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APPARATUS FOR PLATING

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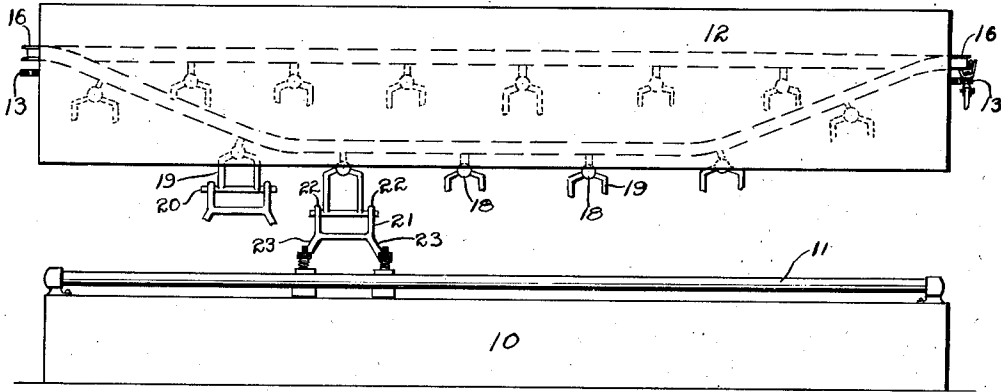


Fig. 1

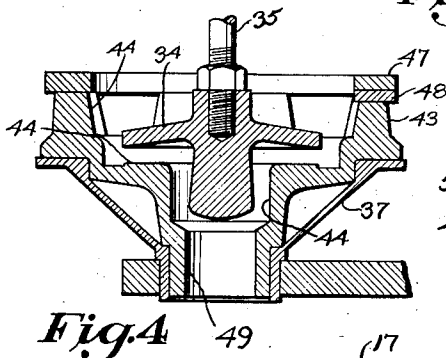


Fig. 4

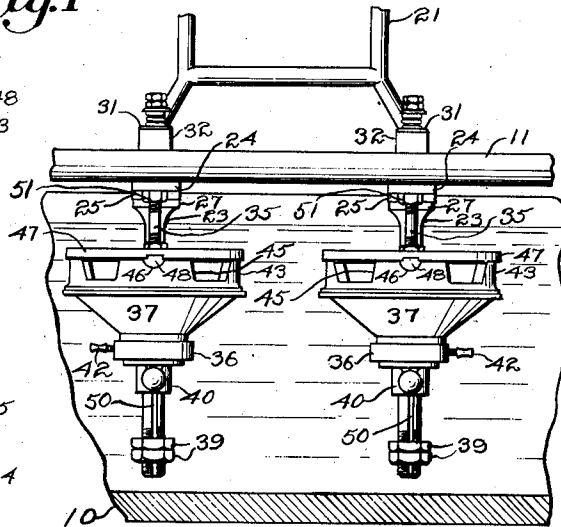


Fig. 3

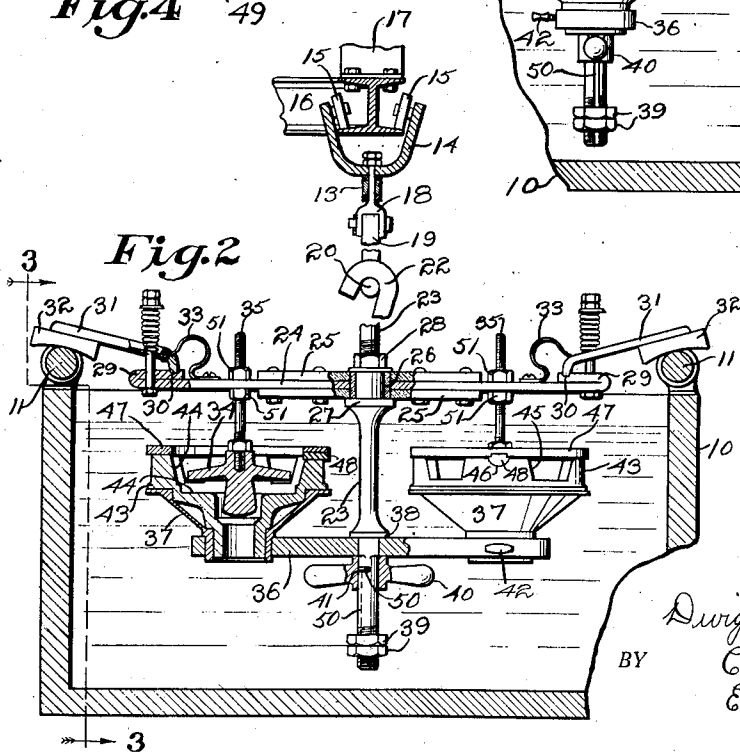


Fig. 2

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APPARATUS FOR PLATING

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The object of my invention is to provide a system of plating which may be simply and economically operated and which will last indefinitely.

5 Still a further object of my invention is to provide a system for plating wherein the articles being plated may be carried through a plating solution on a conveyor, so that the articles may be plated by what is termed a
10 continuous process as distinguished from a job process.

Still a further object of my invention is to provide improved means for depositing a plate on articles in connection with a continuous system of plating whereby the plate may
15 be limited to any desired portion of the surface of the article.

Still a further object of my invention is to provide means for depositing plate on inside and inaccessible portions of an article in a
20 continuous plating process.

With these and other objects in view, my invention consists in the arrangement, combination, and construction of the various parts
25 of my improved device, and the method of using same, as described in the specification, claimed in the claim, and illustrated in the accompanying drawings, in which:

30 Figure 1 shows a side elevation of a device for plating according to my improved method.

Figure 2 shows a vertical transverse sectional view to the device shown in Figure 1.

35 Figure 3 shows a vertical sectional view taken on the line 3—3 of Figure 2, and

Figure 4 shows a vertical central sectional enlarged view of one of the work holders, in which the work is clamped during its progress through the plating solution.

40 Referring to the accompanying drawings, I have used the reference numeral 10 to indicate generally a rectangular plating tank of conventional form. This tank has a pair of conductors or rails 11 and mounted on the
45 edges of the tank at either side thereof, which are designed to carry the current which is furnished to the anode in my improved method of plating. These conductors 11 are preferably insulated from the tank 10.

50 A frame member or casing 12 is suitably

supported above the tank 10 and houses a conveyor. This conveyor consists of a chain 13 having U shaped brackets 14 extended upwardly therefrom at intervals and carrying pairs of spaced rollers 15. These rollers
55 engage the opposite sides of the upper surfaces of the lower web of an I beam 16 which is supported from the casing 12 by suitable brackets 17. This I beam 16 is so shaped that articles carried by the conveyor will be carried
60 to position above the tank 10 and immersed in the tank and then carried up and out of the tank around to position where the conveyor may be unloaded and reloaded. The conveyor is driven by any suitable means.
65

The brackets 14 support a clevis 18 which extends to the conveyor chain 13 which in turn support yokes 19 which have extensions
70 20 at either end thereof designed to form hooks upon which the work holders may be suspended.

The exact construction and drive of this conveyor is not herein fully described and many such conveyors are standard and can practically be bought upon the open market.
75 Any conveyor will answer for this purpose which will carry the work into and through the tank and then up out to the place where the conveyor may be unloaded and reloaded. This conveyor is connected in any suitable
80 way with a source of electrical energy so that it may carry the current to the work so that the latter may act as the cathode during the plating operation.

The work holders are hooked on the hooks
85 20 in such position that the work held thereby may be carried down into the plating bath.

In connection with the plating of metals, it has heretofore been proposed to use a solution containing compounds of the material
90 which it is desired to use for the plate. The work forming the cathode is then connected with any suitable source of electrical energy and suspended in the plating bath. In connection with the ordinary plating bath, the
95 anodes are a series of plates or wire which are suspended in the plating solution in any suitable manner. The work is also suspended in the solution and the current turned on so that a plate may be deposited upon the work. 100

When this plate has been deposited, then the work is removed from the bath by hand and other work substituted therefore. In my improved process I provide means for conveying the work to the plating bath continuously so that the plating operation may fit in with other methods of continuous manufacture so that the entire article should be produced by what are termed "production methods".

10 The work holder consists of a yoke 21 which has hooks 22 to engage the hooks 20 on the yoke 19 so that the yoke 21 may be readily attached to and detached from the conveyor. This yoke 21 has spaced arms 23 15 which each carry a pair of work holding cups. An anode support 24 is supported by the arm 23 and insulated therefrom by a pair of insulating plates 25 and the insulating sleeve 26. The lower plate 25 rests on a shoulder 27 20 formed on the shank 23 and the anode support 24 and the insulators are held from upward movement on the shank 23 by the nut 28.

This anode support consists of a long strip of relatively heavy copper which extends almost across the tank 10 and has its ends bent upon themselves at 29 to form a reinforcement for a brush mounting. The upper surface of the support 24 is notched at 30 so that one end of a brush fork 31 may be pivotally supported in this notch. The brush support 31 has a brush 32 at the outer end thereof and the flexible cable 33 at the inner end thereof which is designed to insure a good electrical connection between the brush 31 and the anode support 24. The brush support 31 and the brush 32 and the end of the anode support 24 are so disposed and shaped that when the yoke 21 is hung on the conveyor and passes through the tank 10 then that the brush 32 40 will contact with the rail 11 at each side of the tank 10 to conduct the anode current to the anode support 24. The anodes 34 are adjustably mounted at either end of each of the supports 24 on the studs 35 which are vertically adjustable in the anode supports 24 by means of the nuts 51. It will be noted that each anode support 24 has an anode mounted at each end thereof.

The lower end of the arms 23 each carry a vertically adjustable movable bracket 36 50 which supports a work holding cup 37 at either end thereof. The cups 37 are removably secured in place by set screws 42.

A shoulder 38 is provided near the bottom of each arm 23 and below this is a pair of stop nuts 39. The bracket 36 slides up and down in the space between the shoulder 38 and the nuts 39. The arm 23 just below the shoulder 38 is square to fit a corresponding opening to the bracket 36 to insure that the cups 37 will always be supported by the bracket 26 in a predetermined position relative to the anodes 34 when the bracket 36 is at the upper limit of its movement.

65 A follower 40 is slidably mounted on the

arm 23 in and provided with a pin 41 which is received in a bayonet slot 50 in the arm 23 between the shoulder 38 and the nuts 39 so that the follower 40 may be slid up and down the arm 23 to lock the bracket 36 at the upper limit of its movement or to release the bracket so that it may be dropped to rest on the nuts 39.

From the construction just described it will be seen that the bracket for supporting the cup 37 may be slid up and down the arm 23 to position so that the cups at each end of the bracket 36 will have certain predetermined positions relative to the corresponding anodes 34.

The work 43 is designed to be set into the work holding cup 37 when the cup is in its lower position and then the follower 40 may be operated to raise the bracket 36 to position with the work 43 adjacent to the anode 34 at which time the work holder may be hooked onto the conveyor to carry the work to the plating solution.

In the particular embodiment of my invention herein described the work is illustrated as being one half of a differential gear casing for an automobile rear axle. I desire to plate the surfaces on this gear casing which I have marked with the reference numeral 44 with chromium in order to harden and protect these surfaces but I do not care to have the rest of the surface of the article plated. As a matter of fact chromium plating the rest of the surface of the article would be a very useless expense and render subsequent machining operations more expensive. If this article were to be plated by ordinary methods, the inner surfaces thereof would not be coated as thickly as the outside surfaces, so that by ordinary plating methods it would be necessary to deposit an unnecessary coat of plating on the exterior surface of the article many times thicker than the coating which it is desired to place on the inner surface of the article. By my improved method, I use a shaped anode 34 which is supported in position so that the work 43 may be clamped in position surrounding the anode 34 so that practically none of the article 43 will be plated except the surfaces which I have marked 44. It will be noted that this differential gear case half which I desire to plate is provided with three extensions 45 which have notches in their upper central surfaces 46 which are designed eventually to receive the ends of the differential spider. It is particularly important that the upper surfaces of this extension 45 and the notches 46 should not be plated with chromium as these surfaces would thereby become hardened thereby making the finishing operations more difficult and expensive. A ring 47 is provided with ribs 48 thereon whereby this ring 47 may be set down over the casing 43 with the ribs 48 entering the notches 46 130

and the lower surfaces of the ring covering the upper surfaces of the extensions 45 so that when the plating operation is continuing, no plate will be deposited upon these upper surfaces of the extensions 45 or the surfaces of the notches 46.

The anodes 34 are properly shaped so that the inner surfaces of these gear casings will be coated except for the surface 49 which is designed to form a bearing which fits over the end of the rear axle. There is no particular objection to slightly hardening this surface so that a coating of chromium will be deposited thereon which will however be considerably lighter than the coating which is deposited upon the surfaces 44.

In other words by my improved method of plating I am enabled to deposit in connection with a continuous method of plating to any desired thickness at any particular surface of the article even though this surface be relatively inaccessible and I am also enabled to deposit different thicknesses of plate at different places on the same article and also to limit the deposit to predetermined surfaces. The advantages of such a method especially in connection with chromium plating where the plating cost is relatively high will be obvious.

In the actual practice of my improved method, the parts set up as disclosed in the drawings, and then the work is clamped in the work holders and the conveyor rotated to carry the work through the plating solution to secure the desired coating on the work. When the work has passed through the solution and has been properly coated, then the conveyor carries it to position where the work holders may be unloaded and reloaded. The work holders for any particular job and the anodes associated therewith are so shaped that the coating will be deposited where it is especially desired to plate and not on the surfaces where the plating need not or should not be.

Among the many advantages arising from the use of my improved device it should first be pointed out that the use of a shaped anode which moves with the work makes the difference between a successful and an unsuccessful continuous system of plating. With a moving shaped anode, the plate can be deposited at any desired surface of the work and the amount of plate deposited can be controlled by varying the distance of the anode from the surface to be plated. Different thicknesses of plate can be secured when desired at different surfaces of the same art. Where only a part of an article need be plated or should be plated, then the costs are cut tremendously. For instance, in connection with the differential gear case half housing, the current required to plate with stationary anodes was more than three times that required to plate where a moving anode is

used. Had the stationary anodes been used, it would have been necessary to go to considerable expense to remove the plate from the upper surfaces of the extensions 45 and the notches 46 therein. There would have been a wholly unnecessary coating on the exterior of the casing 43 of two or three times the thickness of the coating on the inside where this coating was needed. It will be understood that I have used this differential gear half casing merely as illustrative to show that by my method of plating, I am enabled to do three things, namely, to limit the plate to a portion of the surface of the work, to deposit plate of varying thickness at various places on the same article, and to prevent the deposit of any plate on certain portions of the surface of the article. Of course these three advantages are all secured in connection with a continuous system of plating and practically make such a continuous system possible. These advantages are secured by the use of my improved moving shaped anode and a plate shield such as a ring 47.

Some changes may be made in the construction of the various parts of the device as illustrated, and in the method of applying my plate, without departing from the spirit of my invention, and it is my intention to cover by my claim such changes as may reasonably be included within the scope thereof.

I claim as my invention:

In a work holder for plating the inside of a cup-shaped differential gear casing, said casing having a plurality of differential spider notches therein which are required to be left unplated, a cup-shaped support into which said casing is received, a ring adapted to rest upon the rim of the casing, said ring having a plurality of ribs extending therefrom into the notches in the casing, an anode disposed in said casing and shaped so as to follow the internal contour thereof, whereby the anode will be spaced a uniform distance from the inside walls of the casing, and means for lowering said work holder and casing and ring from said anode whereby the casing may be conveniently removed from the work holder, said ring and notches effectively preventing the depositing of metal on the abutting casing surfaces.

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