June 14, 1955 M. VRILAKAS 2,710,834

APPARATUS FOR SELECTIVE PLATING

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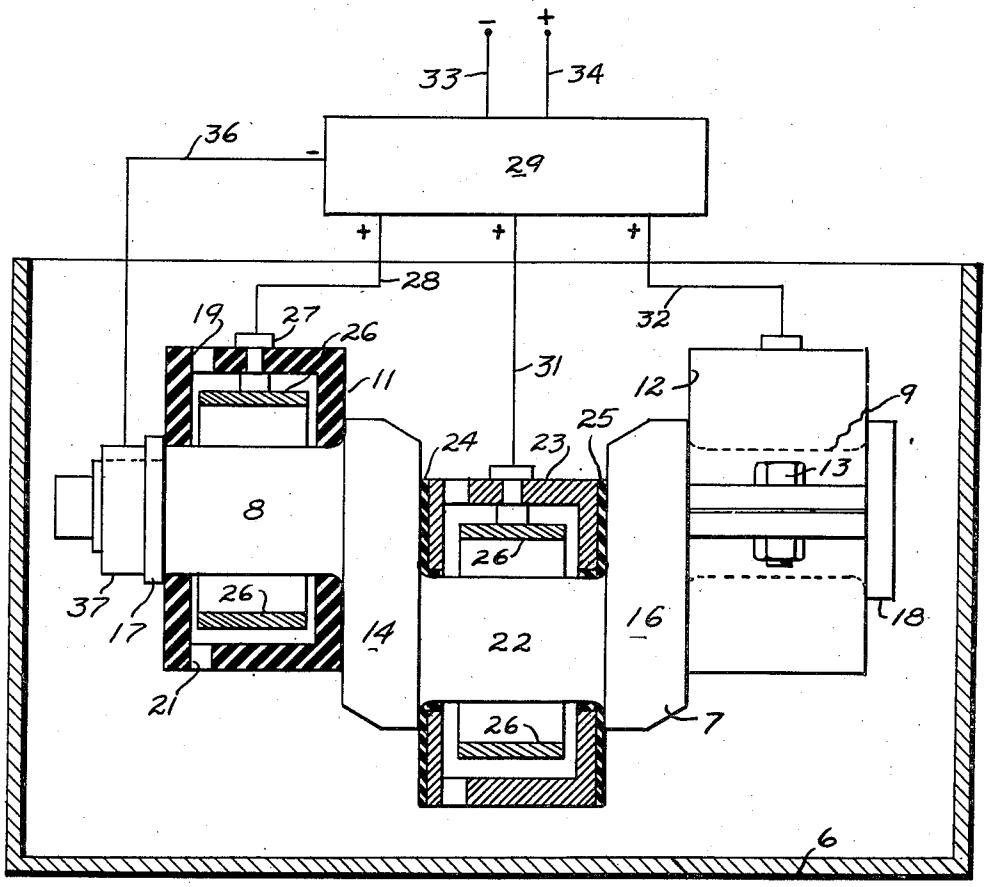

FIG. 1.

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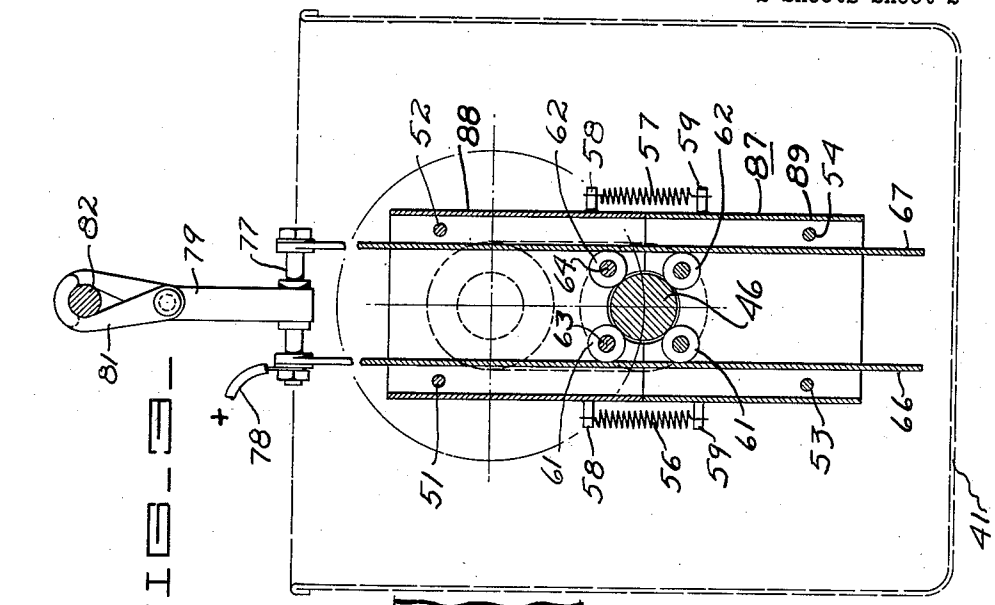

FIG-3

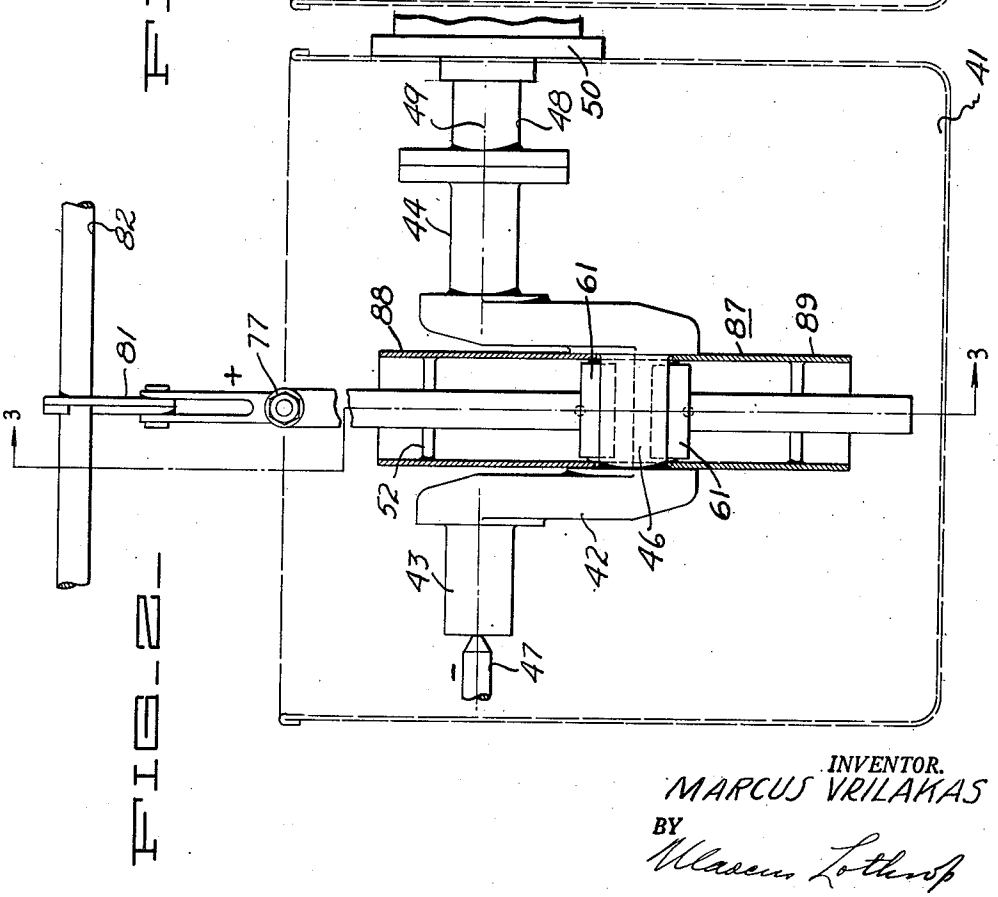

FIG-2

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APPARATUS FOR SELECTIVE PLATING

Marcus Vrilakas, Sacramento, Calif.

Application October 27, 1951, Serial No. 253,526

7 Claims. (Cl. 204—212)

My invention relates to methods and mechanisms for depositing electroplate of a suitable material, usually metal such as chromium, upon certain portions only of an object. The object is an electrical conductor and is included in the plating circuit. In carrying out plating of this general nature, it is now customary to cover, by paint especially, those portions of the object to be plated which are not to receive any deposition of plating material. The result of this technique is to deposit a layer of plating material upon the unprotected portions of the object and to leave the previously prepared and protected portions of the object without any electro deposition.

While this technique has proved to be satisfactory over a long period of time, especially in connection with smaller objects, it has in recent years become important to electroplate certain portions of relatively heavy machinery; for example, internal combustion engine crank shafts. It is deemed advisable to coat the main bearing journals and the crank pin journals with a wear resistant coating such as chromium but for reasons of economy and for other reasons it is desired to leave the crank throws and comparable parts without any superficial plating deposit.

The customary technique of applying paint or the like to those portions which are not to be plated requires first a masking of the parts to be plated against the paint, then a painting operation, followed by the plating cycle, and later followed in some instances by a removal of the paint. All of this is a laborious and costly procedure.

It is therefore an object of my invention to provide a new and improved method and apparatus for selective plating.

A further object of my invention is to provide a plating apparatus useful in connection with crank shafts and the like for plating the selected portions thereof without depositing any plating material on the remaining portions and without necessitating preliminary masking or painting.

A still further object of my invention is to provide a method which can be utilized in conjunction with most electroplating equipment now available, yet which, when practiced will eliminate the previous painting or masking operation.

A still further object of my invention is to provide a means and method for electroplating certain portions only of an object without requiring previous preparation of the object.

An additional object of the invention is to provide improved technique and means in the plating of objects selectively.

Other objects, together with the foregoing, are attained in the embodiment of the apparatus and in the preferred method of practicing the invention described in the accompanying description and illustrated in the accompanying drawings, in which

Figure 1 is a diagram showing generally in cross section on a vertical plane an apparatus for use in selective

plating and for use in carrying out my method for selective plating.

Figure 2 is a similar diagram of a modified form of apparatus.

Figure 3 is a cross section, the plane of which is indicated by the line 3—3 of Figure 2.

While the method and apparatus have been especially successful in the electro deposition of plating material on automotive crank shafts and while they are both described in connection with such an object herein, it will be recognized by those skilled in the art that other objects can equally well be selectively plated in accordance with my disclosure.

In one form of apparatus, as shown in Figure 1, there is provided a tank 6 within which an object 7 to be placed can be disposed. The object 7 is preferably an electrical conductor and is a crank shaft, for example. It can be mounted for rotation about its major axis in accordance with the customary practice, or it can simply be immersed. The crank shaft 7 is virtually completely submerged in a plating bath contained within the tank 6 which is virtually full of such liquid electrolye.

In accorrdance with my invention, I surround each of the main bearing journals 8 and 9 with casings 11 and 12, preferably fabricated of non-conducting material or electrically insulating material and dispose them so that they come apart in two halves, being fastened by suitable securing means 13. The dimensions of the casings 11 and 12 are such that they fit accurately around the journals 8 and 9 and come into abutment with the crank throws 14 and 16 and with the end flanges 17 and 18. Each of the casings 11 and 12 is open to the electrolyte in the tank 6 by means of apertures 19 and 21, but is otherwise closed.

As an alternative, I disclose on the central crank throw 22 and between the crank cheeks 14 and 16 a casing 23 fabricated of metal but which is provided with insulating discs 24 and 25 to preclude electrical flow between the casing and the material of the object 7 being plated. The casings 11, 12 and 23 are otherwise identical.

Disposed inside each of the casings is an electrode 26 which is preferably an annular form and can be split as are the various casings themselves on a horizontal plane. Each of the electrodes 26 is spaced from its adjacent part 8, 22 or 9 to be plated and is connected through an insulating fitting 27 by a conductor 28 to a supply 29 of electroplating current. Similarly, the casing 23 has its electrode connected through a conductor 31 whereas the casing 12 has its electrode connected through a conductor 32 to the source 29. The source of electroplating current 29 is any suitably arranged mechanism connected by leads 33 and 34 to a source of electromotive force.

The remaining portions of the plating circuits are all combined into a lead 36 extending from the source 29 to a conductor 37 in direct metallic contact with some convenient portion of the crank shaft 7.

Then the crank shaft with its portions selected for plating suitably surrounded by cases and connected as shown is immersed in a plating electrolyte and when the current is caused to flow there is a plating action that takes place between each of the electrodes such as 26 to the adjacent crank pin such as 8 without current flow being extended to the adjacent portion such as 14 of the crank shaft. The journals themselves, consequently, are covered with a deposit of plating material such as chromium, but the adjacent material such as the throws 14 and 16 are not in any wise plated, being protected by the casings 11 and 12 and 23.

When the plating is completed, the parts are removed from the bath, the casings are removed, and the job is then finished without the necessity of any further work.

In the modified form of my apparatus for practicing my method as shown especially in Figures 2 and 3, there

is provided a tank 41 for the reception of the electroplating bath. This electrolytic liquid substantially fills the tank. Immersed in the tank is a crank shaft 42 having main bearings 43 and 44 and a crank pin bearing 46.

The crank shaft is preferably supported for rotation within the bath and that is accomplished by a suitable support 47 and a rotating support 48, conveniently the shaft of a drawing motor 50 so that the shaft is revolved about its axis 49.

Encompassing the crank pin bearing 46 is a casing 87 having an upper half 88 and a lower half 89. The casing is preferably made of non-conducting plastic or other comparable material and is pervious to the electrolyte in that it is made without any top or bottom inclosures. The top half of the casing 88 is cut away as closely as possible to conform to the crank pin diameter and the walls of the top portion of the casing are spaced apart by struts 51 and 52. Similarly, the bottom half 89 of the casing fits its part of the crank pin bearing relatively well, abuts the top part of the casing and has its walls held in position by struts 53 and 54. For convenience in handling, the two halves of the casing are held in closed position by coil springs 56 and 57 engaging lugs 58 and 59 on the two halves so that while the parts are normally held together to provide a functionally unitary casing, by unhooking the springs the casing can be readily taken apart and taken away from the bearing.

In order partly to locate the casing but more especially to treat the deposited material to avoid excrescences or growth or "treeing" of the material being deposited, each of the parts of the casing is provided with a pair of rollers 61 and 62 turning on pins 63 and 64 mounted in the casing. As the crank shaft rotates, the rollers roll upon the surface of the crank pin and insure that a satisfactory plating deposit is made.

The plating itself is effectuated by the medium of a pair of electrodes 66 and 67 which are bars often arcuate in transverse cross section which are dependent between the struts 51 and 52, for example, and the rollers 61 and 62, for example. The electrodes are thus loosely confined between the struts and the rollers and the side walls of the casing. The electrodes hang freely through the casing and are secured at their upper ends to a cross piece 77 to which the conductor 78 is attached. This conductor corresponds to the conductors 28 or 31 or 32 of the Figure 1 modification. The cross piece 77 is hung from a hook 79 having a closure hook 81, both adapted to embrace a supporting rod 82 mounted on any convenient support.

In the operation of this device when the current is flowing through the plating circuit as disclosed in connection with Figure 1, and when the crank shaft is rotated in the bath within the tank 41, the casing rises and falls and moves laterally with the rotation of the crank pin, being prevented from rotation with such pin by the interposition of the electrodes 66 and 67. These electrodes swing from side to side in the fashion of a pendulum hung from the rod 82 and during this time are effective to assist in the plating operation. When the plating is being deposited, it is kept from the parts of the crank shaft such as the cheeks 42 by reason of the positioning of the surrounding permeable box or casing 47.

When the plating operation is completed, the mechanism is removed from the bath, the springs 56 and 57 are unsnapped, and the parts are thereby released from the crank shaft which is a completely plated and finished article without further work.

I claim:

1. An apparatus for selective plating comprising a tank for containing a plating bath, a pair of parallel elongated electrodes, means above said tank for suspending said electrodes in said bath for swinging movement on a fixed horizontal axis, a casing of electrically insulating material extending around said electrodes and in freely sliding relationship therewith, said casing being open at the top and bottom and having alined openings therethrough between said electrodes, means for supporting an object to be plated extending through said alined openings and between said electrodes, means for supporting said casing on said object, means for moving said object and said casing in said bath in a direction along the length of said electrodes and in a direction transverse to the length of said electrodes, means for preventing said electrodes touching said object, and means for including said object and said electrodes in a plating circuit.

2. An apparatus for selective plating comprising a tank for containing a plating bath and for containing an electrically conducting horizontally disposed shaft, means for rotating said shaft within said tank, said shaft having a portion eccentric to the axis of rotation, an electrode support fixed above said tank, a pair of electrodes hanging from said support into said tank on opposite sides of said eccentric portion of said shaft, an insulating casing open at the top and bottom and extending around but free from said electrodes and extending above and below said shaft, said casing being split on a shaft diameter and being cut out to pass the eccentric portion of said shaft, means for supporting said casing on the eccentric portion of said shaft, means in said casing for holding said electrodes away from the eccentric portion of said shaft, means for holding said casing against separation at said split, and means for establishing a plating current between said electrodes and said shaft.

3. An apparatus for selective plating comprising a tank for containing a plating bath and for containing an electrically conducting horizontally disposed shaft, means for rotating said shaft within said tank, said shaft having a portion eccentric to the axis of rotation, an electrode support fixed above said tank, a pair of elongated electrodes supported on said electrode support for swinging movement in unison across the axis of rotation and hanging into said tank on opposite sides of said eccentric portion of said shaft, an insulating casing open at the top and bottom and extending around said electrodes and above and below said eccentric portion of said shaft, members extending across and secured to said casing and resting on said eccentric portion of said shaft in position to support said casing on said eccentric portion of said shaft and to hold said electrodes away from said eccentric portion of said shaft, and means for establishing a plating current between said electrodes and said shaft.

4. For use in an apparatus for selectively plating a selected area of a rotating shaft, an insulating hollow casing defined by four walls and open at the top and bottom and being split on a shaft diameter into two halves, said casing having cut out portions to pass said shaft with said selected area within said casing, insulating members extending across the interior of said casing and secured to the walls of said casing and adapted to rest on and transfer the weight of said casing to said area of said shaft, said insulating members being positioned to hold a straight electrode extending through the open top and bottom of said casing away from said shaft, and means for releasably holding said casing halves together.

5. An apparatus for selective plating comprising a tank for containing a plating bath and for containing an electrically conducting horizontally disposed shaft having an eccentric portion, means for revolving said shaft in said bath, a fixed electrode support above said shaft, an elongated electrode depending from said electrode support to swing laterally and hanging into said tank on one side of the eccentric portion of said shaft, an insulating casing open at the top and bottom and extending around said electrode to abut and swing said electrode in one direction as said shaft is rotated, said casing being split on a shaft diameter into two halves and having cut out portions to pass the eccentric portion of said shaft, insulating means extending across said casing between said electrode and the eccentric portion of said shaft in position to hold said electrode away from said shaft and

to abut and swing said electrode in the other direction as said shaft is rotated, means for releasably holding said casing halves together, and means for establishing a plating current between said electrode and said shaft.

6. An apparatus for selectively plating a crankshaft having a main bearing and a crank pin bearing comprising a tank for containing a plating bath, means for supporting said shaft within said bath for rotation about the axis of said main bearing with said axis substantially horizontal, means for so rotating said shaft, a supporting rod above said bath and parallel to said axis, a pair of elongated electrodes hung on said rod to swing transversely of said axis, said electrodes being spaced apart and of sufficient length to lie on opposite sides of said crank pin bearing in all rotated positions thereof, an insulating casing open at the top and bottom surrounding both said electrodes and closely approaching said crank pin bearing, means for supporting said casing on said crank pin bearing, means for keeping said electrodes away from contact with said crank pin bearing, and means for connecting said electrodes and said crankshaft in a plating circuit.

7. An apparatus for selective plating comprising a tank for containing a plating bath, means for supporting a crankshaft in said tank for rotation within said plating bath with the main bearing axis of said crankshaft in a fixed horizontal position, said crankshaft having an eccentric crank pin, means for rotating said crankshaft

about said main bearing axis to swing said crank pin in a circle centered on said axis, means above said tank and disposed substantially above said crank pin for supporting an electrode, an elongated electrode hanging from said supporting means and free to swing laterally thereon, means for establishing a plating current between said electrode and said crank pin, an open end casing of insulating material extending between said electrode and the throws of said crankshaft adjacent said crank pin and extending around said electrode and said crank pin, means for supporting said casing on said crank pin for sliding movement relative to said electrode, and means on said casing for swinging said electrode with said casing and for holding said electrode away from said crank pin.

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