ART OF SURFACING ONE METAL WITH ANOTHER

Filed Oct. 4, 1934
This invention relates to improvements in the art of surfacing one metal with another. It is the primary object of the invention to provide means for producing mechanically the largest opening with which the barrel was provided was altogether too small for any electrode which would be sufficiently large to make electroplating feasible. The most nearly acceptable known method involved the introduction of molten aluminum into the barrel and the discharge therewith of any surplus. It was found, however, that the thickness of the deposit on the metal could not be accurately gauged and the surface of the deposit was invariably rough and tended to make the barrel unsanitary. While useful for many purposes, this method was not as desirable for this specific purpose as that herein disclosed.

By means of the invention hereinafter to be disclosed, aluminum has been used successfully to line the interior of a steel barrel to produce a smooth and sanitary surface therein. Aluminum is chosen as the example because metalurgists regard the coating of aluminum on steel as being one of the most difficult metallurgical problems. The process and apparatus hereinafter to be disclosed are successfully usable for coating with aluminum and may also be used for any other metal, as for example, the surfacing of ordinary steel with special steel such as cobalt or stainless steel.

The drawing shows apparatus of two different forms suitable for carrying out the present invention.

Figure 1 is a plan view of apparatus usable for metallogically coating the interior of a barrel. Figure 2 is an enlarged detail view of the fragment of a barrel in section during the coating operation.

Like parts are identified by the same reference characters throughout the several views.

The apparatus shown in Fig. 1 is substantially a duplicate of that illustrated in my companion application No. 740,662 filed August 29, 1934. In effect it is a centrifuge in which the barrel may be mounted for turning it upon its longitudinal and transverse axes, the whirling on at least one axis being accomplished not only at differing speeds, but also in reverse directions.

The shaft 5 provides a potential rotatable support for a yoke 6 having a headstock 7 and a tailstock 8 detachably engageable with the barrel 10. When the supporting shaft 5 is rotated by means of belt 11, the barrel is turned end for end about a transverse axis. When yoke 6 is horizontal the barrel may be turned on its longitudinal axis and accelerated, decelerated or reversed by engaging the chuck 12 with the squared end of its headstock spindle 7.
Mounted upon the base 18 is a slide 16 carrying a motor 17 which drives the chuck 12 through any suitable reversing gear mechanism.

In order to provide the barrel 10 with a metal lining the procedure is as follows.

The requisite quantity of aluminum or other metal is provided in powdered form. If the coating is to be of aluminum, the aluminum should preferably be chemically pure and free of those substances commonly mingled with commercial flake aluminum to prevent oxidation. Powdered aluminum of the requisite quality is commercially available.

The powdered metal is preferably mixed with a suitable flux. The flux may, however, be independently coated upon the interior of the barrel if desired. The advantage in mixing the flux with the powdered aluminum consists in the fact that an excess of flux may be used as a vehicle for assisting in the coating of the interior of the barrel with the aluminum. For example, the liquid flux and powdered aluminum may be introduced into the barrel in bulk through the bung hole and the barrel rotated on its support to distribute the aluminum over the interior, after which the surplus flux may be dumped out. The powdered metal may also be sprayed on to the surface to be coated, or in some applications of the invention, it may conveniently be brushed on. The manner of its distribution over the surface to be plated is broadly immaterial.

Having coated with flux and with powdered metal the surface to be plated, said surface is preferably (but not necessarily) heated. In coating steel barrels with aluminum it has been found expedient to heat the barrel to a temperature between 600 degrees F. and 1200 degrees F., 1100 degrees being a very satisfactory temperature. With the barrel thus heated, a large quantity of balls of assorted sizes are introduced into the barrel through the bung hole, as shown best in Fig. 2 in which the balls 20 clearly appear. The number of such balls is broadly immaterial. They may be warm or cold. Ordinary highly polished steel ball bearings have been found to be very useful.

When the balls are in the barrel in sufficient quantities (for example) to fill the barrel from one sixth to one third full, the barrel is rotated on one or both of the axes on which it is mounted for rotation in such an apparatus as that shown in Fig. 1. If the balls achieve the speed of the barrel and rotate unitarily therewith, the rate of motion is either changed or the direction of rotation reversed so that the balls are preferably kept in a state of constant rotative movement respecting the barrel in which they are mounted. Due to the change in rate of movement the balls will tend to change their position in the barrel, and since they are of varying sizes they will roll all interior surfaces thereof. During the end over end rotation of the barrel, which preferably occurs first, the balls will usually not roll about the surface of the barrel but will be tumbled so as to strike all portions of the surface with a considerable impact.

I have found that both the impact and the rolling are effective to drive the powdered coating material (in this case the powdered aluminum) into the pores of the steel wall of the barrel, with the result that a continuous and relatively non-porous metallic lining is produced. Such a lining completely coats the interior of the barrel, closing and covering all crevices or joints therein and providing a smooth, continuous, imperforate, one piece lining.

Either the rolling or the hammering alone may be used and, as above indicated, the heating of the barrel is not essential to the successful operation of the process, although it facilitates and expedites the production of a smooth lining.

Any suitable flux may be used according to the metals to be joined. The flux may either be applied preliminarily to the supporting metal, or it may be mixed with the powdered metal which is to form the coating.

I claim:

1. The process of lining a metal barrel, which consists in the introduction through a small hole in the barrel of a pulverulent metallic lining material, a suitable flux and a plurality of balls, the heating of the barrel and the rotation thereof, whereby to distribute the lining material in the barrel and to roll it into a continuous coating for the interior thereof.

2. The process of coating a non-cylindrical metal barrel having a small aperture, which process includes the preparation of the interior surface of the barrel to receive the coating, the introduction therein of a pulverulent lining material, and a series of balls in sufficient number to reach all portions of the inner surface of the barrel, the application of heat, and the rotation of the barrel, whereby to distribute the lining material and to roll it into intimately bonded relation to the entire inner surface of the barrel.

3. The process of coating the interior of an elongated metallic article which is not perfectly cylindrical on its inner surface, which process includes the preparation of the inner surface of said article to receive a bonded coating, the introduction into the article of a pulverulent metallic lining material, and a number of balls of differing sizes in sufficient quantities to reach all portions of the surface of the article during the rotation thereof, the application of heat, and the rotation of the article, whereby to displace said balls therein and thereby to distribute the lining material and to roll it into intimately bonded relation with the entire inner surface of the article.

FREDRICK GETTELMAN.