United States Patent Office 2,836,552 Patented May 27, 1958

2,836,552

TREATMENT OF NICKEL FOR ELECTROPLATING CHROMIUM THEREON

James D. Patrick, Dayton, Ohio, assignor to General Motors Corporation, Detroit, Mich., a corporation of Delaware

No Drawing. Application October 6, 1955
Serial No. 539,000

2 Claims. (Cl. 204—140)

This invention relates to the preparation of nickel for electroplating chromium thereon.

In commercial processes of plating chromium on nickel it is common practice to activate the nickel surface prior to chromium plating by cleaning the article in a solution of hydrochloric or sulphuric acid. The article or part may be merely dipped in an aqueous solution of either of these acids or the part being treated may be made cathodic in the solution. Normal time in the acid solution is quite short and if the parts remain in the activated solution too long unsatisfactory chromium plate results, thus making it necessary to remove the chromium plate and replate the parts. In the operation of automatic plating machines which are commonly used today the machine may be frequently stopped without warning and in case the parts are left too long in the activating solution defective chromium plating will result such that it will be necessary to reject the articles. Accordingly the primary object of this invention is to provide an improved procedure for activating nickel for electrodepositing chromium thereon and especially an activating procedure in which prolonged immersion in the activating solution will not adversely affect the parts being processed.

The present invention provides an improved activating process and improved electrolytes for carrying out the process. The improved electrolytes employed in accordance with the invention comprise aqueous solutions of chromic acid together with minor proportions of other ions, such as sulfate, chloride, fluoride, silico-fluoride or fluosilicate ions. These ions may be added as acids or as salts, for example, alkali metal or alkaline earth metal salts. The nickel surface to be treated, which may be a nickel article or a composite article comprising a base member on which is a coating of nickel, is immersed in the solution and electric current is applied with the nickel or nickel coated article the cathode. A preferred bath comprises 2 to 6 oz./gal. of chromic acid and from .10 to .15 oz./gal. of sulfate added as sulphuric acid. While these are the preferred concentrations considerable variation may be employed with satisfactory results. For example, the chromic acid may range from 1 to 15 oz./gal. and the sulfate from .05 to .30 oz./gal. When other ions such as chloride, fluoride, silico-fluoride, or fluosilicate are used in place of sulfate equivalent amounts are used.

The nickel surface to be activated is employed as a cathode in the electrolyte. The anodes may be of any suitable material. Lead and lead alloy anodes are quite satisfactory. A voltage on the order of 3 to 4 is preferred for best results although satisfactory results may be obtained with other voltages, for example, those on the order of 2 to 6. An average current density of 5 a. s. f. is satisfactory under most conditions. The current density should be kept below that at which metallic chromium will be deposited or cloudy chromium deposits will be produced during the subsequent chromium plating operation. In view of the fact that chromium may start to deposit at about 40 a. s. f. under certain combinations of the above variables, average current densities of about 10 a. s. f are about as high as it is safe to go on most complicated shapes; otherwise the current density on some areas being treated may exceed 40 a. s. f. For these reasons the preferred amperage is on the average of 4 to 6 per square foot, although the range of 2 to 12 is satisfactory under most conditions.

Optimum results have been obtained with bath temperatures on the order of 80° to 130° F. However, considerable variation is permissible and temperature ranges on the order of 60° to 160° F. are satisfactory.

Optimum results are obtained with electrolyzing times of 30 seconds to three minutes. Under some conditions, as when the nickel surface is already fairly active as it enters the bath, shorter times of only about 10 to 15 seconds may be employed. Longer times than three minutes may also be used. One important advantage of the present invention is that the parts may be left in the bath for prolonged periods up to 30 minutes or more.

After the activating treatment the parts may be plated with chromium by known procedures in any conventional or other chromium plating bath.

Various changes and modifications may be made in the embodiments of my invention described herein without departing from the principles and spirit of the invention.

I claim:

1. A method of activating a surface of nickel for the electrodeposition of chromium thereon which comprises providing an aqueous solution consisting essentially of chromic acid within the range of 2 to 6 ounces per gallon and sulfate within the range of .05 to .30 ounce per gallon, immersing the nickel in said solution, said solution being at a temperature within the range of about 60° to 160° F., and passing an electric current through said solution with the nickel as the cathode at a current density of about 2 to 12 amperes per square foot for a time within the range of about 30 seconds to three minutes.

2. A process of activating a surface of nickel for the electrodeposition of chromium thereon which comprises providing an aqueous solution consisting essentially of chromic acid within the range of 2 to 6 ounces per gallon and sulfate within the range of .10 to .15 ounce per gallon, said solution being at a temperature within the range of 80° to 130° F., immersing the nickel in said solution, and passing an electric current through the solution with the nickel as cathode at a current density of about 4 to 6 amperes per square foot for a time within the range of 30 seconds to three minutes.

References Cited in the file of this patent

UNITED STATES PATENTS

1,827,247	Mason	Oct. 13, 1931
2,182,244	Beall	Dec. 5, 1939

FOREIGN PATENTS

255,421	Switzerland	Jan. 17, 1949

OTHER REFERENCES

Principles of Electroplating and Electroforming, Blum and Hogaboom (1949), publ. by McGraw-Hill Book Co., pp. 338–343 cited.