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METHOD OF ELECTRODEPOSITING COBALT AND CHROMIUM.

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To all whom it may concern:

Be it known that we, HARRY CREIGHTON PEFFER and HARRIE CLARK PIERCE, citizens of the United States, residing at La Fayette, in the county of Tippecanoe and State of Indiana, have invented certain new and useful Improvements in Methods of Electrodepositing Cobalt and Chromium, of which the following is a specification.

This invention relates to the electrodeposition of cobalt-chromium alloys or compounds.

For this purpose we use a bath containing salts of cobalt and chromium which may be prepared as follows:

Dissolve 15 grams of chromic oxid (Cr_2O_3) in 25 c. c. hot concentrated hydrochloric acid; dilute with water to 125 c. c. and add 35 grams calcium chlorid ($CaCl_2$), 2 grams sodium chlorid (NaCl) and 15 grams cobaltous chlorid ($CoCl_2$). The relative proportions of the ingredients of such a bath would be as follows:

Cr_2O_3	120 g.
HCl (Conc.)	200 c. c.
$CaCl_2$	280 g.
NaCl	16 g.
$CoCl_2$	120 g.
H_2O	800 c. c.

We may use an anode of pure cast chromium, and a cathode of cleaned and polished sheet steel or other metal.

Instead of a chromium anode we may use an alloy of cobalt and chromium (such as an alloy containing 75% cobalt and 25% chromium), in which case the bath may have the following composition:

$CrCl_3.6H_2O$ (ammonia free)	64 g.
$CoSO_4.7H_2O$	50 g.
NaCl	2 g.
Water	125 c. c.

Instead of NaCl, an equivalent amount of $CoCl_2$ may be used.

In carrying out the electrodeposition a current density of 1 to 2 amperes per square inch is used and the bath is preferably maintained at a temperature of from 70 to 80° C. The cobalt content of the bath must not be allowed to get too low, or the cathode deposit instead of being hard and shiny, will be crumbly and dark. The addition of clove oil seems to have a beneficial effect on the deposit. 5 to 6 drops of clove oil are dissolved in 4–5 c. c. alcohol and several drops of this solution are added to the bath from time to time. The clove oil further serves to keep the bath from foaming.

In case the bath tends to thicken after being used for some time, sufficient water is added to keep the volume of the solution constant.

It is generally preferable to electrolyze or "age" the bath for about an hour and a half during which time the deposit may consist only of cobalt. Thereafter the deposit consists of a hard firmly adherent coating or plate of chromium and cobalt.

While we prefer to use soluble metallic anodes, as above described, an insoluble anode, such as a carbon anode, may be used. It will be further understood that our invention is not limited to the use of the precise proportions of ingredients above specified. The term "anode containing chromium" is used in the claims to designate both chromium metal and chromium alloys.

We claim:—

1. The method of obtaining deposits of cobalt chromium alloy resistant to the action of practically all atmospheric conditions and practically immune to the action of all organic and mineral acids, which consists in passing an electric current thru a bath containing chromium and cobalt compounds, the temperature of the bath and the current density being so controlled as to produce a hard adherent deposit of cobalt and chromium.

2. The process as claimed in claim 1 in which an anode containing chromium is used.

3. The process as claimed in claim 1 in which the anode is a cobalt-chromium alloy.

4. The process as claimed in claim 2 in which the bath contains chlorids of cobalt and chromium.

5. The process as claimed in claim 3 in which the bath contains also calcium and sodium chlorids.

6. The process as claimed in claim 1 in which the temperature is maintained at from 70° to 80° C. and a current density of from one to two amperes per square inch is employed.

In testimony whereof, we affix our signatures.

HARRY CREIGHTON PEFFER.
HARRIE CLARK PIERCE.