

UNITED STATES PATENT OFFICE

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PRODUCTION OF RESISTANT SILVER SURFACES

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The present invention relates to the production of resistant silver surfaces.

Silver or silver-plated vessels, piping and the like, are largely used in the chemical and allied industries, when resistance to the corrosive action of liquids or vapors containing chlorine, hydrochloric acid, solutions of chlorides and the like has to be considered. The resistance of silver towards these agents is based substantially on the insolubility of the superficial coating of silver chloride formed. Frequently, as for example in the case of concentrated aqueous hydrochloric acid, this resistance is not great enough to fulfill technical requirements. It has already been suggested to increase the chemical resistance of silver by alloying it with certain base metals which are absorbed by the silver and form therewith a solid solution. Utensils made of such materials can be employed in many cases.

I have now found that strong resistance to corrosion is obtained, in a very simple and advantageous manner, even in the case of finished articles of silver or of insufficiently resistant alloys rich in silver, by treating the surface which is to be protected, at temperatures above 500° C., but below the melting points of the components, with a metal less electropositive than silver or with an alloy of such a metal, capable of forming with the silver solid solutions which are rich in silver.

As metals which are suitable for the said purpose copper, tin, cadmium, zinc, antimony, aluminum, thallium, magnesium, and in particular manganese and manganese aluminium alloys, may be mentioned. Metals of a low melting point such as tin or antimony are preferably used in the form of alloys of a higher melting point, such as for instance antimony containing 18.2 per cent of aluminium. By means of this treatment the preparation of alloys by melting, prior to the manufacture of the appliances or articles, is rendered superfluous. On the contrary, the finished silver articles, even when the same have already been used, can be provided with protective coatings in the specified manner, and thereby provided with an excellent power for resisting corrosion, as

though the said articles were made of the silver alloys. Owing to the greater hardness of the solid solutions, the mechanical properties of the said articles, if made of pure silver, are also substantially improved.

The process can be carried out, for example, by treating the surface of the article which it is desired to protect, in an inert atmosphere and at temperatures above 500° C. but below the melting point of the components, with the desired metal which forms solid solutions rich in silver with the silver, said metal being in the form of powder.

The improvement of the surface area here-in described is not restricted to articles of solid silver, but can also be applied to silver plate. In this latter case, the coating of silver deposited on the basis metal, such as copper, should preferably be thicker than is usually the case, since the high temperature required for the process also produces diffusion at the margin between the basis metal and the plating, that is to say, reduces the thickness of the latter. The superficial silver alloy produced according to the present invention is inseparably united with the substratum.

The following example will further illustrate the nature of the said invention which however is not limited thereto.

Example

The silver article which is thoroughly cleaned with an abrasive, is embedded in finely powdered manganese or a manganese aluminium alloy, prepared by melting, for example by the aluminothermal process and containing, for example, about 80 per cent of manganese, so as to be completely surrounded by the powder. The article is then heated to between 600° and 960° centigrade for a considerable time, say for several hours, in an inert atmosphere, the temperature and duration of the heating being dependent on the desired thickness of the diffusion layer. By modifying these two factors, it is possible to extend the superficial improvement to any desired depth and to vary the superficial content of manganese or manganese aluminium in accordance with the required chem-

ical and mechanical resistance. If only parts of the surface of a silver article, such as the inside of a tube, are to be treated, the article need only be covered by the powder in such parts. The finished work can be scoured with emery or the sandblast, and then polished like fine silver.

What I claim is:—

1. As new articles of manufacture, silver articles having a highly resistant surface of an alloy of silver with a metal less electropositive than silver and capable of forming solid solutions with silver, said surface being supported by a less resistant silver-containing material.

2. As new articles of manufacture, silver articles having a highly resistant surface of an alloy of silver with manganese, said surface being supported by a less resistant silver-containing material.

3. As new articles of manufacture, silver articles having a highly resistant surface of an alloy of silver with manganese and aluminium, said surface being supported by a less resistant silver-containing material.

In testimony whereof I have hereunto set my hand.

PETER ASSMANN.

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