

UNITED STATES PATENT OFFICE

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METHOD OF PREPARING ARTICLES FOR PLATING

No Drawing.

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The object of the invention is to provide an improved method of preparing articles for plating with metal, particularly with chromium, such preparation involving the cleaning of the surface of the article and the removal of any gases in the pores of the metal to insure a permanent deposit of the chromium film in the plating operation which follows the cleaning and depositing steps. The desired result is secured by the use of an alkaline cleaning bath in connection with an electrical treatment while the article is in the cleaning bath. The cleaning step serves to remove any oil, scale or dirt on the surface of the metal, and the degasifying step, which following the cleaning step, includes a reversal of the current through the bath which serves to remove the hydrogen present on the surface of the metal or in the pores of the metal.

The cleaning liquid preferably employed contains in addition to water about 35 per cent of sodium hydroxide and 15 per cent of sodium phosphate, although a variety of alkaline cleaning solutions may be employed such as potassium hydroxide or the like. The cleaning bath contains about $3\frac{1}{2}$ ounces of the mixture specified per gallon of water, although this is a variable depending on conditions. The temperature of the bath is a matter of some importance and I have found that about 130 degrees F. gives excellent results.

In carrying out the operation, the article to be prepared for plating is placed in the bath and connected with the negative terminal of a source of current, the other terminal having electrical connection with the liquid of the bath. Current is then supplied, preferably for a period of about three minutes, with a current density of about 25 amperes per square foot of the article being treated, the time and current density being variables depending on conditions. This flow of current serves to free the surface of the metal from oil, scale and other dirt and also apparently causes a deposit of hydrogen in the surface pores of the metal.

The direction of current flow is now reversed, and the current density reduced to preferably about 15 amperes per square foot, such current being continued for about $1\frac{1}{2}$ minutes. Here again, the current density and time factor are variables depending on conditions, a longer application of current compensating for a reduced current density. This is an important phase of the operation, and must be regulated with care. Either too much current or too little will seriously affect the result later secured in the plating operation. This reverse flow of current apparently causes a collection of oxygen at the surface of the article which unites with the hydrogen previously collected there, thus forming water and getting rid of both gases so that the surface is in the best condition to receive plating. If the current supplied in this stage is insufficient, some hydrogen remains on or in the surface metal and interferes with the permanence of the plating subsequently applied, and if the application of current is too great, either in the matter of time or density, there is such an excess of oxygen on or in the surface metal as will interfere with the plating and reduce its permanence. A slight excess of oxygen left by this operation is of advantage during the starting of the plating step which follows, as it combines with the hydrogen formed at this time and neutralizes it.

The article is now removed from the cleaning bath, washed in water, preferably of the same temperature as that of the cleaning bath, and then transferred immediately to the plating bath and current applied thereto in the usual way. The process has been developed primarily for use in preparing the work for plating with chromium, and probably has its greatest value in such connection, but may also be used to advantage in preparing work for plating with metals other than chromium. When this system of cleansing is employed, no requirement exists for reversing the current flow in the chromium plating bath, as has heretofore been done in many cases, and the plating which is applied after the cleaning operation will not peel off, and is permanent and satisfactory in every way. There is also no injury to the surface of the metal during the cleaning and degasi-

fying operation as applied to articles of ferrous composition, such as iron and steel such as often results where these steps are carried on in a chromic acid or sulphuric acid bath which attacks the metal and dissolves out some of the carbon in the surface of such metal.

What I claim is:

1. A process of plating directly with chromium the surface of an article of ferrous composition, which consists in placing the article in an alkaline bath, passing an electric current through the bath and article with the article connected to the negative terminal of the source of current supply, and then applying current through the bath and article in the reverse direction so as to free the surface of the article from hydrogen, washing the article with water, transferring it immediately to a plating bath and securing a deposit of chromium over the surface of the article by electrolysis.

2. A process of plating directly with chromium the surface of an article of ferrous composition, which consists in placing the article in an alkaline bath, passing an electric current through the bath and article with the article connected to the negative terminal of the source of current supply, and then applying current through the bath and article in the reverse direction so as to free the surface of the article from hydrogen and cause a slight deposit of oxygen thereon, washing the article with water, transferring it immediately to a plating bath and securing a deposit of chromium over the surface of the articles by electrolysis.

3. A process of plating directly with chromium the surface of an article of ferrous composition, which consists in placing the article in an alkaline bath, passing an electric current through the bath and article with the article connected to the negative terminal of the source of current supply, and then applying current through the bath and article in the reverse direction so as to free the surface of the article from hydrogen, removing the article from the alkaline bath and immediately plating the article with chromium by electrolysis.

In testimony whereof, I have hereunto subscribed my name this 29th day of May, 1930.

HARRY F. HITNER.

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