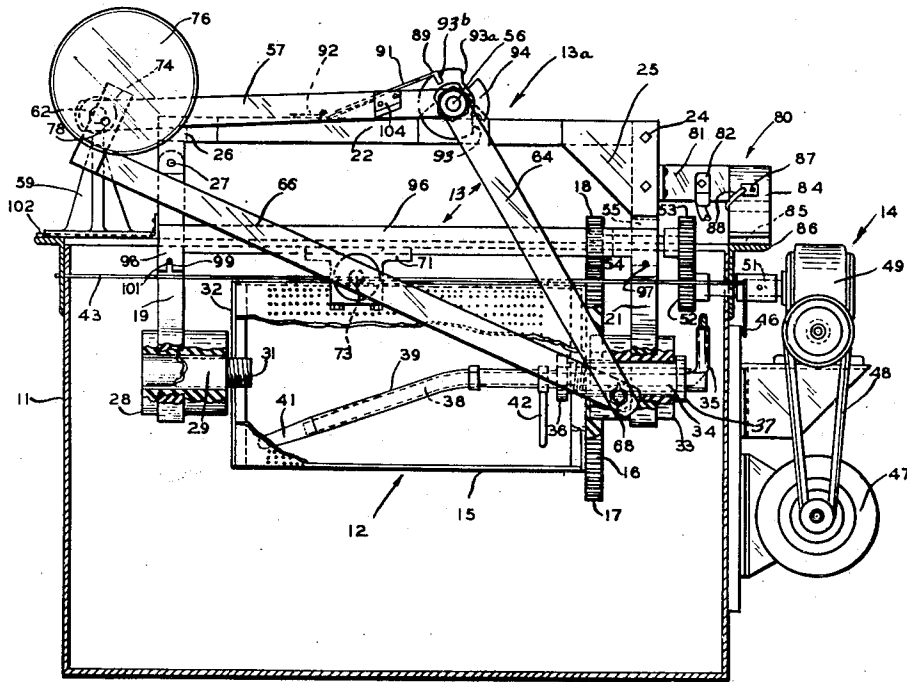


N. K. HOUSE

ELECTROPLATING MACHINE'

3 Sheets-Sheet 1



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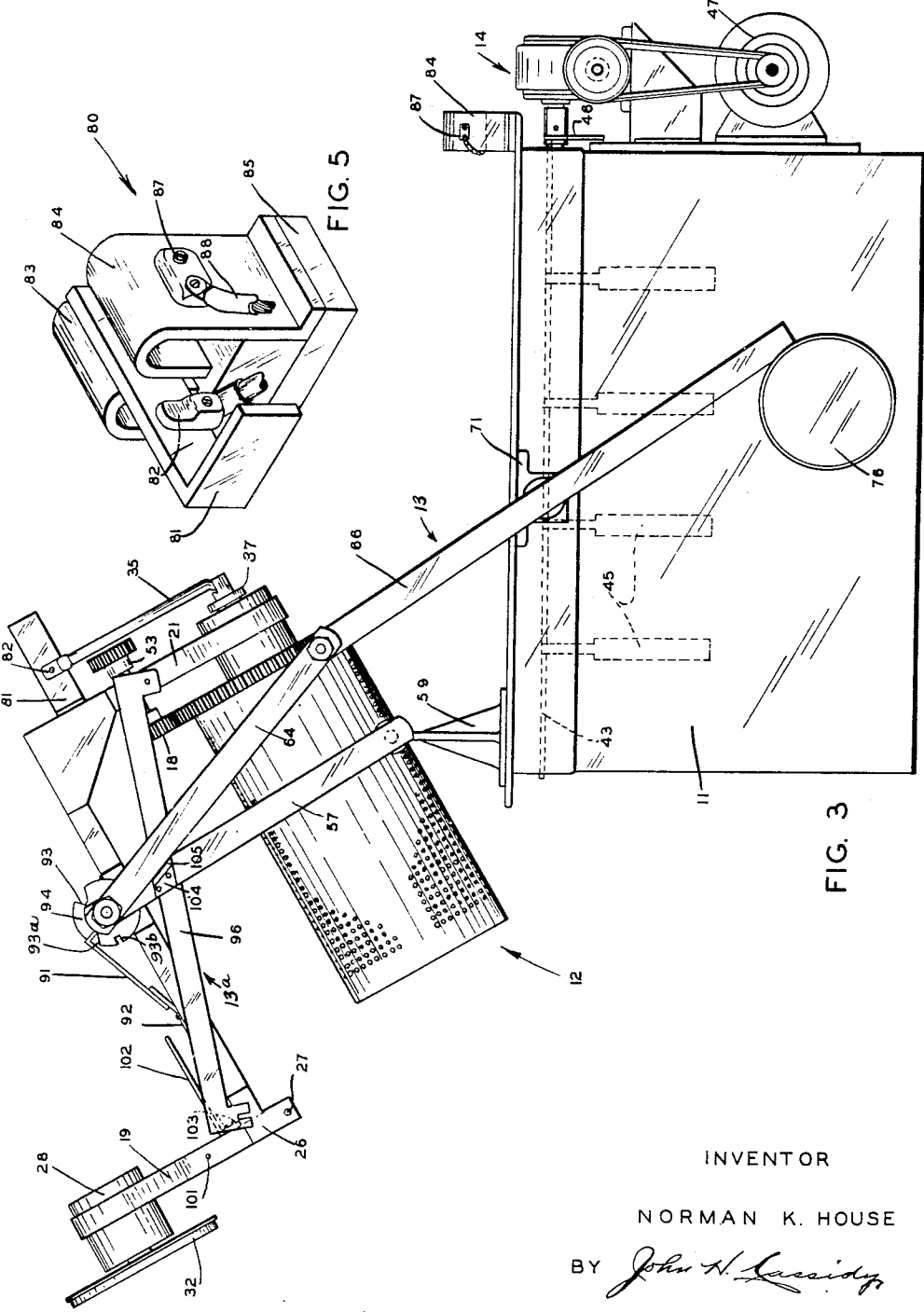
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3 Sheets-Sheet 2



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ELECTROPLATING MACHINE

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This invention relates to electroplating equipment, generally, and concerns itself primarily with barrel platers.

It is a general aim of the invention to provide an electroplating device, of the barrel type, which is capable of speeding up and increasing production, which is adaptable for use with alkaline or acid solutions, is easy to handle, which may be loaded and unloaded quickly, and which obviates the use of unloading trays.

More specifically, it is an object of the invention to provide a barrel type electroplating device in which the plating barrel is connected with an immersing tank, the two forming a compact unit, and the barrel being suspended in the tank for counterbalanced movement from an immersing position, to an unloading position outside of the tank, thence rotated to a position for loading and from said last position back to its original attitude.

Other objects and advantages will become apparent as the description proceeds and a more comprehensive understanding of the invention will be afforded from the following detailed specification when considered in conjunction with the accompanying drawings, in which

Fig. 1 is a side elevational view of an electroplating device, with sections removed, showing the invention in its preferred embodiment,

Fig. 2 is an end view of the device looking at it from its motor side and showing its barrel in immersed position,

Figs. 3 and 4 are side elevational views of the electroplater illustrating its counterbalanced barrel supporting structure as it assumes, respectively, an unloading and loading position,

Fig. 5 is a perspective view of a knife switch which makes the plating circuit when the barrel is in immersed position and breaks it when the barrel is in any of its other positions,

Figs. 6, 7, and 8 are plan, side and end views, respectively, of a latching pawl which holds the barrel supporting frame in its various positions, and

Fig. 9 is a perspective detail view showing a pivoting and latching arrangement for the barrel's closing means.

As illustrated in Fig. 1, the electroplating device contemplated in the instant invention comprises an immersing tank 11 in which a work holding barrel 12 is suspended. The barrel 12 is carried on a counterbalanced supporting structure 13 by means of which it is moved from an immersed position within the tank to a point entirely without the tank for either loading or

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unloading operations. Also comprising a part of the electroplating unit, a driving mechanism 14 is provided which rotates the plating barrel 12.

The barrel 12 is preferably of non-conducting material such as hard rubber and comprises a perforated cylinder 15, one end of which is closed by a disk 16 also of non-conducting material whose outer periphery is provided with teeth 17 which mesh with a pinion 18. Through these gears, the barrel is rotated.

The plating barrel is suspended in the tank from the counter balanced supporting structure 13 by a suspension frame 13a, now to be described. Two non-conducting supports 19 and 21 which may be fabricated from material such as a hard rubber substitute exhibiting high electrical and chemical resistance properties, constitute the suspension members, per se, and depend from two horizontal members to which they are connected taking the form of two metal strips 22 and 23. The support 21 is rigidly attached to the members 22 and 23 as by the bolt 24 the same being bracketed thereto by a corner bracket 25 which retains the support 21 at substantially right angles with the members 22 and 23. The support 19 is attached to the members 22 and 23 by means of a corner bracket 26 onto one arm of which the support 19 is pivotally connected as by the pin 27.

The support 19 carries a non-conducting journal 28 in which a shaft 29 is bearinged. The shaft 29 is provided at one end with threads 31 by means of which it is secured to a disk like member 32 providing a closure cover for the cylinder 15.

In a similar manner the support 21 has attached thereto a journal 33 made of non-conducting material in which a metallic bearing 34 is carried. Through the bearing 34 an insulated conductor 35 is carried to extend into the barrel 12 as the cathode electrode of the plating circuit. Non-conducting disks 36 and 37 hold the conductor 35 in proper position. Also, the conductor 35 is carried into the barrel 12 in a manner such that its metallic core 38 is entirely insulated by its insulation 39 except for a contact point 41 which rides in the lower part of the barrel in contact with the work to be plated and a contact 42 depending from the conductor itself.

The electroplating circuit is completed by two rod like conductors 43 and 44 which extend throughout the length of the tank on opposite sides of the barrel. From these rods, and at spaced intervals along their length, a plurality of metal strips 45 are hung into the plating solu-

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tion. Both of the conductors 43 and 44 are insulated from the tank 11 and are connected on the end thereof by means of a common bus bar 46.

As previously stated the barrel 12, in which the work to be plated is carried, is rotated about its longitudinal axis by a driving mechanism 14. The latter device is conveniently mounted on the end of the immersing tank 11 and comprises a motor 47 which is connected by means of a belt drive 48 with a gearbox 49. From the box 49 a shaft 51 is driven to rotate the pinions 52 and 53. The latter element is splined to a shaft 54 which is journaled in a suitable bracket 55 carried on the support 21. This shaft, on its other end, has the pinion 18 splined thereto which completes the driving train for the barrel 12.

For removing the plating barrel 12 from its immersed position to one for unloading and loading the counterbalance supporting structure 13 is provided. This latter mechanism comprises a series of linkages carried on opposite sides of the tank which will now be described. The suspension frame 13a for the barrel 12, previously described, which essentially comprises the members 19, 21, 22 and 23, is carried on a shaft 56 forming a part of the structure 13 about which it is free to rotate. This shaft extends across the tank 11. Two bracket bars 57 and 58 are pivoted respectively to two upright brackets 59 and 61 which in turn are supported on the walls of the tank 11. These bars are attached to their respective supporting brackets in a manner such as to pivot about the shafts 62 and 63 journaled in the brackets 59 and 61. The other ends of the bars 57 and 58 are keyed or splined to the shaft 56 in order that they may not turn thereon.

Also connecting with the shaft 56 are two bars 64 and 65. At their point of connection with the shaft 56 both of these bars are free to rotate thereabout. At their other ends these bars are connected to two counterbalance arms 66 and 67 respectively by means of the bolts 68 and 69 about which they are free to rotate. The counterbalance arms 66 and 67 are fulcrumed on their respective sides of the tank 11 in a pair of brackets 71 and 72, each of the arms being free to rotate about a pin such as 73 for the bracket 72.

On one end of each of the counterbalance arms 66 and 67 a channel iron 74 and 75 is attached thereto at right angles. These channels form mounting brackets for two weights 76 and 77 which are secured thereto by the bolts 78 and 79 respectively. These weights which are disk like in shape are connected eccentrically to their supporting brackets 74 and 75 and may be moved about the bolts 78 and 79 to adjust their respective positions relative to the pivot points such as 73 thus providing an adjustment to their counterbalancing effect for the entire supporting structure 13.

As illustrated in Fig. 1 the supporting structure 13 assumes an attitude in which the plating barrel 12 is immersed in its plating tank 11 as will be described more fully in connection with its operation. The supporting structure 13 is moved to its position illustrated in Figs. 3 and 4 by rotating the counterbalancing arms 66 and 67 in a counter clockwise direction. Under this operation the entire barrel assembly is moved from its immersed position to a point without the tank where it may be rotated about the shaft 56 into either a loading or unloading position. When this is done, it will be readily apparent that both the

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driving connection from the driving mechanism 14 and the electric circuit to the plating cathode must be automatically broken and made again when the barrel is moved into its immersed position. The first of these two functions, namely, the breaking and making of the drive train is accomplished by physically moving the pinion 53 out of, and into, engagement with the pinion 52.

For making and breaking the connections to the cathode electrode a switch 80, which is illustrated in detail in Fig. 5, is provided. This switch is of the knife type and comprises a movable contact 81 which is attached to the non-conducting supporting member 21. A connector 82 attaches one end of the cable 35 to this contact and as the whole barrel assembly is moved into and out of the tank the contact 81 is moved into or out of engagement with two spring contacts 83 and 84 forming the fixed contact points of the switch. These latter elements are secured to a non-conducting base 85 which is attached to a bracket 86 carried on an end wall of the tank 11. The connector 87 attaches the incoming conductor 25 88 to the fixed contacts of the switch.

As will be recalled the barrel supporting frame is free to rotate about the shaft 56. Accordingly, it is necessary that means be provided to lock the frame against rotation when the barrel is moved to an unloading position such as is illustrated in Fig. 3, or a loading position such as is illustrated in Fig. 4. For this purpose a locking device, which is illustrated in Figs. 6 to 8, inclusive, is provided. This device comprises an elongated latching pawl 89 which is attached to an arm 91 secured to the members 22 and 23 by a hinge 92. The latching pawl 89 is supported on the arm 91 in a manner such as to engage in spaced slots or grooves 93, 93a and 93b, cut in the periphery of two wheels 94 and 95, both of which are attached to the shaft 56. Through this latching arrangement the barrel may be locked in any of its various attitudes as desired.

For the purpose of making the barrel accessible for loading or unloading operations its cover member 32, which is attached through the shaft and journal arrangement previously described to the support 19, is removable by rotating the support 19 about its pivot point 27. When in its immersed position, however, this closure mechanism in the barrel is preferably locked in place. This is accomplished by means of a latching arrangement illustrated in Figs. 1 and 9. Here an elongated latching bar 96 is provided which is pivoted for rotation about a bolt 97 by means of which it is secured to the support 21. The movable end of this bar is provided with an arm 98 at right angles thereto in which a groove 99 is cut, said groove being fashioned therein to pass over a headed pin 101 secured to the member 19.

Further, and to prevent the barrel 12 from being rotated in a counter clockwise direction when in its immersed position, which action would withdraw the movable contact 81 from fixed contacts thereof and break the electroplating circuit, a stop bracket 102 is provided. This bracket, which takes the form of a T-shaped flat plate, is rigidly attached to the support 19 by means of bolts 103.

In order to prevent the various linkages of the supporting structure from being rotated past a point necessary to properly position the barrel for loading and unloading operations a stop member 104 is secured to the arm 58. This stop,

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which is fashioned from an angle iron, projects a flange 105 into the path of the bar 65 and prevents further rotation of the structure 13 in a counter clockwise direction. This retains the entire supporting structure in the position illustrated in both of the Figs. 3 and 4 and in this position the barrel 12 may be rotated about the shaft 56 to a loading or unloading attitude.

Operation

Assume for a starting point of the operating cycle that a load of work has just been plated and the parts are in position as illustrated in Fig. 1. Then, while the driving mechanism 14 continues to rotate the barrel, the operator grasps the arm 91 and moves it about its hinge to withdraw the latching pawl 89 from the notches 93b in the wheels 94 and 95. After the latching mechanism is thus released, continued upward force is applied through the hand to the arm 91 to lift the barrel 12 from the tank. In this operation the weights 76 and 77 are adjusted to counterbalance the barrel in its supporting structure thus reducing the required lifting force to a minimum.

It will be noted, here, that the novel arrangement of the gears 52 and 53 obviates the necessity of stopping the driving mechanism 14 and allows the motor 47 thereof to continue to run. Thus, as the structure 13 pivots to withdraw the barrel 12 from the tank, the pinion 53 is moved out of engagement with the pinion 52 and rotation of the barrel is stopped. Conversely, as the barrel is moved back into the tank, the pinion 53 meshes with the continuously rotating pinion 52 and operation of the plating barrel 12 is resumed.

When the barrel has been lifted to a point where the stop 104 prevents further rotation of the supporting structure 13, the latch bar 96 is lifted upwardly from engagement with the pin 101 and the support 19 is rotated about the pin 27 until the closure member 32 occupies a position illustrated in Fig. 3. The barrel is then rotated in a counter clockwise direction about the shaft 56 which moves the same into an unloading position and the plated work within the barrel is discharged therefrom directly into a suitable container, such as a tote basket. Here the barrel 12 may be retained in its unloading position by moving the latching pawl into engagement with the notches 93a in the wheels 94 and 95 as is shown in the figure.

The foregoing describes one mode of operation of the device to bring the plating barrel into its unloading position. A different mode of operation may be resorted to, if desired, whereby the plating barrel automatically assumes an unloading position when the counterbalanced supporting structure 13 is moved to its furthestmost position in withdrawing the barrel from the tank. Under such alternative mode of operation, and starting with parts of the device in their position as shown in Fig. 1, the latching pawl 89 is first withdrawn from the notches 93b in the wheels 94 and 95 and the barrel is raised slightly by pushing downwardly on one of the weights 76 or 77 until the pawl 89 is free of the notches 93b and rides on the peripheral surface of the wheels 94 and 95 lying between the notches 93b and 93a. Next the latching arm 96 is raised to release the barrel cover 32 for opening. Thereafter, movement of the counterbalanced supporting structure 13 to its full position against the stop 104 is made and as the action is initiated the pawl 89 will ride into and engage in the notches 93a, the same being caused by the relative movement of the

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members 22 and 23 to which the arm 91 is attached and the wheels 94 and 95. In this regard it is to be remembered that the members 22 and 23 rotate about the shaft 56, that the wheels 94 and 95 are fixed to the shaft and that the bars 57 and 58 are keyed to the shaft. It is obvious, therefore, that as movement of the structure 13 to its position shown in Fig. 3 is completed, the shaft 56 will be rotated in a counterclockwise direction, the wheels 94 and 95 will rotate with it, and, by the forces transmitted through the pawl 89 and arm 91, will tilt the frame on which the barrel is supported about the shaft 56 until the same is moved to its unloading position. The cover 32, which has been unlocked previously, will by gravity then pivot about the pin 27 to open the barrel and the contents thereof will be dumped.

After the unloading operation has been completed the latching pawl 89 is withdrawn from the notches 93a and the barrel is rotated about the shaft 56 to the position illustrated in Fig. 4. In this position, movement of the barrel about the shaft 56 is arrested by moving the latching pawl 89 into engagement with the notches 93, and the new work can be emptied into the barrel 12 directly from a tote basket. Next, the supporting member 19 is moved downwardly to bring the closure member 32 into closing position and the latch bar 96 is moved into engagement with the pin 101 to lock the barrel closed. Thereafter the latching pawl 89 is withdrawn from the notches 93 and the barrel falls into a horizontal position which it retains substantially while the supporting structure 13 is moved to carry the barrel back again to its immersed position. This movement of the barrel automatically closes the plating circuit switch 80, and starts the barrel to rotate, as described above, to condition the machine for plating the new work.

It will be apparent to those skilled in the art that the above described device is readily adaptable for use as a still plater. All that would be required would be to swing the barrel from the immersing tank, place a cathode electrode across the tank in a manner such as to engage the spring contacts 83 and 84 of the switch 80 and from this cathode electrode suspend the work pieces to be plated into the plating solution.

It will be obvious also that the plater embodying the instant invention obviates the use of unloading trays since the work to be plated can be discharged from the barrel 12 directly into tote baskets and similarly the same may be loaded by emptying the work from a tote basket directly into the barrel.

It is also to be pointed out that no limitation is intended as to the material used in the construction of the device. Its fabrication from non-conducting materials prevents unwarranted plating of any of the apparatus and limits this operation exclusively to the work that is being plated.

A further point to be noted is the ease with which the device may be constructed to render the same entirely automatic in its operation. Thus through suitable linkages the barrel closing device could automatically be moved to its open and closed position as the supporting structure is moved out from and into the immersing tank.

Various changes may be made in the details of construction, within the scope of the appended claims, without departing from the spirit of this invention. Parts of the invention may be used without the whole and improvements may be added while retaining some or all of the advantages of the invention.

I claim:

1. In an electroplating device having a tank, a barrel, and a counterbalanced supporting structure for moving the said barrel from a point within to a point without said tank, the combination of a frame for mounting said barrel on said supporting structure, and means forming a part of said frame carrying an end closing cover for said barrel pivotably movable to open and close said barrel.

2. In an electroplating device, a tank, a barrel, and a counterbalanced supporting structure for moving said barrel out of and into said tank comprising first and second counterbalance arms attached approximately at their centers to opposite sides of said tank by means about which they are free to rotate, an adjustable weight attached to one end of each of said counterbalance arms, first and second bars attached to the other ends of said counterbalance arms, a shaft extending across said tank between said bars and rotatably connected therewith, first and second bracket bars attached at one of their ends to said tank by brackets about which they move and at their other ends rigidly attached to said shaft, and a frame means for cradling said barrel on said shaft, said frame means being free to rotate about said shaft.

3. A device as claimed in claim 2 including a latching means for arresting the movement of said frame about said shaft.

4. A device as claimed in claim 2 including an end closing cover for said barrel supported on a pivotable section of said frame, said cover being movable with said section to open and close said barrel.

5. In an electroplating device, a tank, a work holding barrel adapted for rotation within said tank, and means for supporting said barrel relative to said tank comprising a shaft extending across said tank and movable through an arc to

withdraw said barrel from said tank, and a frame for suspending said barrel on said shaft for movement about said shaft.

6. A device as claimed in claim 5 including a latching means for arresting the movement of said barrel and frame about said shaft comprising a wheel rigidly fixed to said shaft for rotation therewith said wheel having spaced notches cut into its peripheral surface, and a hinged pawl attached to said frame movable into and out of engagement with the notches in said wheel.

7. In an electroplating device, a tank, a barrel and a barrel supporting structure including a shaft movable in an arc to carry said barrel from a point within to a point outside of said tank, a frame for supporting said barrel on said shaft comprising an elongated member attached to said shaft to rotate thereabout, first and second barrel supports attached to said member, the first being pivotably connected and the second rigidly fixed thereto, said first barrel support having a removable end cover for said barrel supported thereon.

8. Apparatus as claimed in claim 7 including means attached to said first barrel support means engageable with said tank to arrest the movement of said frame about said shaft when said barrel is within said tank.

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