UNITED STATES PATENT OFFICE.

FRANZ SALZER, OF DRESDEN, GERMANY.

PROCESS FOR PRODUCING AN ELECTROLYTIC DEPOSIT OF METALLIC CHROMIUM.

No. 900,597. Specification of Letters Patent. Patented Oct. 6, 1908.

Application filed January 16, 1908. Serial No. 411,138.

To all whom it may concern:

Be it known that I, FRANZ SALZER, a subject of the Emperor of Austria, residing in Dresden, Germany, at present in Ujpest, near Budapest, Austria-Hungary, have invented certain new and useful Improvements in Processes for Producing an Electrolytic Deposit of Metallic Chromium, of which the following is a specification.

It has been frequently tried to make a deposit of metallic chromium by electrolysis on account of its great passivity and resistance against chemical action and its hardness, but all experiments made up to date have not succeeded in finding any method of practical use.

Various solutions of chromic salts and compounds have been used for this purpose, which gave a cathodic deposit with great difficulty and very high current density.

By this invention it is possible to produce easily a very coherent and firm deposit of any thickness, much harder than steel, very flexible and of fine color. I use for this purpose a bath composed of a mixture of chromic acid and chromoxid in such proportions that the acid character is greatly diminished, but enough chromic acid must be present to make the bath conductive. Theoretically one could say that it consists mostly of chromic chromate $Cr_2O_3(CrO_3)_3$ with more or less oxid of chromium than is due to this formula, but it is better to have an excess of oxid than the formula would demand.

According to the formula the proportion of weights of CrO_3 and Cr_2O_3 is 2:1, but the bath will work better the more the weights of both compounds get nearer and the proportion will be about constant during the electrolysis. If for example a mixture is employed in which the proportion of CrO_3 and Cr_2O_3 is 2 to 1, very much current will be necessary and the deposit comparatively small. But if the proportion is 4 to 3 or still nearer the bath works better. The quantity of chromium compounds contained in the solution may amount to 5 to 25 per cent. of metallic chromium.

The bath can be prepared for instance by partial reduction of pure chromic acid, by means of an electric current or chemically or by a partial saturation of CrO_3 with $Cr_3(OH_3)_3$, or by partial oxidation of chromium salts. To increase the conductivity an addition of a small amount of an electrolyte for instance of a little acid will be advantageous.

The bath works if duly prepared and the conditions of the beginning being maintained with a cathodic current density of 2 to 5 amperes per sq. decimeter and 3 to 6 volts on any metal, the surface of it being carefully cleaned. It is useful to work at ordinary temperatures. By variation of the electrolyte and the conditions the quality of the deposit may also be varied. It is good to keep the bath pretty concentrated.

Although all the other galvanic baths, as it is well known, need a great amount of conductive salts in this bath only a very small amount of an electrolyte is allowed, because a greater addition would produce at the cathode chromous oxid (CrO) or only hydrogen. There are different ways to keep the composition of the bath constant for instance by using insoluble anodes, which facilitate the oxidation of about as much chromoxid to chromic acid, as chromic acid is reduced by the cathode. Electrodes consisting of fused ferro-ferric-oxid (Fe_3O_4), for instance, have this property. If other insoluble anodes are used as for instance lead or platinum, the composition of the bath can be maintained nearly unchanged if the anodes are partly separated from the cathodic solution by a diaphragm and partly not separated. As the temperature will gradually rise while the current passes, it is also very important to keep the temperature constant. This may easily be done by water cooling.

What I claim is:—

1. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid.

2. The process of producing an electrolytic deposit of metallic chromium by employing a bath containing chromic acid and chromoxid, the proportion of chromoxid approximating that of the chromic acid.

3. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid, chromic acid being in excess.

4. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and a small amount of an electrolyte.

5. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of

chromic acid and chromoxid and using anodes, which facilitate the oxidation of about the same amount chromoxid to chromic acid, as chromic acid is reduced at the cathode by passing an electric current through the bath.

6. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and a small amount of an electrolyte, and using anodes, which facilitate the oxidation of about the same amount of chromoxid to chromic acid as chromic acid is reduced at the cathode by passing an electric current through the bath.

7. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and using anodes partly separated from the cathodic solution by a diaphragm, and partly not separated.

8. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and a small amount of an electrolyte and using anodes partly separated from the cathodic solution by a diaphragm, and partly not separated.

9. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and by cooling the bath during the passage of the current.

10. The process for producing an electrolytic deposit of metallic chromium by employing a bath containing a mixture of chromic acid and chromoxid and a small amount of an electrolyte and by cooling the bath during the passage of the current.

In witness whereof, I have hereunto signed my name in the presence of two subscribing witnesses.

FRANZ SALZER.

Witnesses:
SIGMUND BERNAUER,
G. GUNDERMAN.