Aug. 14, 1956 H. C. LUECHAUER 2,758,962

METHOD OF ELECTROPLATING AND APPARATUS THEREFOR

Filed Dec. 28, 1951

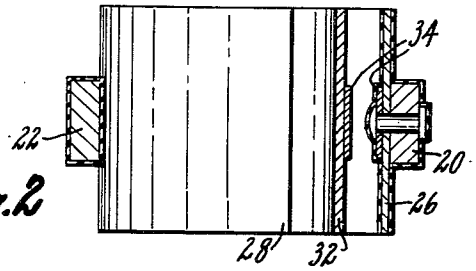


Fig. 2

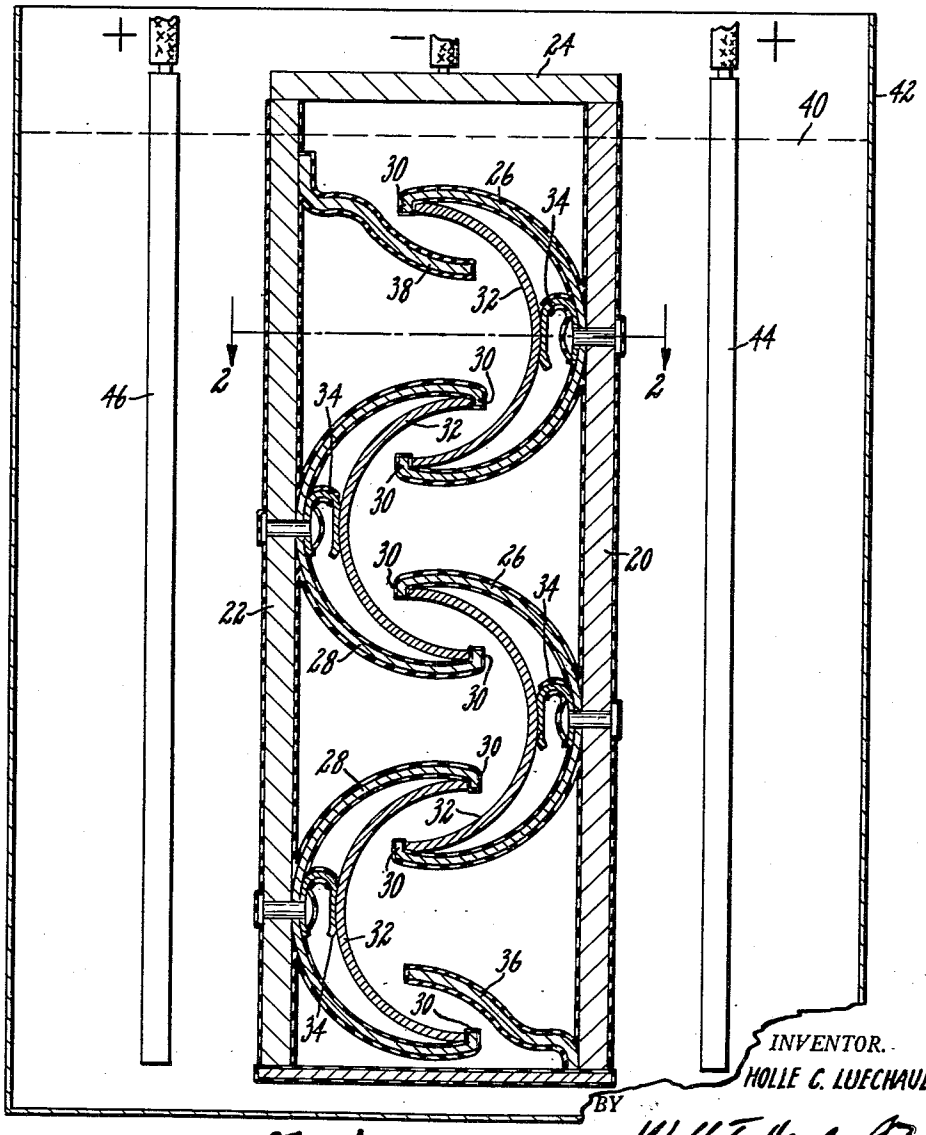


Fig. 1

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United States Patent Office

2,758,962

Patented Aug. 14, 1956

2,758,962

METHOD OF ELECTROPLATING AND APPARATUS THEREFOR

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Application December 28, 1951, Serial No. 263,759

3 Claims. (Cl. 204—15)

This invention relates to electroplating and is particularly concerned with a method and apparatus for precision plating semi-circular objects at the concave surfaces thereof.

It is, therefore, the main feature of the invention to provide a method and apparatus which will produce precision plating of very thin films of electroplating on the concave surface of a semi-circular object to be plated wherein the thickness of the plate is in the order of from .00005 to .001 and wherein the thickness of the plate is substantially uniform throughout the extent of the plated surface.

In carrying out this feature, it is another feature of the invention to provide a method and apparatus for plating semi-circular engine bearings at the inner concave surface thereof with a very thin layer of electroplate which is uniformly distributed in a precision-like manner.

In carrying out the above object, it is a further object of the invention to electroplate a plurality of bearings simultaneously wherein the bearings are self-shielded, that is, are disposed with respect to one another in such a manner as to produce a uniform thickness of plate at the concave surfaces thereof.

In carrying out all the objects above, it is a further object to shield the surface of the bearings to be plated, namely, all surfaces except the concave bearing surface.

A still further object of the invention is to dispose a plurality of semi-circular articles, such as bearings, in alternate staggered fashion upon a rack wherein plating electrodes are placed in spaced relation to either side of the rack, said bearings being so disposed that the throwing power of the electroplating bath is such that every portion of the concave surface of each bearing is plated in substantially the same thickness during a similar type period.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein preferred embodiments of the present invention are clearly shown.

In the drawing:

Fig. 1 is a cross section through one type of plating rack which may be used in connection with the invention as claimed herein, showing the electrode in position.

Fig. 2 is a section, taken on line 2—2 of Fig. 1.

In the plating of articles having irregular surfaces, it is always difficult to obtain a uniform thickness of the plate upon the high and low portions of the surfaces. This is occasioned by the fact that the throwing power of the setup varies with the distance from the anode and portions of the article to be plated that are closest to the anode, obtaining a relatively heavier plate than do the more remote portions of the article to be plated. Furthermore, overhanging edges and the like complicate the matter whereby very poor uniformity of thickness of plate is obtained in many instances. These factors are generally known in the plating art.

In the plating of certain articles, such as engine bearings, it is often desirable to provide a very thin precision-like layer of electroplate on the bearing surface. This layer

may be babbitt, for example, lead, tin, copper, lead indium or any other suitable lead base bearing alloys or it may be silver, indium, etc., but in all cases, the thickness of the layer must be controlled and above all must be uniform throughout its extent. Since all engine bearings are semi-circular in shape, this plating process involves many problems which are difficult to eliminate. In the past, the problem has been attacked by use of circulating the electrolyte, by using shaped anodes and the like. All of these expedients are not only costly but to my knowledge, have not accomplished the desired end.

It should be pointed out here that when plating babbitt, silver or other bearing metal upon the surface of a semi-circular bearing that the operation must be one of great precision, since, the bearing surface per se, which may be aluminum, copper-lead, bronze or any of the other usual bearing layers is machined to close tolerance prior to the plating operation and therefore no further machining is contemplated after plating since engine bearings must necessarily run on very small tolerances. It is obvious after the plating surface has been machined, that the plating must be of extreme accuracy so that the finished plated bearing is of the desired accurate diameter. Furthermore, it is desirable to plate only enough electrode deposited metal onto the surface of the bearing to accomplish the end desired since the usual metals being plated are costly and plating excessive metal on the bearing not only varies the bearing characteristics in many instances, but likewise depletes the bearing baths and makes control factors costly.

For all of these reasons, it is therefore not only desirable but quite important to provide a method and apparatus for plating semi-circular objects, such as engine bearings, wherein the plate deposit upon the surface to be plated is of a precision-like thickness, readily predetermined and easily maintained throughout a plurality of operations on many thousands of articles to be plated.

It is a known fact that objects having irregular shaped surfaces can be plated more or less uniformly by using shields placed between the object to be plated and the anode whereby a restriction of the ionic flow from anode to cathode is obtained so that more or less uniform throwing power upon the article to be plated is accomplished.

I am aware of processes and apparatus in use today wherein bearings, for example, are plated in a closed box having a longitudinal slot therein intermediate the ends of a plurality of semi-circular bearings whereby the throwing power of the electrolytic bath is sufficiently varied to obtain a more or less uniform plate on the bearing surfaces.

I have found that control of operations with this type of shielding is difficult and often the thickness of the plate will vary if the control is not maintained closely. In the accompanying drawing, I have shown another method and apparatus for accomplishing a uniform plate upon the surface of semi-circular articles, such as bearings, wherein a pair of conducting rods 20 and 22 are provided connected to a yoke 24 to form a cathode structure which is connected to the negative terminal of the power source. Upon each of the rods 20 and 22 are disposed a plurality of semi-circular metal clips 26 and 28. These metal clips 26 and 28 act as holders for the part to be plated. All of these clips include inturned flanges 30 at the extremities thereof so that a bearing 32, for example, when placed in the clips has its ends abutting the inner surfaces of the flanges 30. In this connection, all portions of the apparatus described thus far are coated with a rubber-like composition or some other suitable non-conductive material.

Intermediate the ends of each clip 26 and 28, is provided a spring clip 34 which is riveted to the rod 20 or 22 as the case may be and which clips 34 having a metallic surface thereon at the point where the clip contacts the bearing 32.

The clips 34 are spring-like in that they are preferably U-shaped in cross section and are made of phosphor bronze or other spring-like conducting material so that when bearings 32 are placed in the shielding clips 26 and 28, the clips 34 actually press the bearings 32 against the abutment flanges 30 to hold the bearings 32 in place while simultaneously acting as current conductors to the bearings.

It will be noted that in Fig. 1, the bearings and associated shielding clips 26 and 28 on opposite rods 20 and 22 are disposed in staggered relation to one another. This staggered relation is the main factor in my invention since it accomplishes a shielding action whereby when the staggering is properly carried out, all bearings receive a uniform thickness of plate. It is apparent that any number of bearings and shields may be provided in a single rack compatible with the rack and size of part being plated. In this connection, at either end of the rack is placed shielding members 36 and 38 attached to opposite rods 20 and 22 which act in the same manner and for the same contour as the end of the other shields in the rack. These shields 36 and 38 are used to properly shield the end of each of the top and bottom bearings in the rack. These shields 36 and 38 are also insulated.

The yoke 24 with its appended rack members may be immersed in a suitable electrolyte 40 held within a tank 42 and the circuit may be completed by the inclusion of two anodes 44 and 46 of a desired metal, which anodes are placed in direct line with the rods 20 and 22 a desired distance therefrom. Thus anode 44 acts as the anode for the bearings held in shielding clips 28 while anode 46 acts as an anode for bearings held in shielding clips 26. In each instance, the shielding clips on the opposite side of the rack have the dual function of shielding the back surface of the bearing held therein and shielding the front surface of the bearings held in oppositely disposed clips.

It is suggested that when carrying out the method disclosed herein in the plating of semi-circular objects, the exact positioning of the shielding clips 26 be accomplished by trial for the desired uniform thickness of plate to be deposited, the type of plate to be deposited and the exact contour of the article to be plated. In other words, the shielding clips 26 and 28 should be located with respect to one another to accomplish the desired results for any given setup as should the position of the electrodes 44 and 46.

It is understood that if the edge portions of the bearings 32 are to be shielded that the clips 26 and 28 may be so designed or each bearing may be provided with an edge shield as is well known in the art. Furthermore, it is understood that the end shields 36 and 38 may be eliminated if it is desired to use dummy bearings in the two end clips whereby the dummy bearings are used over and over again and wherein no definite plate is desired thereon, the main basis of this invention being the self-shielding of bearings by alternate disposition in opposed directions while using the double anode whereby each bearing shields the surface to be plated to the other so that a uniform precision-like thickness of plate is deposited.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. Apparatus for electroplating semi-circular objects comprising in combination, a U-shaped rack, a plurality of oppositely disposed shielding clips each adapted to receive a semi-circular object, said clips being positioned so as to overlap one another on opposite sides while in spaced relation thereto, a plurality of spring conductor clips, one of which is disposed centrally of each clip and is adapted to be compressed when an article to be plated is within the clip for forming a good conducting connection thereto, and a non-conductive coating covering all portions of said rack except the containing surfaces of said conductor clips.

2. Apparatus as claimed in claim 1 including a pair of shield members attached to the rack on opposed sides thereof to act as shields for the upper and lower surfaces of the upper and lower articles to be plated.

3. In a method for obtaining a substantially uniform electroplate on the concave surfaces of a plurality of similarly shaped, semi-cylindrical objects, each of which includes an insulating member shielding the convex side thereof, the steps comprising; staggering the objects in rows on opposite sides of a central plane with their concave surfaces facing one another, overlapping portions only of the objects in one of said rows with the objects in another of said rows so that the closest spaced overlapped portions of each pair of opposed objects are spaced from one another and are disposed on opposite sides of said central plane from the remainder of the respective objects for shielding the concave surfaces of the objects, electrically connecting all of said objects to one terminal of a power source, immersing said electrically connected objects in suitable electrolyte, providing a pair of anodes connected to the other terminal of said power source, immersing said anodes in said electrolyte in spaced relation to one another and each facing the convex sides of the objects in one of said rows of objects, whereby a uniform thickness of electroplate is deposited on the concave surfaces of said objects.

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