

UNITED STATES PATENT OFFICE

2,449,726

DIRECT COATING OF SILVER ON IRON
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2 Claims. (Cl. 204-46)

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This invention relates to the direct coating of silver on iron or steel and is a continuation in part of my abandoned application Serial No. 490,764, June 14, 1943.

Silver plating has been carried out for many years and, by common well-known methods, silver plated articles are produced using a metal base upon which the silver can readily be plated and upon which the silver will remain without peeling. However, upon ferrous metals, silver cannot be plated successfully without an auxiliary coating of another metal such as copper or nickel. Otherwise, the silver coating will peel. This is particularly the case where this metal is subjected to bending, distortion or the like.

The most perfect silver plating is plating on sterling silver and I have found that it is possible to silverize iron or steel initially so as to provide a silver base upon which silver may be built up to any practical desired degree by plating, producing a result comparable with silver plating on silver.

It is, therefore, an object of the present invention to provide a method for producing silver plated or coated iron or steel without the use of an auxiliary metal coating and in which the silver coating will not be subject to peeling or cracking.

A further object of the invention is to provide a method of silver plating iron and steel such as to produce silver coated plate which may be used in place of tin plate if desired.

A still further object of the invention is to provide a new and improved method of silver coating of iron or steel through which, regardless of its sphere of use, the silver coating will be improved over silver plating of the past.

With these and other objects in view, the invention broadly comprises the direct coating of iron or steel with silver by electrolytic deposition under conditions of high current density, such that the silver deposit on the iron or steel becomes in effect an inherent part of the metal base itself.

According to the invention, the iron or steel to be coated with silver is first of all subjected to a superficial cleaning to remove obvious occurrences of foreign material. This is all that is necessary since the process followed effects a cleaning of the metal simultaneously with the deposition of the silver.

The metal is then subjected to an electrolytic process to form a silverized base for silver plating to any desired degree. This base is formed by employing anodes of iron or steel in a plating bath incorporating electrodepositable silver as an

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element of the solution and subjecting the iron or steel to be silverized to a high current density. The process is carried out preferably employing an alkaline solution. By electro-depositable silver is meant silver in solution in any of the chemical combined forms commonly known to yield silver-plate under known silver-plating processes. This may consist of sodium cyanide, silver cyanide, sodium chloride and potassium carbonate. Either sodium chloride or potassium carbonate can be eliminated. When eliminating the sodium chloride, however, greater care in respect to cleaning of the metal before processing is required. On the other hand, elimination of potassium carbonate increases the time element before the solution may be used for the processing.

I prefer to use a solution made up of sodium cyanide, 8 to 15 ounces; silver cyanide, $\frac{1}{4}$ to 2 ounces; sodium chloride, $\frac{1}{4}$ to 2 ounces; potassium carbonate, $\frac{1}{8}$ to 1 ounce; and clean water, the balance, to make a solution of one gallon.

In this solution, the iron or steel to be coated is incorporated as the cathode and anodes of iron or steel are employed. The process is then carried out employing a voltage of 8 to 12 volts and an amperage of 30 to 80 amperes per square foot of surface to be coated in the average case. I find that the higher the amperage the more efficient the result within certain limits. In fact, depending upon the capacity of the material to withstand the amperage applied, it is possible to employ an amperage up to 200 amperes per square foot. However, I do not find that improvement seems to be obtained above 200 amperes per square foot of metal being coated.

The percentage of the ingredients in the solution are varied within the ranges given in accordance with the character of the objects being coated at the cathode.

As a result, the iron or steel is given a basic silver coating which firmly adheres to the base metal. The desired silver coating can be built up in this way continuing the electrolytic deposition until the desired depth of coating has been effected. However, it is more practical to effect the required depth of silver coating by following ordinary silver coating methods after the initial coating of the iron or steel in order to provide a base for plating. Consequently, when the initially coated iron or steel is subjected to an ordinary silver plating method, a silver plated article may be produced with a coating of desired thickness and the resulting product will not peel, chip or crack when distorted, as in the case where direct silver plating of silver on iron is attempted.

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As indicated above, the degree of amperage employed will be related to the capacity of the material to withstand it. As indicative of the degree of amperage it should be noted that mill plate black iron having a thickness of $\frac{7}{1000}$ of an inch was silverized according to the present invention when employ-in an amperage of 50 amperes per square foot. Forged mild steel pliers were silverized by this method employing current having an amperage value of 100 amperes per square foot. Cold rolled steel $\frac{1}{8}$ inch thick was silverized employing current amperage of 185 amperes per square foot.

In all cases of silverizing, according to the present invention, the silver applied directly to the iron or steel is permanently applied and will not chip, peel or crack. Consequently, it will be apparent that the invention makes it possible to provide a direct silver to iron coating which will be permanent and without the use of an intermediate coating of other metals which heretofore has been necessary.

What I claim as my invention is:

1. The process of applying directly to a ferrous metal cathode a coating of silver comprising; placing said ferrous metal cathode in an aqueous bath having sodium cyanide 8 to 15 ounces, silver cyanide $\frac{1}{4}$ to 2 ounces, sodium chloride $\frac{1}{4}$ to 2 ounces, potassium carbonate $\frac{1}{8}$ to 1 ounce, to a gallon of water; placing an iron anode in said bath and passing an electrical current of a value between 30 to 200 amperes per square foot of sur-

face area of the cathode, between said anode and cathode.

2. The process of applying directly to a ferrous metal cathode an adhering strike coating of silver from a conventional silver plating bath having silver cyanide present in an initial concentration of $\frac{1}{4}$ to 2 ounces per gallon of the bath along with sodium cyanide 8 to 15 ounces per gallon of the bath, sodium chloride $\frac{1}{4}$ to 2 ounces per gallon of the bath, potassium carbonate $\frac{1}{8}$ to 1 ounce per gallon of the bath and water to complete 1 gallon of the bath solution; comprising placing an iron anode in said bath and passing an electrical current of high density between said anode and cathode, the current value being in the range of 30 to 200 amperes per square foot of surface area of the cathode.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
53,037	Thompson	Sept. 11, 1866

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