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ELECTROPLATING SEQUENCE

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This invention relates in general to the plating of articles or surfaces of base metals such as, for example, iron, copper and its alloys, zinc and the like. More particularly, the invention resides in a new and improved electroplating sequence in which nickel deposits are employed as finishing or preparatory layers, as for example where the finished surface is to be a nickel surface, or where the finished surface is to be a chromium surface on nickel.

Two general classes of nickel plating are well recognized in the art, namely, the ordinary white nickel and the so-called bright nickel. In general, the white nickel deposit requires buffing to bring up a high lustre, whereas the bright nickel does not. There is a well recognized difficulty in securing firmly adherent deposits of bright nickel on base metals, under ordinary conditions, due to the fact that such bright nickel deposits are always under a considerable stress or tension which reduces their power to permanently adhere to the base metal, and especially so when a bright nickel is used as a preparatory coating followed by a finishing electrodeposit of chromium, which introduces still further stress or stresses tending to cause the bright nickel deposit to crack and peel from the under surface to which it is attached. This difficulty in the field of chromium plating, for example, is indeed so great that it is substantially correct to state that bright nickel deposits have not been successfully employed as preparatory deposits on which to apply chromium plating.

I have discovered that the difficulty of obtaining satisfactory adherence and permanence in bright nickel deposits, whether as finishing or preparatory layers, is satisfactorily overcome by interposing a layer of white nickel between the base metal and the bright nickel, so that the bright nickel lies adjacent to the white nickel, which latter may be directly on the base metal of which the article is composed, or upon any approved preparatory coating as used, for example, in standard plating cycles or sequences. Thus, in chromium plating, where it has become more or less standard practice to deposit nickel on the base metal of the article, then copper and then nickel, as a preparatory sequence for receiving chromium, I may for example deposit on the base metal of the article a preliminary deposit of white nickel, then copper, then a second layer of white nickel, followed by a layer of bright nickel and finally chromium. These preliminary deposits before the chromium may all be applied without subsequent buffing, where the

article itself has been properly buffed initially. By reason of the high lustre of the bright nickel surface, the deposited chromium will be obtained in a satisfactory lustrous state. The white nickel next to the bright nickel deposit, appears to act somewhat as a "primer" coat, which withstands the tension of the bright nickel coat, so that even under the stress or tension of the subsequently deposited chromium layer the composite layers adhere firmly.

In practicing the invention, any of the standard white nickel and bright nickel solutions may be employed, either of the single salt type or of the double salt type, as given for example in "Principles of Electroplating and Electroforming", by Blum and Hogaboom, the bright nickel solution containing a suitable addition agent or "brightener", such as for example gum arabic, gum tragacanth, or any of the other materials well-known for this purpose. The work to be plated is first polished and buffed, then thoroughly cleaned and rinsed, in accordance with well understood practice, and thereafter passed through the plating sequence. This plating sequence, white nickel, bright nickel, chromium, characteristic of my present invention, may be preceded by one or more other deposits, which need not be here specifically described. With respect to the white nickel, bright nickel, chromium sequence, it will be understood that the plating operations will be conducted under proper current density, temperature and other conditions known to those skilled in this art, for the avoidance of coarsely granular or cloudy deposits, so that the resultant finish of the chromium plated article will have the desired bright lustre. Any of the standard chromium plating solutions may be used, for example, the well-known chromic acid solutions.

The invention comprises in its broader aspect the sequence of bright nickel on white nickel deposits, whether the white nickel is applied directly on the base metal object or on an intervening preparatory electrodeposit, and whether the bright nickel is to serve as a finishing surface or as a preparatory surface for some other deposit, such as for example chromium. The invention also includes, as a particularly important specific embodiment, the sequence of white nickel, bright nickel and chromium. In this latter specific embodiment, the white nickel may likewise be directly on the base metal of the article, or on an intervening preparatory electrodeposit such as, for example, cyanide copper on iron, or white nickel, then acid copper, on iron,

or any of the other standard preparatory deposits on iron, copper and its alloys, zinc and the like.

I claim:—

- 5 1. The method of electroplating, which comprises depositing a layer of white nickel, followed by a layer of bright nickel.
2. The method of electroplating, which comprises depositing a layer of white nickel, followed by a layer of bright nickel, and then a layer of chromium.
- 10 3. The method of electroplating, which comprises depositing a layer of copper, then a layer of white nickel, and next a layer of bright nickel.
- 15 4. The method of electroplating, which com-

prises depositing a layer of copper, followed by white nickel, then bright nickel, and thereafter a layer of chromium.

5. A sequence of electrodeposits, comprising in the order named white nickel and bright nickel. 5

6. A sequence of electrodeposits, comprising in the order named white nickel, bright nickel and chromium.

7. A sequence of electrodeposits, comprising in the order named copper, white nickel and bright nickel. 10

8. A sequence of electrodeposits, comprising in the order named copper, white nickel, bright nickel and chromium.

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