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PROTECTIVE BACKING FOR MIRRORS

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This invention relates to improvements in the production of mirrors, and to the provision of a protective backing for mirrors.

More particularly, the present invention relates to a novel method and composition for the plating of freshly silvered mirrors with a protective layer of copper, by chemical as distinguished from electroplating means.

The process of the present invention in general relates to the employment of the known principle of the electromotive series of elements wherein one metal will displace another which is lower in the electromotive series from solution. Thus, for example, copper may be precipitated out from a solution of copper sulfate by commingling the copper sulfate solution with a suspension of finely divided particles of metal above it in the electromotive series such as iron, zinc, etc., and this expedient has been heretofore employed for the deposition of a coating of copper on a freshly silvered mirror for protection of the silver layer.

It is a particular object of the present invention to provide a protective coating of metallic copper on a silvered mirror in the general manner aforesaid, which is without blemish of either the silver or the copper layers successively deposited, which are resistant to aging and which require no further protective coating.

It is a further object of the present invention to provide a better process control and facilitate the handling of the finely divided metal particles employed for displacing the copper from solution in a manner whereby the reaction may be tempered, and whereby the chemicals are permitted to react fully with attendant economy, and with prevention of abrading of the silver layer onto which the copper is deposited.

As heretofore indicated, the process comprises the employment of a solution of copper sulfate with added mineral acid and the joint spraying and commingling thereof with a suspension of finely divided metal particles onto the silvered mirror by, for example, passing a freshly silvered mirror forwardly on a conveyor in a horizontal or substantially horizontally disposed position while moving the sprays transversely of the path of the mirror and in a plane substantially parallel thereto.

This has generally required the use of a vessel equipped with a stirrer for keeping the metal particles agitated in a body of water substantially close to the point of spraying so that the metal particles will be dispered in as uniform manner as possible. Such procedure has also heretofore required the employment of extremely finely divided particles of metal, such as that which will all pass a 300-mesh screen and finer, primarily for the purpose of preventing scratching of the freshly silvered layer onto which copper is being deposited.

It is evident that such process requires care in the continuous agitation of the iron particles close to the work to maintain their suspension. Further, it has been found that the employment of such extremely finely divided particles of metal results in a too rapid action and often in nonuniform deposition of the desired copper layer.

In accordance with the present invention I am able to provide a better, simpler, and more uniform suspension of the metal particles; I am able to temper the reaction by being able to use relatively larger metal particles than heretofore thought feasible or desirable, such as

those passing a 200-mesh sieve but which all retained on a 300-mesh sieve, without scratching of the silver layer and with a better utilization of the chemicals.

These advantages are essentially accomplished by the addition of a small amount of bentonite to the metal powder suspension. Thus, I am able to prepare a good pre-suspension which is stable for the purposes herein contemplated, of metal particles and bentonite in water at a distance from the work and to provide a consistently uniform spray thereof without necessity for employment of an agitator closely adjacent the point of spraying. The use of these larger size particles of metal powder permits the reaction to be tempered, that is to say, prevents its going forward too rapidly in localized areas. At the same time, the resultant commingled sprays of metal and bentonite particles in water on the one hand, and copper sulfate-acid solution on the other, tend to remain on the silvered mirror in the form of a mudlike slurry providing ample opportunity for uniform and complete reaction of the chemicals.

Thus, as a typical example of the process of the present invention, I prepare a first solution composed of three pounds of copper sulfate, 5.25 pounds (44 fluid ounces) of 66° Bé. concentrated sulfuric acid and from about 14 to about 17 gallons deionized water. I then prepare a dispersion composed of approximately two ounces of pulverized iron, all of which passes a 200-mesh sieve but all of which is retained on a 300-mesh sieve, and eight ounces of bentonite (Volclay BC having a pH of from about 7.5 to about 8.5). These two liquid bodies may be separately placed in overhead tanks and flowed by gravity to spray nozzles employing 15 to 25 pounds of air pressure.

The copper sulfate solution may be sprayed at the rate of sixteen fluid ounces per minute and the iron particle-bentonite suspension at the rate of five to six fluid ounces per minute at a point of about eight to fourteen inches above rinsed, freshly silvered glass passing thereunder on a substantially horizontal support while the nozzles reciprocate perpendicularly to the motion of the glass and in a plane substantially parallel thereto. Multiple nozzle sets are preferably employed whereby one can deposit as thick a film of copper as desired. The commingled sprays fall upon the silvered surface as a light mud, the mud holding the reagent chemicals in contact and preventing run-off and thereby permitting full reaction of the chemicals.

Successive applications may be made without intermediate rinse, and after passing under as many sprays as desired, the mirror is then rinsed with low-conductivity water, resulting in a copper-clad mirror free from blemishes at either the silver or copper deposits, which may then be used without further coating.

Although I have hereinbefore given a typical example of the process of the present invention and specific amounts of reactants, it will be understood that these proportions of reactants may be varied within the skill of the art.

Thus, the first solution prepared with from about 14 to 17 gallons of deionized water may contain from about 1 to about 6 pounds of copper sulfate and from about 1½ to about 8 pounds of 66° Bé. sulfuric acid. Similarly, the dispersion of iron powder and bentonite per gallon of water may contain the iron powder in the proportions of from about ½ to about 4 ounces and the bentonite from about 4 to about 10 ounces by weight.

It will also be understood that variations of the proportions of the copper solution to the iron suspension can be employed and achieved by, for example, varying the nozzle sizes to obtain varying discharge rates.

I claim:

1. In a process of coating a freshly silvered mirror surface with a protective coating of copper by jointly applying to said silver surface an aqueous solution of copper sulfate and sulfuric acid and an aqueous suspension of finely divided particles of iron, the improvement which comprises incorporating bentonite in said suspension.

2. In a process of coating a freshly silvered mirror surface with a protective coating of copper by jointly applying to said silvered surface an aqueous solution of copper sulfate and sulfuric acid and an aqueous suspension of finely divided particles of iron, the improvement which comprises pre-suspending said iron particles by incorporating bentonite therewith.

3. The process of coating a freshly silvered mirror with a protective coating of copper which comprises jointly spraying onto said silvered surface an aqueous solution of copper sulfate and sulfuric acid and an aqueous suspension of bentonite and iron particles of −200 to +300 mesh particle size.

4. The process of coating a freshly silvered mirror with a protective backing of metallic copper which comprises

applying to said silvered surface a freshly formed slurry composed of a mixture of (*a*) an aqueous solution of copper sulfate and sulfuric acid and (*b*) an aqueous suspension of bentonite containing finely divided particles of iron in the proportion of from about 4 to about 10 ounces by weight of bentonite and from about ½ to about 4 ounces by weight of iron per gallon of water.

5. Finely divided particles of iron suspended in an aqueous bentonite dispersion in the proportion of from about 4 to about 10 ounces by weight of bentonite and from about ½ to about 4 ounces by weight of iron per gallon of water.

6. An aqueous dispersion of bentonite containing finely divided particles of iron stably suspended therein and wherein said particles of iron are from −200 to +300 mesh size.

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