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PROCESS FOR THE PRODUCTION OF ARTICLES MADE OF IRON AND STEEL WITH CORROSION-PROOF SURFACE

Gottfried Becker, Buderich b. Neuss, and Karl Daeves and Fritz Steinberg, Dusseldorf, Germany; vested in the Alien Property Custodian

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The surface of articles of iron or steel can be rendered corrosionproof thereby, that they are chromed by thermic diffusion. In this known method carried out generally with employment of gaseous chromium carriers, the chromium exchange from the gas against an approximately similar quantity of iron of the parts to be treated, in that at this exchanging layers of chromium are produced on the surface of the articles which, similar as those produced at the cementation with the fundamental material, are most intimately connected and grow together with the fundamental material.

The carbon content of the iron- and steel alloys employed for the production of the articles to be subsequently chromed causes, as is known, in so far serious difficulties at the chroming, as the carbon of the fundamental material forms carbides together with the chromium which diffunds in, said carbides checking the further penetration of the chromium layers.

It was believed, that this inconvenience could be sufficiently obviated by the prescription not to increase the carbon content of the iron to beyond 0.2%. Applicants have, however, ascertained that for the chroming capability and the quality of the chroming zones of the iron carbon alloys then produced not only the percentage of the carbon content of the alloys, but the total quantity of the carbon contained in the steels is decisive, in which instance then, besides the carbon content of the alloy in percents, also the cross section of the parts to be treated has still to be considered, from which the carbon gets to the surface during the chroming.

As the observation of all these measures may cause difficulties under circumstances, the invention proposes, to prevent the influence of the carbon content of the articles to be treated and especially its moving to the surface, thereby that the parts to be subsequently chromed are made of so called alloyed steels.

It has now shown, that not all of the known and even the best known alloying elements are not in position to check the moving of the carbon at the chroming. This carbon movement could not be prevented, for instance, even at the chroming of a fundamental substance with 0.1% and less carbon and additional 2% of molybdenum. This inconvenience was even then not overcome, if to the iron carbon alloys to be chromed such addition of chromium was added from the beginning that the carbon content of the alloys had to be considered as bound off thereon. Also in a steel with 0.1% carbon and 3% chromium the carbon moved for instance in the cross section of the fundamental material in opposition to the diffunding-in chromium, so that also in this instance chromium zones with unsatisfactory physical and chemical properties were obtained as result.

It has now been found surprisingly, that the moving of the carbon and thereby the inconvenience thereof can be prevented, if the articles to be chromed are made of an iron carbon alloy, which contains in the base material chromium together with other alloying elements, which alone or at least in these percentages have no effect. An addition of 3% chromium alone to a steel with 0.06% carbon can not stop the carbon movement in the base material. The same is valid for a steel which besides 0.06% carbon and other iron companions, contains alone 0.5% vanadium. By the simultaneous addition of chromium 3% and vanadium 0.5% to the steel, the movement of the carbon is practically absolutely prevented and thereby a chromed surface is produced, which can withstand the highest physical and chemical stressings.

Besides chromium and vanadium the steels, from which articles with perfect chromium layers have to be produced according to the invention, may further contain 0.3 to 3% of molybdenum, which has to be fully or partly replaced by tungsten. A steel with carbon 0.12%, chromium 1.2%, molybdenum 1.2% and vanadium 0.6% could be chromed especially well.

Consequently, the invention relates to a process for the production of articles of iron and steel with corrosion-proof surface by diffunding-in of chromium into the surface at temperatures from about 900 to 1100°, according to which the articles to be chromed are made from alloys of the iron, which contains less than 0.2% carbon (preferably 3 to 4% chromium), 0.3 to 3% of vanadium (preferably 0.5 to 1.5% of vanadium), remainder iron and the usual companions, and the articles consisting of these alloys are then chromed. Besides chromium and vanadium the steels may further contain 0.3% to 3% molybdenum, the content in chromium amounting then practically to from 0.5 to 5% (preferably 1 to 2%) and the content of vanadium again to 0.3 to 3% (preferably 0.5 to 1%). Tungsten has to be substituted completely or partly for the molybdenum in the alloy.

A silicium content in these materials has no decisive influence upon the physical and chemical property of the zones, but facilitates in quantities from 1 to 2% the diffunding-in of the chromium to a certain degree.

GOTTFRIED BECKER.
KARL DAEVES.
FRITZ STEINBERG.