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COPPER PLATING

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This invention relates generally to the manufacture of glass mirrors and more particularly to an improved method of or process for applying a protective coating or backing of metal over the rear surface of the reflecting medium, the latter being ordinarily applied to the glass in the form of a closely adhering thin film or layer of silver, gold or other such metal having the usual reflecting qualities.

Upon investigating the problem of mirror deterioration, it has been found that among the primary causes of such deterioration is the presence of water vapor in the atmosphere with its attendant frequent condensation upon the mirror, the presence of salt in the moisture which comes into contact with the mirror, and the ever present hydrogen sulphide in the atmosphere, this latter being noticeably concentrated near cities and being evidenced by the rapid tarnishing of silver in homes. It is well known also that the useful life of a mirror is considerably reduced when subjected to intense heat.

In order to protect the reflecting films of mirrors and the like from the deleterious effects of an extremely acid or alkaline atmosphere as well as from moisture or heat, various attempts have been made from time to time and prior to this invention to apply to the reflecting film of the mirror metallic coatings or backings having the property of sealing the reflecting film or medium from the destructive influence of atmosphere and excessive temperature. Not only has it been proposed to employ different kinds of protective coatings or backings but various methods have been employed to apply the same to the film which it was desired to protect. One of the more common methods has been to electrolytically deposit a coating of metallic copper directly on the metallic reflecting film, such as silver. Inasmuch as this silver film is ordinarily extremely thin it has been found that the copper electrolytically deposited thereon eventually combined with the silver to form a blue streak thereby spoiling the mirror for its intended purpose. This reaction between the silver film and its electrolytically deposited coating of copper is primarily due to the relative position of these metals in the electro-chemical scale, the characteristic blue streak being particularly noticeable when the mirror is subjected to the influence of the atmosphere which latter acts more or less in the nature of an electrolyte.

It is among the objects of the present invention to provide a new and improved method of applying to the reflecting film of a glass mirror a protective backing or coating of metal for effectively sealing the reflecting film from the deleterious effects of atmosphere, moisture and excessive temperatures.

A further object of the invention is to provide a method for applying a metallic coating or backing to a mirror wherein the possibility for the backing to react with the reflecting film is effectually precluded.

Still another object of the invention is the provision of a new and improved method for applying a protective coating of metal by a process other than electrolytic-deposition and which involves merely a brushing, spraying or similar operation and wherein the use of expensive equipment and skilled labor is entirely eliminated.

A still further object of the invention is to provide a new and improved method or process for preparing the protective metal for application to the mirror, the metal so prepared being of powdered form and each granule thereof having a more or less leafy physical structure so that when the powdered metal is applied to the mirror the granules thereof lay shingle-like over the reflecting film.

A still further object of the invention is the provision of a mixture consisting of fine-

ly ground metal and a conveyor or vehicle for maintaining the metal in suspension, the mixture being adapted to be inexpensively and readily applied as a protective coating for mirrors with the vehicle or conveyor thereof serving effectually as a binder for the ground metal at the same time that it prevents actual metallic contact between the metallic reflecting film and its metallic protective coating. Electrolytic action between said film and coating in the presence of atmosphere having acid or alkaline characteristics is thus effectively precluded.

Other objects and advantages of this invention will appear more fully hereinafter.

While in the following description of the present invention particular reference is had to the use of copper as the protective coating for the mirrored surface, it will be understood of course that other metals may be employed to advantage and without departing from the general principles or spirit of the invention.

In carrying out the invention a solution is first prepared as follows:—In 144 ozs. of methanol (technical) or special denatured alcohol dissolve completely one pound of pure, arsenic free flake shellac.

Where a protective coating of pure copper is desired to be employed, one pound of pure metallic copper prepared as described immediately hereinafter is added to 24 ozs. of the shellac solution. This pure metallic copper is prepared by grinding and powdering the same, ethylene glycol being employed as the lubrication and flotation medium in the grinding of the metal. It is preferable to use ethylene glycol for this purpose because it reduces the possibility of adulterating the ground metal with any organic impurities. Moreover, the use of ethylene glycol as the lubricant during the operation of grinding the metal produces a powdered copper which is more suitable for the purpose of this invention in that the physical structure of each particle or granule of the copper is of a more or less leafy nature.

Having prepared the copper in the manner just described it is added to the solution of shellac and alcohol in the proportion of one pound of copper to 24 ozs. of said solution. This mixture must be kept in a well stoppered bottle when not in use and must be shaken well each time before using.

The mirror, which may have a silver, gold or other type of reflecting surface, must be thoroughly dry before the protective coating of copper is applied thereto. When it is judged that the reflecting surface of the mirror which is to be coated with copper is sufficiently dry, the mixture of the ground copper and its conveyor of shellac and alcohol is applied to the surface to be covered by a simple brushing or spraying operation, a sufficient quantity of this mixture being brushed or sprayed over the metallic reflecting film of the mirror to completely cover every portion of said film. The chemical action of the copper which has been applied to the mirror in the manner just described is such that in the course of a day or so a fine protective coating will have been formed similar to that obtained through the electrolytic-deposition method. It differs, however, from the latter method in that while a film of pure copper is provided to cover the metallic reflecting film of the mirror an intermediate film of shellac is provided immediately over said latter film. The reflecting film is thus doubly protected, first by a film or layer of shellac and second by a film or layer of pure copper, the latter being in turn also covered by a film or layer of shellac.

The fact that the protective layer of copper is separated from the metallic reflecting film of the mirror by the intervening layer of shellac precludes the possibility of any chemical combine or reaction between the reflecting film and its protective coating which so frequently occurs where the latter is electrolytically deposited upon the former. Also, due to the fact that the minute granules or particles of the ground copper are of more or less leafy physical structure, when the aforesaid mixture is brushed or sprayed over the surface to be protected these granules or particles lay shingle-like upon said surface to form a uniform and regular protective film affording a maximum degree of protection. Each of these leafy particles being thoroughly coated with the shellac dissolved in alcohol prevents actual metallic contact between the reflecting surface of gold, silver or the like and the protective film of copper in consequence of which spoilage of the mirror is reduced to a veritable minimum.

In place of ground and powdered copper, it will be understood that other metals may be employed for the purpose of protecting the reflecting films of mirrors and reflectors from atmospheric and heat deterioration, these other metals being similarly ground and powdered preparatory to mixing the same with the solution of shellac and alcohol. I have found that aluminum, lead, tin and the like, either separately or in combination, when applied as protective coatings or backings in the manner before described have the property of sealing the reflecting film against the deleterious effects of moisture, gases and the like.

A combination of powdered metals which has been found affords maximum protection for the reflecting surfaces of mirrors in locations where the atmosphere is extremely acid or alkaline is as follows:—

	Parts
Copper	73
Tin	23
Lead	10
Antimony	5

For protecting the reflecting surface of mirrors and reflectors from intense heat, aluminum has been found to be most satisfactory, the aluminum being ground and powdered and then added to the aforesaid solution of shellac and alcohol in the proportion of one pound powder aluminum to 24 ounces of said solution, this mixture being readily applied to the surface to be protected by a simple brushing or spraying operation.

It will be obvious that the method herein described of applying a protective coating of metal to the reflecting surfaces of mirrors and the like is extremely economical due to the fact that the necessity for expensive equipment and skilled labor is entirely eliminated. In addition to this, tests have indicated that the protective coatings of metal applied in accordance with the present method are quite superior to those applied by any of the present known methods including the electrolytic deposition method wherein copper, when electrolytically deposited upon silver, combines and reacts with the silver to form ruinous blue streaks, particularly when the silver reflecting film is thin and the atmosphere is such as to act as an electrolyte.

It will be understood, of course, that the invention is susceptible of various changes from time to time without departing from the general principles or real spirit of the invention and it is accordingly intended to claim the same broadly, as well as specifically, as indicated by the appended claims.

What is claimed as new and useful is:—

1. A method of protectively coating the metallic reflecting film of a glass mirror or the like to protect the same against spoilage due to exterior influences which consists in applying to the rear surface of said mirror a free flowing mixture of resinous material and comminuted copper particles of substantially leafy form.

2. A method of protectively coating the rear surface of a glass mirror or the like having a metallic reflecting film which consists in dissolving by weight one part of shellac in about nine parts of alcohol, in adding powdered copper of leafy physical structure to said solution in the proportion by weight of about two parts of the metal to three parts of the solution, and in applying the resultant mixture over the surface to be protected.

3. In a glass mirror having a metallic reflecting film, a protective coating therefor consisting of comminuted copper uniformly spread over the rear surface of the mirror, each particle of said copper being substantially of leafy physical structure and covered with resinous material, the latter serving not only as a binder for the comminuted copper but also as an insulating film between said copper and the metallic reflecting film.

4. In a mirror having a metallic reflecting film, a protective covering for said film consisting of minutely ground leafy particles of copper arranged in substantially overlapping relation and imbedded in a supporting medium of resinous material applied to and covering the rear surface of said mirror, each of said copper particles being completely covered by said resinous material.

In testimony whereof, I have hereunto affixed my signature.

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