

UNITED STATES PATENT OFFICE

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PROCESS FOR THE ELECTROLYTIC PRODUCTION OF A PARTICULARLY STRONG CHROMIUM COATING

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This invention relates to a process for the electrolytic production of a particularly strong chromium coating. According to the invention, such a chromium coating is obtained by producing first by aqueous electrolysis a chromium coating on the body to be coated, whereupon chromium is deposited upon the said coating by the electrolysis of a chromium-containing fused bath. As electrolyte for the aqueous electrolysis is preferably used an aqueous solution of chromic acid containing a small quantity of sulphate ions.

As shown by experiments, the new process gives a particularly high hardness of the superficial layers of the coated articles or objects and at the same time an increased resistance to corrosion. The obtention of the high hardness is probably due to the fact that at the high temperature of the fused bath electrolysis, there takes place a cementation of the chromium layer previously produced by the aqueous electrolysis, with the metal situated under it. If desired, the quality of the coating obtained by the new process, can be still further improved by depositing during the fused bath electrolysis, in addition to chromium and at the same time also one or more "improving" metals, for instance boron or silicon. This can be done by electrolyzing with sufficient densities of current a fused bath which contains boron or silicon, or a fused bath which contains both substances and in which chromium is dissolved for instance in the form of oxide.

As shown by experiments, the new process gives chromium coatings which, as regards their characteristic properties, are superior to the chromium coatings prepared by any one of the hitherto known processes, as well as to those which are produced by fused bath electrolysis alone. Accordingly, the objects coated by the new process are particularly suitable for use where they have to comply with extraordinarily severe conditions.

The two layers of coating, i. e., the first layer deposited by aqueous bath electrolysis and the second layer deposited by fused bath electrolysis, may be applied by known meth-

ods. For example for the aqueous electrolysis coating the bath disclosed in the literature by Sargent may be employed and for depositing the second layer by fused bath electrolysis, a bath containing barium fluoride and chromium fluoride in the molecular ratio 1 to 1.5 may be applied at a temperature of 1100° C., a tension of 15 volts and a current density of 2000 amp./m.². If boron is to be deposited with the chromium, a bath made by dissolving 20% by weight of chromium oxide in molten sodium tetraborate (borax) and the electrolysis carried out at 900° C. with a tension of 8 volts and a current density of 4000 amp./m.², may be used. If silicon is to be deposited with the chromium instead of boron, sodium meta-silicate is substituted for sodium metaborate in the bath described. For the deposition of both silicon and boron the two baths above described are judiciously combined.

What I claim as my invention and desire to be secured by Letters Patent is:

1. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to be coated, and then depositing chromium upon said coating by electrolysis of a chromium containing molten bath.

2. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to be coated, and then depositing chromium together with an improving metal upon said coating by electrolysis of a fused bath containing the same.

3. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to be coated, and then depositing chromium together with at least one metal of the class consisting of boron and silicon upon said coating by electrolysis of a fused bath containing the same.

4. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium

coating by aqueous electrolysis on the object to be coated, and then depositing chromium together with boron upon said coating by electrolysis of a fused bath containing the same.

5 5. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to
10 be coated, and then depositing chromium together with silicon upon said coating by electrolysis of a fused bath containing the same.

15 6. In a process for the production of a particularly strong chromium coating, the combination of first producing a chromium coating by aqueous electrolysis on the object to be coated, and then depositing chromium together with boron and silicon upon said coating by electrolysis of a fused bath containing the same.

20 In testimony whereof I affix my signature.
MARTIN HOSENFELD.

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