May 31, 1932. W. G. HILDORF ET AL 1,861,272

METHOD OF CHROMIUM PLATING CRANK SHAFTS

Filed Dec. 10, 1928

Fig. 1.

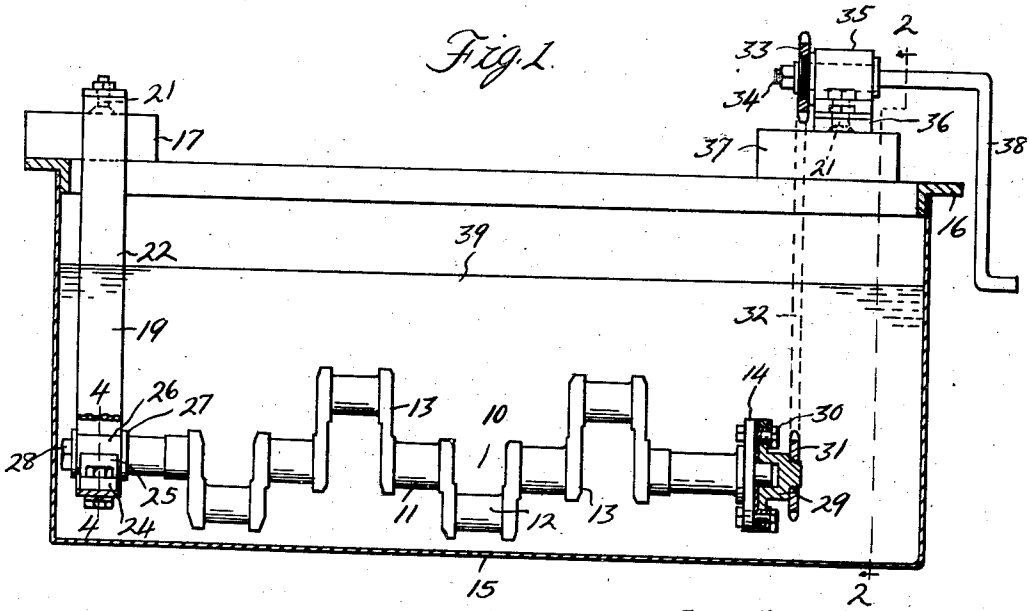


Fig. 2.

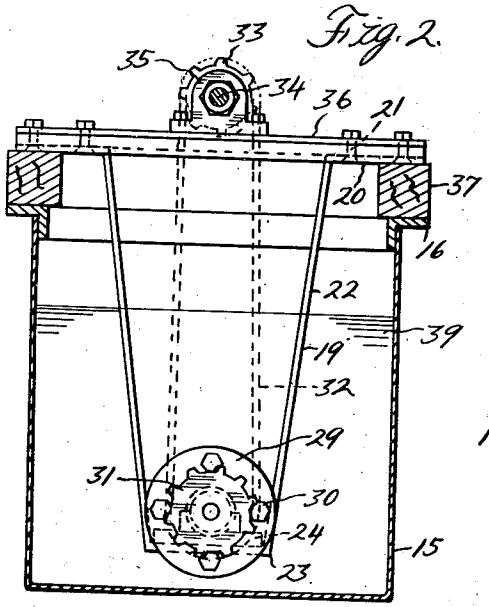


Fig. 4.

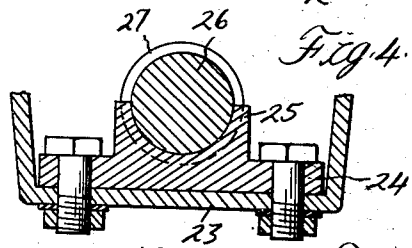
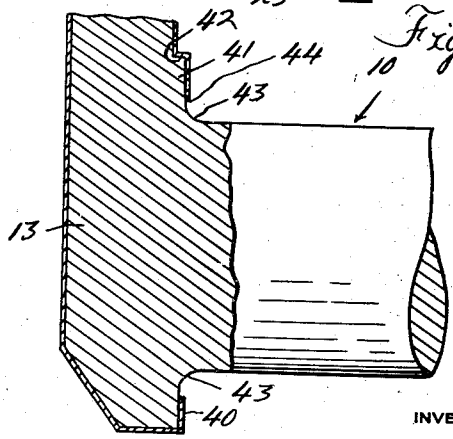


Fig. 3.



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UNITED STATES PATENT OFFICE

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METHOD OF CHROMIUM PLATING CRANK SHAFTS

Application filed December 10, 1928. Serial No. 324,914.

The invention relates to chromium plated crank shafts and more particularly to a method for depositing the chromium on the bearing surfaces of the crank shaft in such a manner as to obtain a uniform quantity and thickness of deposit on both the main bearing surfaces and the crank bearings. The invention also relates to the apparatus for carrying out the electroplating process.

In order to obtain a chromium plated crank shaft suitable for use in internal combustion engines, it is desirable to have the chromium deposit on all of the bearing surfaces, that is, the main bearings which are in axial alignment and the crank bearings which are parallel to the main bearings but offset with respect thereto. Because of the peculiar shape of the crank shaft there is no obvious way of successfully plating the same with chromium since the electrolytic processes now available for electrodeposition of chromium will not cause a uniform deposition over the entire surface of the crank shaft if the latter is merely suspended in an electrolyte as a cathode. We have found, however, that by mounting a crank shaft in such a manner as to permit the same to be suspended in an electrolyte and slowly rotated during the plating process, it is possible to secure very satisfactory results providing that certain other conditions are maintained. One of these conditions is that certain parts of the crank shaft, principally the cheek plates and other surfaces extending transversely to the axis of the cranks, be rendered non-conducting so as to confine the cathode surfaces to the parallelly arranged bearing surfaces themselves.

Our invention consists in a process for chromium plating crank shafts comprising the steps of first treating the crank shaft with stop-off lacquer or other suitable material for rendering metallic surfaces non-conductors, the lacquer being applied to all surfaces of the crank shaft except the bearings. The crank shaft is then suspended in an electrolyte, preferably in a horizontal position and connected to a mechanism for rotating the shaft while the electroplating process is being carried out. The anode may be the metallic tank itself, or if desired one or more separate anodes may be immersed in the electrolyte and spaced at substantially equal distances from the main axis of the crank shaft. By carrying out the process as outlined above, it has been possible to secure crank shafts having uniform deposition of chromium over all the bearing surfaces.

While the process as outlined above may be carried out in various ways, we have found it desirable to construct a special type of apparatus whereby the crank shaft may be quickly immersed in the plating solution and rotated during the plating operation. In order to fully set forth the features of this apparatus, reference should be made to the accompanying drawings, wherein

Figure 1 is a longitudinal section through a tank;

Figure 2 is a cross section on the line 2—2 of Figure 1;

Figure 3 is an enlarged sectional view of one of the crank bearings of the crank shaft;

Figure 4 is a section on the line 4—4 of Figure 1.

As illustrated in the drawings, the crank shaft 10 has a series of axially aligned main bearing surfaces 11 and a series of offset crank bearing surfaces 12 with intermediate transversely extending portions or cheek plates 13. In the particular construction illustrated, one end of the crank shaft has an enlarged annular flange 14 in accordance with conventional practice.

The apparatus used in carrying out the plating process comprises a metallic tank 15 having the reinforced top flange 16 on which are mounted insulating blocks 17 composed of wood or other suitable insulating material. 18 is a metallic cross bar at one end of the tank supported on the blocks 17. The cross bar has secured thereto a stirrup 19 which, as shown, is composed of the flanges 20 secured to the cross bar by bolts 21, the downwardly inclined side portions 22 and the bottom strip 23. Mounted on the bottom strip is a bearing block 24 having a semi-cylindrical bearing face 25 adapted to support a cylindrical bearing member 26, which in turn is secured to the end of the crank shaft. The bearing member 26 has side flanges 27 for retaining

the same in the half bearing 25 and has a bore therethrough for receiving the bolt 28 which unites the same to the end of the crank shaft 10.

The opposite end of the crank shaft has a fixture 29 secured to the flange 14 by bolts 30 and the fixture has a sprocket wheel 31 attached thereto. The sprocket wheel engages a chain 32, which in turn is suspended from above the tank on a sprocket wheel 33. 34 is a shaft on which the sprocket is mounted, the shaft being journaled in a bearing 35 which in turn is mounted on a cross member 36 supported on blocks 37 on the tank. A hand crank 38 is secured to the shaft 34 and extended to the end of the tank for manual operation. This shaft, of course, may be replaced by mechanism for turning the shaft by power if desired. All of the metallic parts immersed in the plating solution 39 within the tank are coated with lacquer or other material rendering the same non-conductors.

With the apparatus as above described, the crank shaft after having mounted thereon the bearing member 26 and the fixture 29 is immersed in the electrolyte with the bearing member 26 engaging the half bearing 25. The chain 32 engaging the sprocket 31 supports the opposite end of the shaft and the chain is engaged with the upper sprocket 33. In order to electrically connect the crank shaft as the cathode, the stirrup 19 may be used as the terminal.

As heretofore set forth, the crank shaft has the cheek plates covered with a stop-off lacquer so that only the bearing surfaces of the crank shaft are exposed to electrolytic action. In applying the stop-off lacquer 40, it is preferable to carry the same to a point closely adjacent the crank bearings 12. Thus referring to Figure 3, 41 represents the thrust bearing of the crank shaft which is slightly raised from the surface of the cheek plate forming an annular shoulder 42. Between the thrust bearing and the crank bearing there is a fillet 43 and in grinding the crank bearings it is customary to grind both the annular bearing surface 12 and the flat thrust bearing surface 41. In plating the crank shaft the fillet 43 is a point where it is difficult to obtain smooth uniform deposits, but we have eliminated the problem by carrying the stop-off lacquer to the point 44 where the curvature of the fillet begins instead of terminating the lacquer at the annular shoulder 42. This arrangement while it prevents the formation of a chromium surface on the thrust bearing 41, eliminates the surface 41 as a cathode surface and thus renders it possible to obtain a uniform deposit in the corner or fillet 43.

In applying our process to crank shafts, it is preferable to first grind the same, that is, to accurately grind all of the main bearings and crank bearings. The shaft is then subjected to the chromium plating process while continually rotating until the desired deposit is obtained on the ground bearing surfaces. After the chromium is deposited it is preferable to subject the main and crank bearings to a final honing operation, thereby obtaining a shaft having accurate bearing surfaces of extremely hard metal.

What we claim as our invention is:

1. The method of obtaining uniformly deposited chromium surfaces on crank shaft bearings which consists in suspending a crank shaft in an electrolyte, mounting the same for rotation about its main axis, protecting the surfaces between the bearings of said crank shaft from electrical contact with said electrolyte whereby exposing only the bearings as cathode surfaces and rotating said crank shaft during the passage of current through said electrolyte.

2. The method of obtaining uniformly deposited chromium surfaces on the bearings of crank shafts which consists in covering the cheek plates of the crank shaft with a non-conductor, suspending said crank shaft as a cathode in a chromium plating electrolyte, rotating said crank shaft and simultaneously passing current through the electrolyte whereby the chromium is uniformly deposited on the bearing surfaces.

3. A method of obtaining uniformly deposited chromium surfaces on the bearings of crank shafts which consists in protecting the surfaces between the bearings with a layer of non-conducting material, providing said protecting layer on the thrust bearings adjacent said bearing surfaces, suspending said crank shaft as a cathode in a chromium plating electrolyte, rotating said crank shaft and simultanenously passing current through said electrolyte whereby chromium is deposited on said bearing surfaces and in the corners between said surfaces and said thrust bearings.

4. The method of electroplating crank shafts to obtain uniform deposition on the bearing surfaces which consists in applying stop-off lacquer to all surfaces extending transversely of the bearing surfaces, said stop-off lacquer being terminated at the fillet connecting the transverse surfaces with the bearing surfaces whereby the electrodeposited metal is coated on the fillet as well as the bearing surfaces.

5. An apparatus for electroplating crank shafts comprising a tank, a bearing within said tank, a rotatable coupling within said tank having a sprocket thereon, a sprocket mounted above said tank and a chain connecting said sprockets, said bearing and said coupling being adapted to be connected to the opposite ends of a crank shaft and the sprocket on said crank being supported solely by said chain.

6. An apparatus for electroplating crank shafts comprising a tank, a stirrup supported

on said tank having a portion extending downwardly within the same, a bearing on said stirrup, a rotatable sprocket mounted on said tank, a chain depending therefrom into said tank and a sprocket adapted to be connected to the end of a crank shaft engaging the portion of said chain within said tank and being otherwise free from said tank.

7. In an apparatus for electroplating crank shafts, the combination of a crank shaft, a bearing secured to one end thereof, a sprocket secured to the other end thereof, a tank, a stirrup suspended from said tank having a bearing engageable with said crank shaft bearing, a sprocket member on said tank and a chain on said sprocket member for supporting and rotating the aforesaid sprocket on said crank shaft.

8. The method of obtaining uniformly deposited chromium surfaces on the bearings of crank shafts which consists in covering the cheek plates of the crank shaft with a non-conductor, suspending said crank shaft as a cathode in a chromium plating electrolyte and passing current through the electrolyte whereby the chromium is uniformly deposited on the bearing surfaces.

In testimony whereof we affix our signatures.

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