

July 4, 1933.

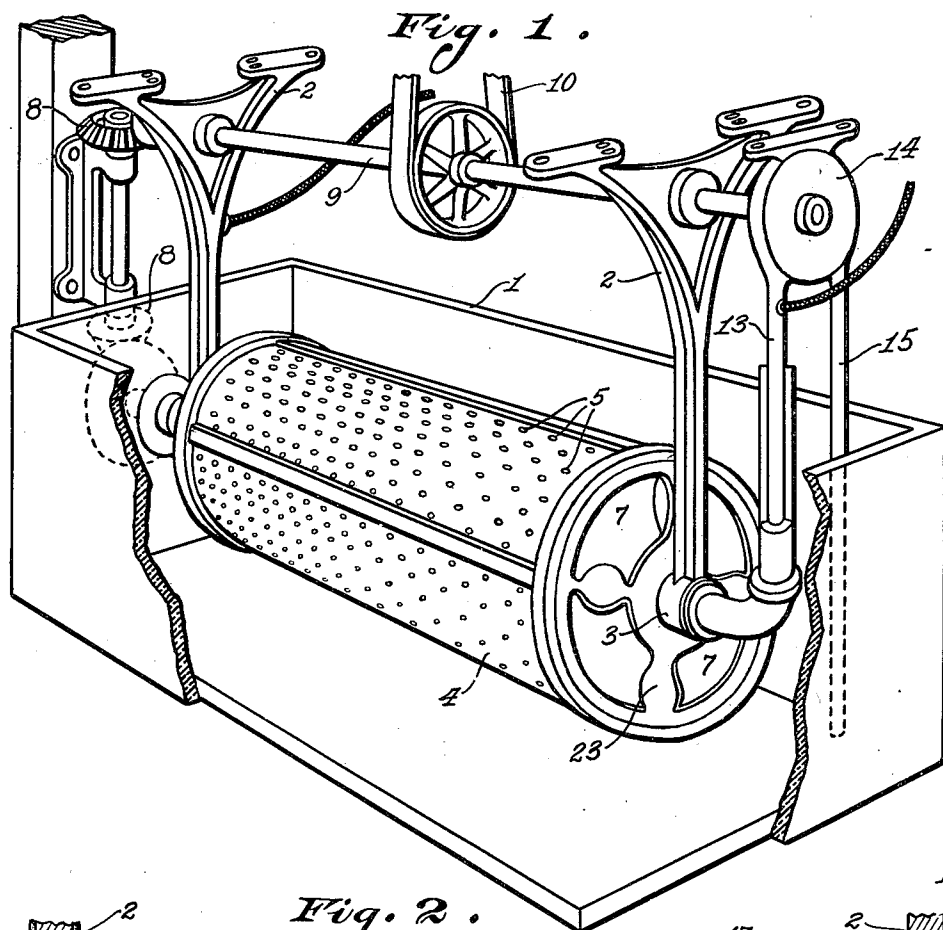
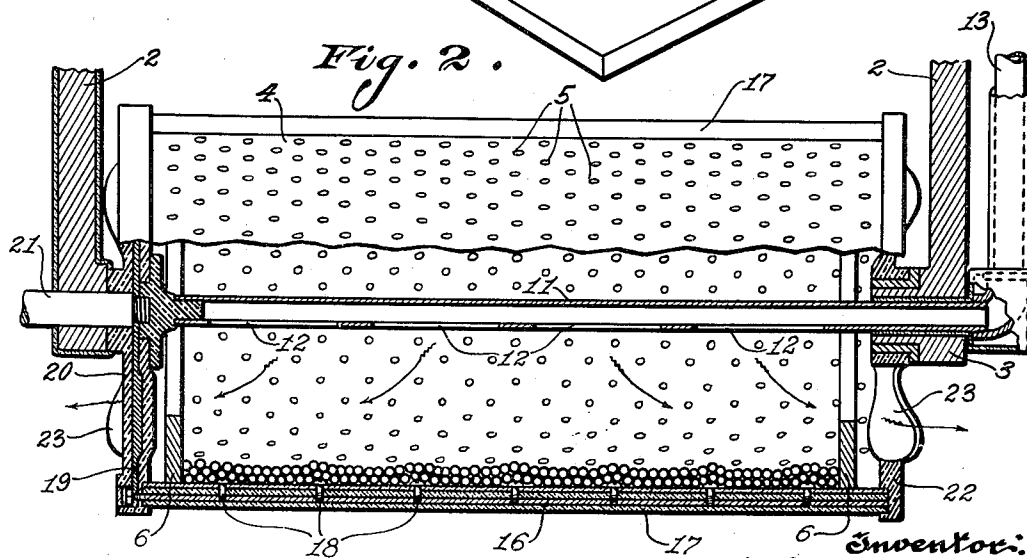
G. L. DAWSON

1,916,465

PROCESS AND APPARATUS FOR ELECTROPLATING PROJECTILES

Filed April 8, 1929

2 Sheets-Sheet 1



Inventor:
 GEORGE L. DAWSON,
 By John H. Brumbaugh
 His Attorney.

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G. L. DAWSON

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Fig. 3.

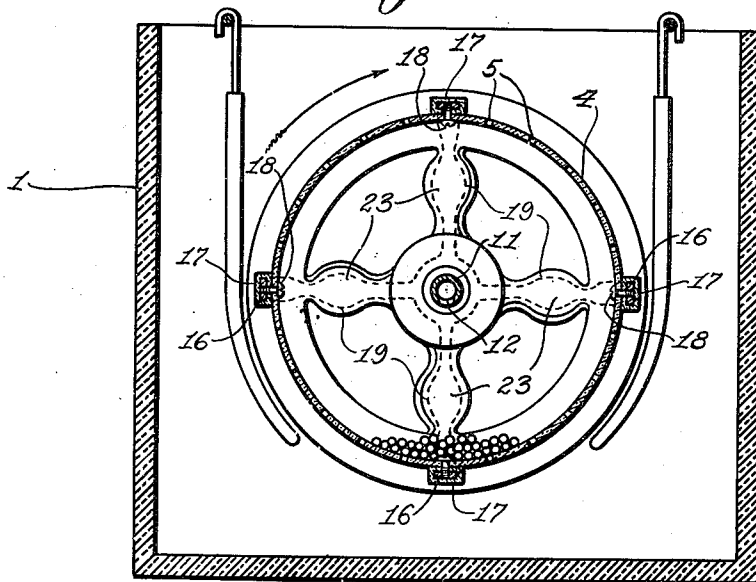
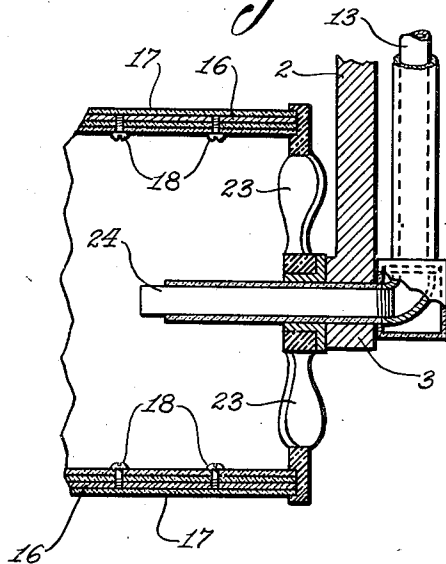


Fig. 4.



Inventor:
GEORGE L. DAWSON,

By John N. Brunning
His Attorney.

UNITED STATES PATENT OFFICE

GEORGE L. DAWSON, OF ALTON, ILLINOIS, ASSIGNOR TO WESTERN CARTRIDGE COMPANY, OF EAST ALTON, ILLINOIS, A CORPORATION OF DELAWARE

PROCESS AND APPARATUS FOR ELECTROPLATING PROJECTILES

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This invention relates to the plating of small articles and more particularly the plating of projectiles such as rifle bullets and shot.

In providing rifle bullets or shot with a plated coating, it is desirable to apply the plating in such a manner that it will form a relatively dense and tough skin so as to form a jacket capable of protecting the projectile against deformation, and of providing a surface which will have relatively little friction in passing through the gun barrel. In order to provide such a dense, tough plating, it is advantageous to carry on the plating operation while the articles are agitated or tumbled one over the other, so that the attrition involved will serve to rub down the plating into firm contact with the body of the article and condense the same. Such a plating is also less liable to flake off than one applied without such attrition. It is further desirable in order to obtain a perfectly uniform plating that the density of the electrolyte surrounding the article in the plating bath be kept substantially constant.

One of the objects of this invention, therefore, is to provide a method and apparatus for plating bullets and shot, which will not only insure a plating of uniform thickness, but which will provide a condensed plating which will have the desired characteristics.

Another object is to provide a method and apparatus for plating such objects by which the electrolyte is maintained at a substantially uniform strength in the region surrounding the articles being plated.

Another object is to provide improved apparatus for carrying out the process of this invention.

Further objects will appear from the following description, taken in connection with the accompanying drawings, in which

Fig. 1 is a perspective view with parts broken away illustrating an apparatus embodying this invention and adapted for carrying out the process thereof;

Fig. 2 is a longitudinal section of the tumbling barrel shown in Fig. 1.

Fig. 3 is a transverse section of the plating bath and the barrel; and

Fig. 4 is a partial longitudinal section of

the tumbling barrel illustrating another embodiment of this invention.

Referring to the drawings, 1 designates a container of any suitable type in which the plating bath is contained. Suspended from an overhead support, not shown in the drawings, is a pair of brackets 2 provided with bearings 3 adapted to receive the trunnions of a tumbling barrel 4 rotatively mounted therein. The barrel 4 may or may not be provided with small perforations 5 in its outer surface. At its ends the barrel is provided with baffles 6, and the supporting end brackets thereof are provided with openings 7 through which the electrolyte may pass. The drum is arranged to be submerged in the electrolyte in the tank 1 as indicated in Fig. 1. Suitable gearing 8 connecting the drum with an overhead shaft 9 may be arranged to rotate the drum in its bearings, the shaft 9 being driven from any suitable source of power as by a belt 10.

Passing through the center of the drum along its axis is a tube 11 provided with perforations 12 and connected with an inlet pipe 13. The pipe 13 is adapted to admit electrolyte to the tube 11 from which it passes through the perforations 12 into the interior of the drum so as to replace the more or less spent electrolyte in the drum. The pipe 13 may be connected to the discharge side of a pump 14 whose suction side has connected thereto a pipe 15 dipping into the electrolyte in the tank 1. The pump 14 is adapted to draw up the electrolyte from the tank and pump it into the interior of the drum through the tube 11.

The barrel 4 may be constructed of any suitable kind of insulating material, such as bakelite. In order to provide for making electrical contact with the articles being tumbled in the barrel, metallic conductors 16 are embedded in insulating strips 17 which are secured to the outer surfaces of the barrel 4. The strips may be thus secured by means of screws or similar fasteners 18 extending from the interior of the barrel outwardly and being threaded into the metallic strips 16, as illustrated in Fig. 2. The heads of these screws are exposed in the interior of the barrel

so that they may make contact with the articles contained therein. The strips 16 are connected at one end with the arms 19 of a metallic spider embedded in the end plate 20 of the barrel and connecting at its center with a trunnion 21 which in turn carries the current to the left hand bracket 2.

The end plates 20 and 22 of the barrel have the openings 7 therein to provide for circulation of the electrolyte. These end plates may have the arms 23 which support the rims thereof formed as propeller blades so that during the revolution of the barrel these blades will act to force the electrolyte out of the drum at both ends. The arms 19 of the spider may be embedded in the blades 23 or the arms 19 may themselves be formed as propeller blades and arranged to support the rim of the end plate, being suitably coated with the insulation such as bakelite or the like to protect them from the action of the solution.

In the operation of this device in accordance with the method of this invention, the articles are placed within the drum 4 which is then driven in rotation while a current is supplied which may be arranged to enter by the pipe 13, said pipe being suitably insulated from the electrolyte. The current passes into the interior of the drum via the tube 11 which forms the anode of the plating bath. Within the drum the heads of the screws 18 form the cathode with which the articles to be plated are in contact. When a copper cyanide solution is used as the electrolyte, the tube 11 may be constructed of iron, and will then provide an insoluble anode and will not be corroded by the action of the current.

During the operation of the device, the electrolyte passes from the tube 11 downwardly toward the articles resting on the bottom of the drum. It may then pass out through the perforations 5, but a great part of its passes as indicated by the arrows in Fig. 2, through the central holes in the annular baffles 6, and out through the openings 7 in the end brackets of the drum. By this means a circulation of electrolyte is set up from the anode tube 11 toward the articles over which it is distributed by the tendency of the end brackets to pump the solution toward both ends of the drum. The plating current passes in the same direction as the electrolyte from the tube 11 toward the surface of the drum upon which the articles to be plated are deposited.

In addition to the use of the tube 11 as an anode, a plurality of external anodes 25 may be mounted as indicated in Fig. 3, so as to be positioned closely adjacent the outside surface of the barrel. Thus the current may travel toward the articles to be plated, both from the internal anode 11 and from the external anode 25, in the latter case the current passing through the perforations in the barrel and by other paths through the

electrolyte. The anode 25 may be constructed of soluble material such as copper which will be dissolved during the plating operation and will serve additionally to replenish the electrolyte with copper as it is deposited upon the articles. Thus the density of the solution may be maintained substantially constant and at the same time the advantages of the use of an insoluble anode in the interior of the barrel may be obtained. It will be clear, of course, that as the material for the anode 25 is dissolved the solution external of the barrel is enriched and this enriched solution is then pumped into the barrel through the tube 11.

In the embodiment of Figure 4, the tube 11 instead of extending the entire length of the barrel, is cut short so as to provide a nozzle 24 by means of which the electrolyte is projected into the barrel. This is also an effective method of replenishing the electrolyte.

As the drum rotates the articles are tumbled one over the other so that all points of each article are brought into contact with other articles or the surface of the drum so that while the metal is being deposited, the deposited plating is being continuously rubbed so as to condense the same, and force it into firm contact with the body of the article. As the electrolyte is continuously replenished, the depletion thereof by the action of the plating current is compensated for and the strength of the solution is maintained substantially constant at that point where it surrounds the articles being plated.

It will be seen, therefore, that this invention provides a method for plating such articles as bullets and shot, which not only insures a plating of uniform thickness but also insures a plating whose material is condensed to provide a tough jacket adhering firmly to the body of the article and not liable to flake off. This is accomplished by providing for continuously replenishing the electrolyte surrounding the articles at the same time that the articles are tumbled in the barrel while the plating is being deposited. By using an anode of insoluble material the same may be used to introduce the electrolyte into the drum and the electrolyte and the current flow in the same direction toward the articles being plated. The electrolyte is then uniformly distributed and the rotation of the drum acts to pump the same out of the drum, thereby assisting in the distribution.

When the plating is complete the articles may be removed and a fresh batch inserted in any suitable manner well known in the art.

While this invention is particularly applicable to the plating of projectiles such as rifle bullets and shot, it will be understood that as to many of its phases it is applicable to the plating of small articles generally. It is further understood that certain features of

the invention may be useful without the entire combination and the use of such sub-combinations is contemplated by this invention, and is within the scope of the appended claims.

It is further obvious that various changes may be made, within the scope of the appended claims, in the details of construction and operation without departing from the spirit of this invention. It is, therefore, to be understood that this invention is not to be limited to the specific details shown and/or described.

Having thus described the invention what is claimed is:

1. An apparatus for plating small articles, comprising, a plating bath, a tumbling barrel rotatable therein adapted to receive the articles, and a tubular anode within said barrel connected to receive electrolyte from a supply and perforated at intervals along the barrel so as to deliver electrolyte along the barrel to the articles within the barrel.

2. An apparatus for plating small articles, comprising, a plating bath, a tumbling barrel rotatable therein adapted to receive the articles, means for introducing electrolyte to the interior of said barrel adjacent the axis thereof, and means operating to withdraw electrolyte thru the ends of the barrel adjacent the periphery thereof.

3. An apparatus for plating small articles, comprising, a plating bath, a tumbling barrel rotatable therein adapted to receive the articles, an insoluble anode within said barrel, a cathode within said barrel adapted to contact with the articles, and a soluble anode in said bath outside of said barrel.

4. An apparatus for plating small articles, comprising, a plating bath, a tumbling barrel rotatable therein adapted to receive the articles, an insoluble anode within said barrel, a cathode within said barrel adapted to contact with the articles, and a soluble anode in said bath outside of said barrel, and means for circulating the electrolyte from the outside to the inside of said barrel.

5. An apparatus for plating small articles,

comprising, a plating bath, a cylindrical drum mounted for rotation on a horizontal axis in said bath, a hollow axle extending thru said drum and perforated at intervals throughout its exposed length, means for delivering electrolyte through said hollow axle and the perforations thereof to be distributed thereby along the length of said drum, means for passing electric current through the incoming stream of electrolyte to articles in said drum, and means for rotating said drum.

6. An apparatus for plating small articles, comprising, a plating bath, a cylindrical drum mounted for rotation on a horizontal axis in said bath, a hollow axle extending through said drum and perforated at intervals throughout its exposed length, means for delivering electrolyte through said hollow axle and the perforations thereof to be distributed thereby along the length of said drums, means for passing electric current from said axle as an anode through the stream of electrolyte therefrom to the articles in said drum, said axle being constructed of material insoluble in the electrolyte, and means for rotating said drum.

7. An apparatus for plating small articles, comprising, a plating bath, a cylindrical drum mounted for rotation on a horizontal axis in said bath, a hollow axle extending through said drum and perforated at intervals throughout its exposed length, means for delivering electrolyte through said hollow axle and the perforations thereof to be distributed thereby along the length of said drum, means for passing electric current from said axle as an anode through the stream of electrolyte therefrom to the articles in said drum, said axle being constructed of material insoluble in the electrolyte, a plurality of cathode buttons fixed in relatively spaced relation on the inner surface of the drum, and means for rotating said drum.

In testimony whereof I affix my signature, this 22nd day of March, 1929.

GEORGE L. DAWSON.