

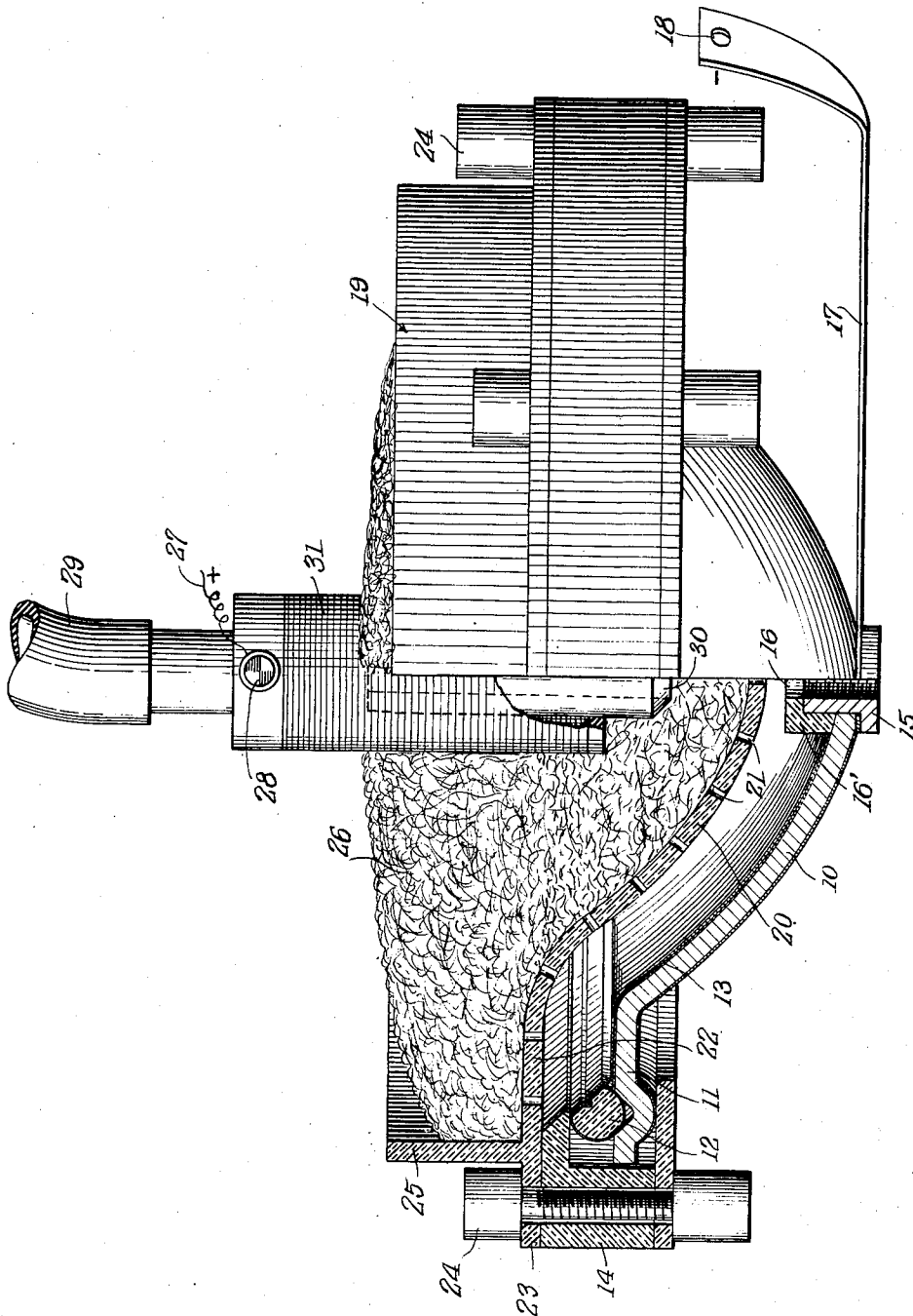
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B. BART

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METHOD AND APPARATUS FOR FORMING MOLDS

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INVENTOR
Blasius Barr
BY
Warren S. Orton
ATTORNEY

UNITED STATES PATENT OFFICE

BLASIVS BART, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO BART REFLECTOR CO.,
INC., OF NEWARK, NEW JERSEY, A CORPORATION OF NEW JERSEY

METHOD AND APPARATUS FOR FORMING MOLDS

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The invention relates in general to an improved method for forming articles by electrolytic deposition and to the apparatus used in the production of articles by following the method herein featured. The present application constitutes a companion case with an application filed under even date entitled "Method and apparatus for forming molds and articles produced thereby," Serial No. 144,904.

The invention in the form herein selected for specific treatment relates to a method of forming working molds for use subsequently in forming flanged metallic parabolic reflectors, but it is understood that this use is simply illustrative of the adaptability of the invention to the electroforming of any non-planar article particularly those in which there are deep recesses. Difficulty has been experienced heretofore in providing a uniform thickness of deposit across such recessed surfaces due presumably to the fact that the depositing current escapes by the shortest path before it can reach the deep portions of the recess. It is known that the deposit is of greater thickness adjacent the anode and that the deposit thins out towards the lowest portion of the recessed parts of the surface of the mold under treatment.

The primary object of the invention is to provide a mode of treatment and an assembly of the parts in the electrolytic bath in such way as to insure a uniformity of deposition over surfaces which contain deeply recessed parts.

This phase of the invention is attained in two ways and which are preferably used conjointly to obtain the most satisfactory results. By the first method, the anode, preferably in the form of fine nuggets or particles, is positioned in close proximity to, but not touching the mold surface under treatment and in general the first method features the disposing of the anode so that the distance between the same and the opposite surface of the mold will be substantially uniform.

The second method is to cause the electrolyte to flow across the depressed surfaces and preferably to extend through the deepest portion of the recessed surface.

With reference to the apparatus feature of the disclosure, the primary object is to provide a simplified form of structural parts for locating the anode material in close proximity to the non-planar surface of the mold, and to provide in connection with the mold holder fluid conducts which will insure the movement of the electrolyte past all of the mold surface under treatment and in such way as will tend to insure uniformity of electrolytic deposition.

Another object of the invention is to provide an anode containing basket the underside or bottom of which will conform substantially to the configuration of the mold surface under treatment, which basket can be readily secured to the mold support, and with the anode material therein, will tend to provide the requisite location of the anode material and the insurance of a positive contact between the current carrying anode bar and the anode material in the basket.

Various other objects and advantages of the invention will be obvious from a consideration of the preferred method of practicing the invention hereinafter described and from an inspection of the accompanying drawings and in part will be more fully set forth in the following particular description of one method and of one form of apparatus for practicing the method and the invention also consists in certain new and novel operations and features of construction and combination of parts hereinafter set forth and claimed.

In the accompanying drawing, the figure is a view largely in side elevation and partly in radial section of a mold supporting frame, with an anode basket positioned thereon together constituting a preferred embodiment of the apparatus feature of the disclosure and illustrating a step in the method feature of the disclosure.

In the drawing, there is shown a metal master mold 10 on the outstanding flange 11 of which is positioned a celluloid-ring 12 designed subsequently to constitute a part of a finished article and which in the instant case is a working mold 13. The master mold and ring are contained in a celluloid clamping frame 14, all as is more particularly disclosed

in the above identified copending application.

The present disclosure distinguishes from the companion application in that the celluloid nipple 16' which acts to block off the deposition of metal forming on the metal connecting tip 15 is provided centrally thereof with an opening 16 for permitting the passage of the electrolyte therethrough as will hereinafter be more fully described. In this case negative electric connection is made to the metal mold through a conducting strip 17 which may also be utilized for the purpose of suspending the assemblage in an electrolytic bath and for this purpose is provided with an eye 18 for engagement with the buss bars usually positioned over the electrolytic tank.

The present disclosure features the use of an anode basket 19 formed of insulating material, preferably celluloid. The bottom 20 of the basket is provided with perforations 21 and is designed so as to conform at least substantially to the configuration of the metal mold surface under treatment. In the case of the parabolic form of metal surface herein disclosed, the bottom of the basket is of similar parabolic formation and is outlined by flanged portion 22 which overlaps the flanged portion 11 of the mold. The basket is provided with an outstanding attaching flange 23, demountably secured in position by clamping screws 24. The basket is provided within the line of clamping screws with an upstanding wall 25 so as to insure sufficient capacity to contain the requisite amount of anode forming material 26 contained in the basket. For instance, if it is intended to electroplate the mold with copper the material 26 is granular copper, and in any case the anode material is of sufficient fineness of particles to insure a configuration of the underside of the anode which will correspond, at least roughly, to the configuration of the mold surface under treatment. Preferably, the loose anode material is arched out of the basket towards the center so as to insure an extensive electric contact with the positive current carrying anode bar 31. The anode bar is preferably a metal cylinder to which electric current is led through the flexible connector 27 leading to the binding screw 28 engaging bar 31. A celluloid tubing 29 extends through the bar 31 and has its lower discharge end 30 intruded into the anode material adjacent the bottom thereof and in axial alignment with the opening 16 in the outlet nipple 16'.

In operation, the electrolyte is forced under pressure or is permitted to flow through the tubing 29, through the anode material which causes the liquid to spread across the entire bottom of the basket, with some of the electrode discharging through the lowermost portion of the recess in the mold and out through the aperture 16.

It is, of course, within the scope of the dis-

closure to position the entire device illustrated within and beneath the surface of an electrolytic bath either with or without the current forming tubing 29 and outlet 16.

By means of the device illustrated and following the method herein suggested it is possible to form the coatings or layers on the mold of substantially uniform thickness, and there is thereby avoided the possibility of abnormal formation of trees and other growths which usually take place adjacent the celluloid ring.

While I have shown and described, and have pointed out in the annexed claims, certain novel features of my invention, it will be understood that various omissions, substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

Having thus described my invention, I claim:

1. In the art of electroplating the recessed portion of a surface, the method which consists in positioning the depositing metal in solid form within the recess, adjacent to but not in contact with the surface of the recess to be plated, and in fixed relation thereto, and subjecting the same to the action of an electrolytic bath while causing the electrolyte to flow through the solid metal and into depositing contact with the recessed surface.
2. In the art of electroforming articles having irregular surfaces, the method which consists in disposing anode forming material in juxtaposition to the negative mold surface to be coated, arranging such material so that the distances between the same and the opposing surface of the mold shall be substantially uniform, subjecting the mold and anode material so disposed to the action of an electrolytic bath while causing the electrolyte to flow across the deepest part of the mold.
3. In the art of electroplating concaved surfaces, the method which consists in subjecting the concaved surface to the action of an electrolyte bath while causing the electrolyte to flow through the deepest portion of the concaved surface.
4. In the art of electroplating irregular surfaces, the method which consists in disposing an anode of metallic particles of the electroplating material in juxtaposition to the surface to be plated and spaced substantially equidistantly therefrom, and subjecting the surface together with the anode particles to the action of a circulating electrolytic bath.
5. In the art of electroplating irregular surfaces, the method which consists in disposing an anode of metallic particles of the electroplating material in juxtaposition to the surface to be plated and spaced substantially equidistantly therefrom, and subjecting the surface together with the anode par-

ticles to the action of an electrolytic bath while causing a stream of the electrolyte to move past the anode particles and into depositing engagement with the irregular surface being plated.

6. In a device for use in forming working molds for subsequent use in forming flanged parabolic reflectors, the combination of a metallic master form including a parabolic central portion provided with an outstanding flange, said flange having a ring locating groove in one face, a ring located by said groove, a ring shaped clamp for securing the ring temporarily to the mold, an anode basket carried by the frame and having a perforated bottom conforming somewhat to and spaced substantially equidistant from the flange and parabolic portion of the master mold, said basket adapted to contain particles of metal forming an anode positioned by said basket substantially equidistant from the mold surface to be plated.

7. In a device for use in forming working molds for subsequent use in forming flanged parabolic reflectors, the combination of a metallic master form including a parabolic central portion provided with an outstanding flange, said flange having a ring locating groove in one face, a ring located by said groove, a ring shaped clamp for securing the ring temporarily to the mold, an anode basket carried by the frame and having a perforated bottom conforming somewhat to and spaced substantially equidistant from the flange and parabolic portion of the master mold, said basket adapted to contain particles of metal forming an anode positioned by said basket substantially equidistant from the mold surface to be plated, and a hollow anode tube adapted to be intruded into the particles in the basket and adapted to convey electrolyte to the basket.

8. In a device of the class described, the combination of a metal faced mold having a depression in the face to be electroplated, means for positioning a body of metal anode particles substantially equidistantly spaced from the surface of said depression, and fixed relative thereto, and means for conveying a stream of electrolyte through the particles to the depression surface.

9. In a device of the class described, the combination of a metal faced mold having a depression in the face to be electroplated, means for positioning a body of metal anode particles in fixed relation substantially equidistantly spaced from the surface of said depression and a conduit for directing a flow of electrolyte through said particles.

10. In a device for electroplating irregular surfaces including a form having the irregular configuration of the desired surface, an anode basket having a perforated bottom approximating said configuration and adapted to position an anode in juxtaposition to and

substantially equidistantly spaced from the negative form surface to be plated.

11. In a device for electroplating concaved surfaces, the combination of an anode basket of insulating material with its bottom perforated and conforming somewhat to the configuration of said surface, closely positioned to but spaced therefrom and adapted to contain an anode material and to position the same close to the concaved surface to be plated, and an anode substantially centered in said basket, and a tube for conducting electrolyte to the particles in the basket.

12. In a device for electroplating concaved surfaces, the combination of an anode basket of insulating material with its bottom perforated and conforming somewhat to the configuration of said surface, closely positioned to but spaced therefrom and adapted to contain an anode material and to position the same close to the concaved surface to be plated, and an anode substantially centered in said basket.

13. In a device for electroplating concaved surfaces, the combination of an anode basket of insulating material with its bottom perforated and conforming somewhat to the configuration of said surface, closely positioned to but spaced therefrom and adapted to contain within the basket and above the bottom thereof an anode material and to position the same close to and above the concaved surface to be plated.

14. In a device of the class described, a mold provided with a concaved portion, and having an opening located at the lowest part of said concaved portion to provide an electrolyte opening to permit the passage of electrolyte through the concaved part of the mold when installed in an electrolytic bath.

15. In a device of the class described, the combination of a mold provided with a concaved portion, and having an opening located at the lowest part of said concaved portion to provide an electrolyte opening to permit the passage of electrolyte through the concaved part of the mold when installed in an electrolytic bath, and a thimble of insulating material outlining said opening.

16. A metal mold provided with an opening extending therethrough, a metal connector inserted in said opening and providing means for making electric connection with the metal mold.

17. A metal mold provided with an opening extending therethrough, a metal connector inserted in said opening and providing means for making electric connection with the metal mold, and insulating means for stopping off the deposition on said metal connector.

18. In a device of the class described, the combination of a mold, a ring detachably located on the mold, means for clamping the ring to the mold and means for locating an

anode in substantially equidistantly spaced relation to the portion of the mold outlined by the ring.

19. In a device of the class described, the combination of a mold having an irregular surface and an anode holder having its bottom perforated and disposed for locating solid anode particles in substantially equidistantly spaced relation above said surface of the mold.

10 Signed at New York, in the county of New York and State of New York, this 20th day of October, A. D. 1926.

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