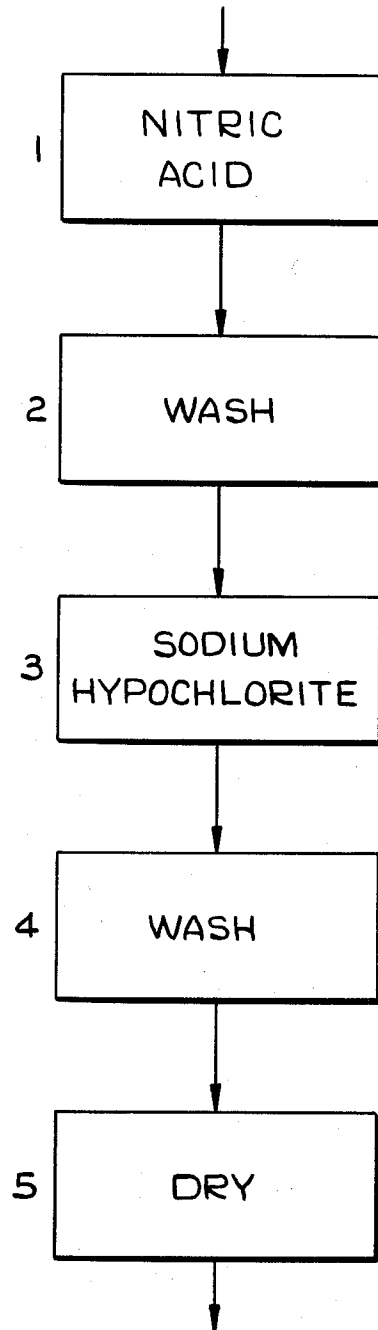


Sept. 1, 1964

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METHOD OF REMOVING A SILVER AND PHENOL-FORMALDEHYDE
RESIN PAINT FROM AN ARTICLE
Filed Aug. 28, 1962

3,147,148



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3,147,148

METHOD OF REMOVING A SILVER AND PHENOL-FORMALDEHYDE RESIN PAINT FROM AN ARTICLE

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Filed Aug. 28, 1962, Ser. No. 219,978

2 Claims. (Cl. 134-28)

This invention relates to a method of removing a dried paint consisting of silver and a phenol-formaldehyde resin from an article, and more particularly to methods of removing such paint from deposited carbon resistors. A general object of the invention is to provide a new and improved method of such character.

In the manufacture of deposited carbon resistors, a coating of carbon having a controlled thickness is deposited on the surface of a cylindrical ceramic core by the decomposition of methane gas. To permit electrical connection, a conductive paint is then applied to the ends of the resistors and baked on. This paint commonly includes a nonvolatile content consisting of about 80 to 92% by weight particulate silver with the balance being a phenol-formaldehyde resin. In the practice of this manufacturing process, the resistors produced sometimes fail to meet qualitative standards because either the silver and phenol-formaldehyde coating or the deposited carbon coating is imperfect. Since both the ceramic cores and the carbon film deposited thereon are expensive it is highly desirable and advantageous to remove the baked silver and phenol-formaldehyde resin paint and reuse the cores when either the conductive coating or the carbon coating is faulty.

When deposited carbon resistors are manufactured in large quantities by techniques of mass production, the number of units rejected for failure to meet qualitative standards may also be large. Therefore, in removing the baked silver and phenol-formaldehyde resin paint from defective resistors to reclaim the cores, it is important to use a method which is economical as well as effective. The method should require a minimum of labor and should use chemical ingredients which are economical and readily obtainable.

Accordingly, another object of the invention is to provide a method of removing a dried paint consisting of silver and a phenol-formaldehyde resin from deposited carbon resistors in order to enable the reuse of the cores.

A further object of the invention is to provide a method of removing a dried paint consisting of silver and a phenol-formaldehyde resin from deposited carbon resistors which requires a minimum of labor and which uses chemical ingredients which are economical, efficient and readily obtainable.

In accordance with the invention, the method includes immersing the article in a solution of nitric acid to dissolve the silver and immersing the article in an aqueous solution of sodium hypochlorite to remove the resin from the article. Preferably, the first solution consists of concentrated nitric acid and the second solution consists of dilute sodium hypochlorite and the article is washed after immersion in the first solution to remove the nitric acid and the resulting silver nitrate.

This invention, together with further objects and advantages thereof, will best be understood by reference to the following description of a specific example thereof taken in connection with the accompanying drawing. The single figure in the drawing is a flow diagram for articles from which dried paint consisting of silver and a phenol-formaldehyde resin is to be removed in accordance with one embodiment of the invention.

Example

A large quantity of defective deposited carbon resistors coated with a baked paint consisting of about 86% metallic silver and about 14% of a phenol-formaldehyde resin binder was completely immersed, as at 1, in a solution of concentrated nitric acid. In the resulting reaction, the silver entered into solution as silver nitrate and was leached from the bake paint so as to leave the resin in a cellulated, irregularly honeycombed condition. After about two hours, the silver was dissolved out of the baked paint. The resistors were allowed to remain immersed for about 14 additional hours to further loosen and cellulate the resin.

The nitric acid was then removed and retained, and the resistors were washed with water, as at 2, to remove the acid, silver nitrate and any loose resin. Subsequently, the resistors were completely immersed, as at 3, in a 5 to 10% by weight aqueous solution of sodium hypochlorite. After about 4 hours, most of the resin was removed. The resistors were allowed to remain immersed for about 12 additional hours to effect complete removal of the resin. The solution of sodium hypochlorite was then removed and retained. Subsequently, the resistors were washed thoroughly with water, as at 4, and dried, as at 5, in an oven at 105 to 110° C.

Ordinarily, sodium hypochlorite is considered a relatively non-reactive agent at a dilute concentration and a low temperature, and would be expected to have little effect on a phenol-formaldehyde resin. However, contrary to expectations, a dilute solution of sodium hypochlorite at room temperature does remove the resin effectively and efficiently.

It is believed that the honeycombed condition produced in the resin as a result of the leaching out of the silver from the baked paint by the nitric acid accounts for the success of an unheated and dilute solution of sodium hypochlorite. More specifically, it is believed that the honeycombed condition allows the sodium hypochlorite to contact and react with a much larger and thinner area of resin than if the resin were a non-cellulate mass. Thus, relatively simple, readily obtainable and inexpensive chemicals can be used to remove the resin and without having to be heated.

Examination of the treated resistors showed the baked silver and phenol-formaldehyde resin paint to have been substantially removed so as to present a clean carbon surface. The resistors were then suitable for repainting or, if the carbon coating were defective, were ready for heating in an oxygen atmosphere to remove the carbon.

Neither the solution of nitric acid nor the solution of sodium hypochlorite require heating. Although the speed of the reactions can be increased by heating the reagents, such heating would require unnecessary time and labor and would also tend to reduce the usable life of the reagents.

The time required to clean the resistors depends on the thickness and composition of the silver and phenol-formaldehyde paint and the strength of reagents. It has been found that in the case of typical resistor terminals the silver is removed by the first solution after about two hours, and the phenol-formaldehyde is removed by the second solution after about four hours.

Both the nitric acid and the sodium hypochlorite may be reused until they fail to clean properly. Their usable life is, obviously, a function of the size and quantity of the articles to be cleaned, the quantity and character of the silver and resin paint to be removed, and the quantity of nitric acid and of sodium hypochlorite used. It is, of course, required that the article, from which the dried paint is to be removed, be of such material that it is relatively inert to the two reagents used.

While various embodiments and examples of the in-

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vention have been disclosed, many modifications will be apparent, and it is intended that the invention be interpreted as including all modifications which fall within the true spirit and scope of the invention.

What is claimed is:

1. The method of removing a dried paint consisting of about 80 to 92% by weight metallic silver and about 20 to 8% by weight of a phenol-formaldehyde resin from deposited carbon resistors, which comprises:

immersing the resistors in an unheated solution of concentrated nitric acid for a period of at least 2 hours but not in excess of 16 hours to remove the silver from the resin such that the resin is a cellular mass; washing the resistors to remove the nitric acid, and the resulting silver nitrate and loosened resin; and immersing the resistors in an unheated aqueous solution of 5 to 10% by weight sodium hypochlorite for at least 4 hours but not in excess of 16 hours to remove the cellulated resin from the resistor.

2. The method of removing a dried paint consisting of about 80 to 92% by weight metallic silver and about 20 to 8% by weight of a phenol-formaldehyde resin from deposited carbon resistors, which comprises:

immersing the resistors in an unheated solution of con-

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centrated nitric acid for a period of 16 hours to remove the silver from the resin such that the resin is a cellular mass;

washing the resistors to remove the nitric acid, and the resulting silver nitrate and loosened resin; and immersing the resistors in an unheated aqueous solution of 5 to 10% by weight sodium hypochlorite for a period of 16 hours to remove cellulated resin from the resistor.

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