Patented Dec. 15, 1931 1,836,598

UNITED STATES PATENT OFFICE

CHAD H. HUMPHRIES, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO METALS PROTECTION CORPORATION, OF INDIANAPOLIS, INDIANA, A CORPORATION OF INDIANA

PROCESS OF CHROMIUM PLATING

No Drawing. Application filed September 9, 1926, Serial No. 134,577. Renewed September 2, 1931.

This invention relates to processes of chromium plating; and it comprises a method of directly obtaining bright and satin finishes on chromium plated metal, without buffing or other forms of abrasion, in which the chromium is deposited in two layers, the first layer being applied at a relatively low temperature at which current efficiency is high and the second being applied at a higher temperature at which bright finishes can be secured, although at lower current efficiency, the entire operation giving a higher over-all efficiency and a bright finish, said finish being either a satin or matt finish or a lustrous finish; all as more fully hereinafter set forth and as claimed.

In the chrome plating art it is customary to carry out the electroplating process at a temperature of about 20° C. At this temperature, plating is rapid and the current efficiency is high, being usually around 33 per cent, over-all current efficiency. While plating at about this temperature has the advantage that a heavy coating may be applied in a short time and with high current efficiency, it has the disadvantage that such a coating exhibits a dull finish. Since such a dull finish is undesirable for most purposes, it is the usual practice to give a final polish by buffing. This buffing operation is time consuming and expensive and is furthermore difficult to carry out, because of the mechanical properties of the metal, chromium; this being particularly true with articles of unusual shape or those having recessed surfaces. When plating is carried on at a somewhat higher temperature, usually about 40° C., the character of the finish produced is markedly different. Instead of a dull finish, a finish possessing a bright luster is obtained. At this elevated temperature however the current efficiency is considerably lowered. It is usually around 12 per cent and operation is slow; it taking a considerably longer time to secure the same thickness of plate. Accordingly, it is the usual practice to plate the article at a low temperature for the sake of efficiency and then produce a bright finish mechanically. The bright finish secured by buffing may be either one exhibiting a high luster or a matt, or satin, finish. This matt finish is considered highly desirable.

It is desirable to provide a process giving directly articles with finished surfaces, obviating the buffing operation; the finish being advantageously a satin finish. This may be readily accomplished under the present invention. I have found that a thin bright coating of the type produced at high temperatures applied over a dull coating of the type produced at low temperatures results in a satin, or matt, effect; and I take advantage of this fact in the present invention. This satin finish can be secured on chrome plated articles irrespective of the size or shape of the article without the use of buffing or any abrading operation. I have found that if the initial plating operation be carried out at 20° C., so that a heavy base coating of chromium is obtained, I may then subsequently coat at a temperature of 40° C. The combination of the superficial bright finish with the dull finish gives me the desired satin or matt finish. Where a brighter lustrous surface is required, the second coating is made a little thicker.

In a typical embodiment of the present invention, presuming a satin finish is to be obtained, I introduce a metal article to be plated in a low temperature chromium plating bath of any of the usual types. The metal to be plated may be iron, steel, or any of the other metals usually chromium plated. I find the chromium plating bath patented by Pierce and Humphries Patent No. 1,545,196 is well suited for the present purposes. This bath contains chromic acid, relatively small proportions of hydrated chromic hydroxid, and ammonium sulfate, all in aqueous solution. Either soluble or insoluble anodes may be employed; or both. As an insoluble anode, lead peroxid may be used, and as a soluble anode commercial forms of metallic chromium. The current density employed is advantageously 14 to 125 amperes per square foot. The article to be plated is made the cathode in the plating solution. Operating at 20° C., I have found that a deposit having a thickness of .00015 inches may be produced in less than

an hour with a current density of 25 amperes per square foot Such a coating is of sufficient thickness to serve as the base coat in the present process. After the base coat has been applied, this base coat of course possessing the undesirable dull finish, I subject the article for a few minutes to the action of the same or a similar chromium plating solution at a temperature of about 40° C. There now results a superficial thin coat possessing a bright finish, that is, having a high luster. But since this thin bright coat has been applied over a dull finish, the net result is a high grade satin, or matt, finish.

If a lustrous bright finish is desired, the plating operation at the higher temperature may be continued until a thicker coating and the desired luster are obtained. By plating on a bright finish in this way, the total current efficiency for the process as a whole is increased over that normally attending the deposition of a bright finish of sufficient thickness for commercial purposes. That is, by putting on the first or base coat at a low temperature but with high current efficiency and then subsequently plating over this coat a second coat at the bright finish temperature, the over-all current efficiency of the plating process as a whole is increased.

What I claim is:—

1. The process of chrome plating which comprises plating a heavy base coat at a temperature at which the current efficiency is high but a dull finish results and then lightly plating the so-plated article at a temperature at which a bright finish is normally obtained whereby the plated article is given a satin finish.

2. In producing satin finish chromium plated articles without buffing or abrasion, the process which comprises providing a metal article with an electro-deposited chrome plating at a relatively low temperature whereby a dull finish is obtained, and then continuing the plating at a higher temperature to produce a bright deposit, the thickness of the bright deposit on the dull finish deposit being such as to produce a satin finish.

In testimony whereof, I have hereunto affixed my signature.

CHAD H. HUMPHRIES.