive bevel gear 662 and the screw rod 663, and the cylindrical nuts 664 will be pushed or pulled according to the direction of the handle bar 66, to further drive the levers 665 to lift or lower the movable cover plate 61, causing the movable cover plate 61 to achieve the purpose of adjusting the volume of drum of plating barrel.

[0026] A prototype of anodizing barrel with pump attached has been constructed with the features of FIGS. 1-12. The anodizing barrel with pump attached functions smoothly to provide all of the features discussed earlier.

[0027] Although a particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited except as by the appended claims.

What the invention claimed is:

1. An anodizing barrel with pump attached comprising:

a volume-adjustable electroplating drum unit, said volume-adjustable electroplating drum unit comprising a perforated drum made of metal or non-metal material having a polygonal or cylindrical shape and an opening, a perforated cover panel having a plurality of pores and covering the opening of said perforated drum, a center contactor or conduit axially extended through said perforated drum, a fixed plate electrode fixedly mounted on said center contactor or conduit inside said perforated drum at one side, a movable plate electrode mounted on said center contactor or conduit inside said perforated drum and moved along said center rod contractor and conduct relative to said fixed plate electrode to adjust electroplating space defined between said fixed plate electrode and said movable plate electrode inside said perforated drum;

a pump-drive unit disposed above said perforated drum, said pump-drive unit comprising a bi-axial motor, said bi-axial motor having a first power output end and a second power output end, a speed reduction gear adapted to rotate said perforated drum about said center contactor or conduit, and an electromagnetic clutch controlled to connect said speed reduction gear to the first power output end of said bi-axial motor; and

a solution circulation unit adapted to circulate plating solution through perforated drum, said solution circulation unit comprising a self-priming pump coupled to the second power output end of said bi-axial motor, said self-priming pump comprising an input port connected to two distal ends of said center conductor or conduit through vertical titanium conduct pipes and adapted to receive plating solution from the electroplating space inside said perforated drum, and an output port for output of plating solution.

2. The anodizing barrel with pump attached of claim 1 wherein said volume-adjustable electroplating drum unit comprises:

a perforated drum shafted between two upright support frames of two hollow cylindrical holder members respectively installed in said upright support frames and coupled to two opposite end walls of said perforated drum for enabling said perforated drum to be turned about said center contactor or conduit, said hollow cylindrical holder members each having a center axle hole and an inner side respectively coupled to the center coupling hole of each of the two end walls of said perforated drum to form the central axis of said perforated drum, said perforated drum being made of metal or non-metal material, said perforated drum having a polygonal or cylindrical shape with an opening, and a driven gear at one of said end walls;

a perforated cover panel covering the opening of said perforated drum, a center contactor or conduit axially extended through said perforated drum;

a center contactor or conduit inserted through the end walls of said perforated drum, said center contactor or conduit comprising a plurality of pores, and two sliding slots longitudinally and bilaterally extended to one end thereof;

- a slide axially slidably mounted on said center contactor and conduit and supporting said movable plate electrode on said center contactor or conduit, said slide comprising a center shaft inserted into said center contactor or conduit, a screw hole axially extended through the central axis of said center shaft, and a set of radial ribs radially extended from the periphery of said center shaft at two sides and respectively perpendicularly inserted through two longitudinal sliding slots of said center contactor or conduit;
- a set of plate electrodes respectively mounted on said center contactor or conduit at two sides, said plate electrodes including a fixed plate electrode fixedly mounted on said center contactor or conduit inside said perforated drum at one side, and a movable plate electrode mounted on said center contactor or conduit inside said perforated drum and moved along said center contactor and conduit relative to said fixed plate electrode to adjust electroplating space defined between said fixed plate electrode and said movable plate electrode inside said perforated drum;
- a screw rod inserted through said center contactor or conduit and threaded into the screw hole of said center shaft of said slide, and a hand bar fastened to another end of said screw rod from outside of titanium coupling pipes for rotation by hand to move said slide and said movable plate electrode along said center contactor or conduit.
3. The anodizing barrel with pump attached of claim 1 wherein said solution circulation unit further comprises two metal coupling tubes respectively connected to the two distal ends of said center contactor or conduit, said metal coupling tubes each having one end closed, two vertical titanium conduct pipes respectively perpendicularly connected to said metal coupling tubes, and two intake pipes respectively connected between said vertical titanium conduct pipes and the input port of said self-priming pump, so that when starting said motor to drive said self-priming pump, said self-priming pump draws electroplating solution from the inside of the electroplating apparatus through the pores of said center contactor or conduit, said coupling tubes, said vertical titanium conduct pipes and said intake pipes into said intake port, and then drives electroplating solution out of the electroplating apparatus through an output pipe for further circulation.
4. The anodizing barrel with pump attached of claim 1 wherein said pump-drive unit further comprises double-belt transmission means coupled to the power output ends of said motor, said double-belt transmission means comprising a first belt transmission mechanism adapted to move said speed reduction gear having said electromagnetic clutch to drive said drum, and a second belt transmission mechanism adapted to drive said self-priming pump.
5. The anodizing barrel with pump attached of claim 1 wherein a side gear driving type pump-drive unit of the present invention is provided comprising a reduction gear installed on the processing trough of the electroplating apparatus and driven by an external motor to rotate a driven gear at one end of a transmission rod, a plurality of transmission gears meshed with fixed gears at the two distal ends of said perforated drum, a belt transmission mechanism coupled between said transmission rod and a speed increaser driven to drive said pump.
6. The anodizing barrel with pump attached of claim 3 wherein said center contactor or conduit has two distal ends respectively connected two metal conductive arms through two titanium coupling pipes and two vertical titanium conduct pipes to transmit DC power to said fixed plate electrode and said movable plate electrode.
7. A anodizing barrel with pump attached comprising vertical volume-adjustable electroplating drum unit, said vertical volume-adjustable electroplating drum unit comprising:
- a drum, said drum having a polygonal shape, a top opening, a plurality of pores, two locating flanges longitudinally disposed at two sides of said top opening, two upright lugs at two end walls thereof, said upright lugs each having a Lock hole.
8. The anodizing barrel with pump attached of claim 7 wherein said vertical volume-adjustable electroplating drum unit further comprising:
- a movable cover panel received in said perforated drum, said movable cover panel being moved vertically in the top opening of said perforated drum to vertically compress the inside space of said perforated drum; said movable cover panel having a top center screw hole.
9. The anodizing barrel with pump attached of claim 7 wherein said vertical volume-adjustable electroplating drum unit further comprising:
- a cover beam plate disposed above the top opening of said perforated drum, said solid cover beam plate comprising a screw rod threaded into the top center screw hole of the movable cover panel. Claimed in claim 8 for enabling said movable cover panel to be suspended in said perforated drum and moved vertically up and down in said perforated drum by means of rotating said handle bar of screw rod which disposed on the top of cover beam plate.
10. The anodizing barrel with pump attached of claims 7 and 8 wherein said perforated drum comprises a plurality of vertical rails symmetrically bilaterally disposed on the inside, and said perforated cover panel comprises a plurality of guide slots symmetrically disposed at two sides and respectively coupled to the vertical rails of said perforated drum for stable vertical movement.
11. The anodizing barrel with pump attached of claim 9 wherein said cover beam plate comprises two quick-release locks for locking, said quick-release locks each comprising a locking rod, and a lever coupled to said locking rod and adapted to move said locking rod in and out of the lock hole on each of the upright lugs at the end walls of perforated drum claimed in claim 7 to fix said cover beam plate in position.
12. The anodizing barrel with pump attached of claim 9 wherein said volume-adjustable electroplating drum further comprises: a handlebar assembled with a primal bevel gear onto the opposite side of the cover beam plate, two stands provided for settling a screw rod under the cover beam plate, a passive bevel gear fixed between and aligned with a couple of right screw and left screw of screw rod, both right screw and left screw of screw rod having a cylindrical nut to fit it, each of cylindrical nut disposed a lug which having a joint hole, a lug with two joint holes disposed on the middle of top side of movable cover plate, two levers with rip on both ends used to joint movable cover plate and cylindrical nuts by means of flexible joint.