

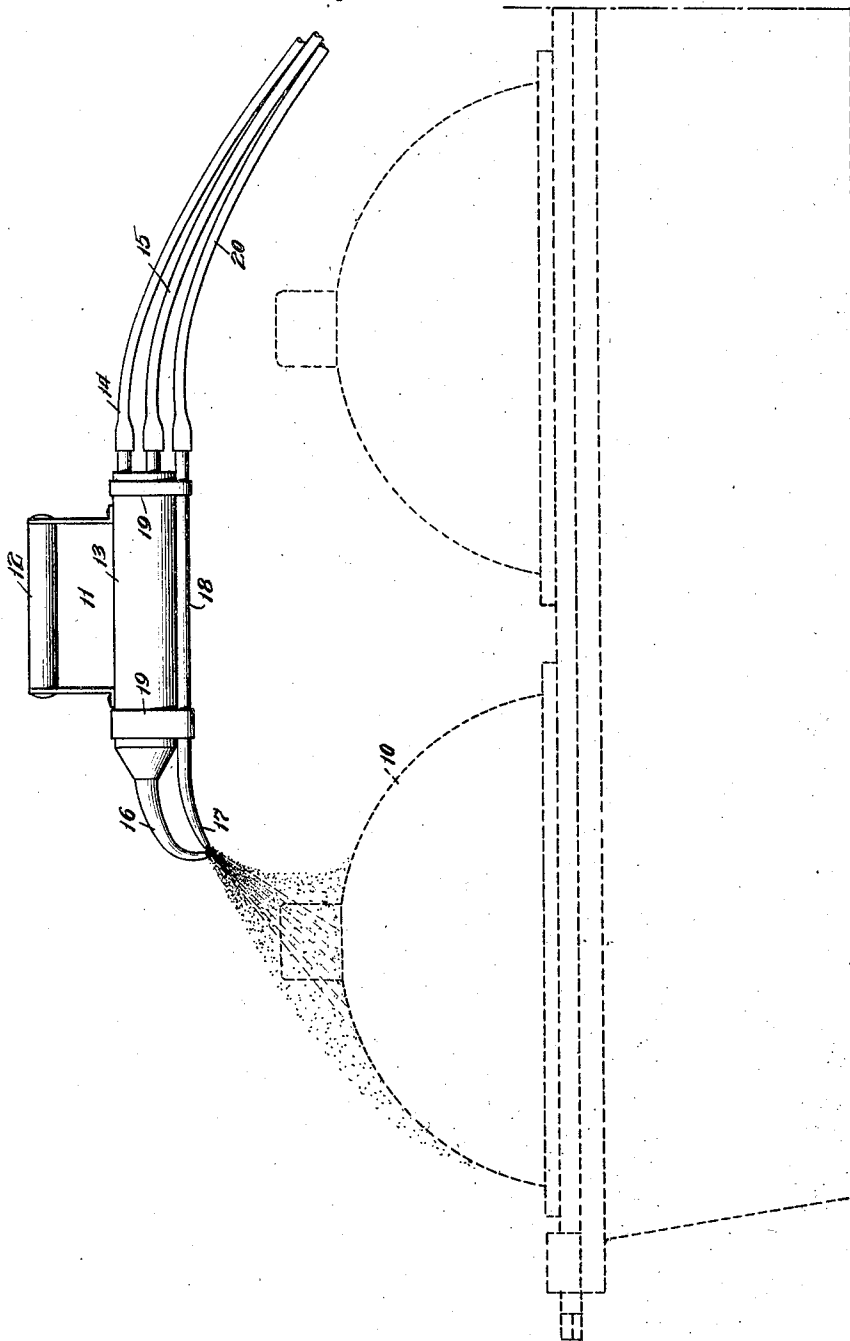
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B. BART

METHOD OF DEPOSITING SILVER

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METHOD OF DEPOSITING SILVER.

Application filed September 23, 1921. Serial No. 502,680.

To all whom it may concern:

Be it known that I, BLASIUS BART, a citizen of the Republic of Switzerland, and resident of East Orange, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Methods of Depositing Silver, of which the following is a specification.

The invention relates in general to a method for depositing silver on an object to be coated thereby and the invention specifically relates to an improvement in the manner of depositing silver on a mould to form reflectors of the type in which the formed silver reflecting surface is backed by a strengthening layer of electrolytically deposited copper.

The present invention features a perfected method which can be practiced independently of personal skill and independently of any variations of climatic conditions present and in which the resulting product will at all times be uniform.

The primary object of the present invention is to attain a brilliant reflecting surface of uniform high lustre, simulating a highly polished silver surface and to attain this result with a minimum loss of reagents, rapidly, in a manner susceptible of adoption for use on a large commercial scale and capable of being operated successfully by unskilled labor.

Certain refinements of operation have been practiced with advantage, for instance, it has been found that the character of the resulting deposit is controlled to a considerable extent by the temperature of the reaction and the temperature of the mould or other deposit receiving surface and in practicing the process herein disclosed a temperature of about 60° F. is suggested.

While it is obvious that different silver compounds may be used and the different compounds in the solutions may be of varying strength, it is suggested that when silver nitrate is used it be freshly prepared, preferably in a proportion of about 80 grammes of the silver nitrate salt to each gallon of water. If rochelle salts is used as the reducing substance 40 grammes to the gallon is suggested and if formaldehyde be used the strength is to be regulated so that it will not discolor the silver.

In spraying or otherwise depositing the mixture onto the surface to be coated care must be exercised so that the deposit is not

made too fast and it is suggested that the discharge be regulated so that one gallon of the substance be discharged per hour when under a pressure of about two pounds per square inch and projected through a pin hole opening.

In practicing the operation the silver solution and its reducing agent are caused to flow in streams into a closed chamber for a limited time sufficient to permit some reducing reaction between the substance but insufficient to permit a complete reduction of all of the silver present. The partially reduced mixture is then projected onto the object to be coated in small quantities, preferably but not necessarily in the form of an extremely fine mist or cloud-like effect.

The best results are attained by spraying a limited portion of the surface to be covered, then applying the spray to another adjacent portion and then returning and re-spraying the previously sprayed portion before the previously sprayed portion has had an opportunity to dry. The action will resemble a gentle blowing of steam on the mould and when a thin, almost transparent film is laid, the depositing action at this place is interrupted for a few seconds and then continued for a few more seconds and again interrupted. Apparently the best results are attained when there is a partial drying, and perhaps incidental oxidizing, of each layer or rather film of the metal deposit as it is laid on the surface. This operation is continued until the desired thickness of silver deposit is attained, but it is a feature of this method that the silver deposit be of unusually thin depth. Afterwards a deposit of copper or similar backing material is deposited on the silver coating, preferably by depositing the silver coated mould in an electrolytic tank, but this forms no part of the present disclosure.

Various other objects and advantages of the invention will be in part obvious from the suggestions herein made relative to the improved method and from an inspection of the accompanying drawings showing a means for practicing the process and in part will be more fully set forth in the following particular description of one particular method of practicing the invention.

Referring to the accompanying drawings there is shown largely in diagrammatic outline a suggested form of apparatus for practicing the process featured in this disclosure.

In the drawings there is shown in dotted outline a convex, chemically clean and preferably highly polished glass mould 10, one form of which is more particularly described in my copending application, Serial No. 502,679, entitled "Mould for reflectors", filed September 23, 1921, but it is of course to be understood that the showing is made in connection with the process as described for forming reflectors of the semi-spherical type and any form of mould or in fact any form of object to be coated may be considered as the equivalent of the member 10. It is understood that at the completion of the process there is a thin layer of metallic silver formed on the glass mould disclosed, after which the mould with the thin silver coating thereon is positioned in an electrolytic tank (also shown in dotted outlines) and a deposit of strengthening material such as copper is formed on the rear side thereof. This completes the process after which the copper-backed silver coated article is removed from the tank.

Referring to the instrument for depositing the silver film it is noted from the drawings that it is in the form of an atomizing tool 11 of the two jet type. The tool is provided with a handle 12 secured to one side of a mixing chamber 13 which is in the form of a cylindrical barrel. The chamber is supplied from a source of silver nitrate solution through the agency of a flexible pipe 14, and is similarly connected with a source of silver reducing solution, such as rochelle salts, by means of a flexible pipe connection 15. The mixing chamber is provided, at the end opposite the inlet formed at the pipes 14 and 15, with a nozzle 16. The discharge end of the nozzle is provided with a pin hole opening. The nozzle is shown to be curved into an L form so as to direct the mixed substances discharged from the mixing chamber 13, transversely of a stream of compressed air. The air is discharged from the nozzle 17 which nozzle constitutes a continuation of a pipe 18, forming part of the tool 11 and secured thereto by straps 19. The pipe is supplied with air from some suitable air compressor through a flexible connection 20. It will, of course, be understood that the fluids in the pipes 14 and 15 are under pressure and that the several pipes are provided with suitable valve controls as is usual in apparatus of this character.

The length of the mixing chamber is regulated so as to give an opportunity for the silver solution and its reducing reagent to react to such an extent as will cause a partial reduction of the silver present while out of contact with the air but the chamber is not so long that a complete reduction is effected before the mixture is discharged. A chamber about five inches long has been used with satisfaction. It is necessary that the

final reducing action takes place in air and at the instant that the reduced silver is contacting with the mould.

Having thus described my invention, I claim:

1. In the art of coating objects with silver, the process which consists in ejecting a spray of a solution of a silver salt into a closed mixing chamber and out of contact with the air, thereby to retard any incidental oxidation, simultaneously ejecting into said chamber a spray of a solution of a reducing agent for the silver-salt, maintaining a physical and chemical contact between the ejected sprays of the solutions while confined in the chamber for a period of time to permit a partial reducing reaction between the solutions and causing the mixed and partially reduced solutions to be sprayed in the form of a mist onto the surface to be coated while completing the reducing reaction.

2. In the art of coating objects with silver, the process which consists in mixing a solution of a silver salt with a reducing agent therefor, maintaining the association in the absence of air and for a period of time less than the period necessary to permit a complete reduction of the silver salt present and spraying the resulting partially reduced substance in the form of a mist and in the presence of air onto the surface of the object to be coated.

3. In the art of coating objects with a silver deposit, the process which consists in forming out of contact with air a stream comprising a silver compound and a reducing agent therefor, maintaining the stream out of contact with air to effect a mixing of the silver compound and reducing agent under conditions which will not favor oxidation and spraying the mixture onto the surface to be coated.

4. In the art of coating objects with a silver deposit, the process which consists in mixing a stream of a silver compound with a stream of a reducing agent therefor while out of contact with air and at a temperature of approximately 60° F. and spraying the mixture onto the surface to be coated.

5. In the art of coating objects with a silver deposit, the process which consists in mixing a stream of a silver compound with a stream of a reducing agent therefor while out of contact with air and at a temperature of approximately 60° F. and spraying the mixture in the presence of air onto the surface to be coated.

6. In the art of coating objects with a silver deposit, the process which consists in mixing a stream of a silver compound with a stream of a reducing agent therefor while out of contact with air and at a temperature of approximately 60° F. and spraying the mixture onto the surface to be coated which

surface has a temperature of approximately 60° F.

7. In the art of coating objects with silver deposit, the process which consists in mixing a weak solution of silver nitrate, of approximately 80 grammes to a gallon of water, with a reducing agent, maintaining the mixing operation first out of contact with the air and then spraying the mixture onto the object to be coated while continuing the mixing operation in the presence of air, the deposition on the object being timed to effect the same before the reducing reaction of all the silver present is completed.

8. In the art of coating objects with silver deposit, the process which consists in mixing a weak solution of silver nitrate, of approximately 80 grammes to a gallon of water, with a reducing agent, maintaining the mixing operation first out of contact with the air and then spraying the mixture onto the object to be coated while continuing the mixing operation in the presence of air, the mixture being deposited at a rate of about one gallon per hour when discharged through a pin hole opening and under a pressure of about two pounds per square inch.

9. In the art of coating objects with silver, the process which consists in mixing a solution of a silver salt with a reducing agent therefor, maintaining the association for a period of time less than the period necessary to permit a complete reduction of the silver salt present and causing the resulting partially reduced substance to traverse an air space while completing the reaction and then causing the resulting metallic silver to be received promptly on the object and approximately at the instant that said reaction has been completed.

10. In the art of coating objects with a silver deposit, the process which consists in forming a mixture of a silver compound and a reducing agent therefor, initially maintaining the reaction under conditions unfavorable to oxidation and until the reaction is partially completed and then causing the same to complete the reaction under conditions favorable to oxidation and utilizing the resulting metallic silver to coat the object approximately at the termination of said reaction.

11. In the art of coating objects with silver, the process which consists in partially reducing a silver solution under conditions unfavorable to oxidation, completing the re-

action under conditions favorable to oxidation, continuing the reaction up to the time the solution or resulting metallic silver is deposited on the object, while maintaining the reaction at a temperature of approximately 60° F.

12. In the art of coating objects with silver, the process which consists in causing a stream of a silver solution, and a stream of a reducing reagent therefor to commingle in bulk for a period of time less than that necessary to effect a complete reduction of the silver present and then causing a restricted amount of said partially reduced stream to complete the reducing reaction while passing through air to the object being coated.

13. In the art of coating objects with silver, the process which consists in mixing a silver solution with a reducing reagent therefor both being in relatively small bulk and for a period of time sufficient to permit a partial reduction of the silver but insufficient to permit a complete reduction of the silver present and causing the resulting mixture to pass during the continuation of said reducing reaction through a pin hole opening on to the object to be coated.

14. In the art of coating objects with silver, the process which consists in mixing a silver solution with a reducing reagent therefor both being in relatively small bulk and for a period of time sufficient to permit a partial reduction of the silver but insufficient to permit a complete reduction of the silver present and causing the resulting mixture to pass during the continuation of said reducing reaction through a pin hole opening on to the object to be coated while maintaining the reaction under temperature conditions of approximately 60° F.

15. In the art of coating objects with silver, the process which consists in introducing into a mixing chamber a stream of a silver solution and a stream of a reducing reagent therefor, both supplied in relatively small bulk, causing the solution and reagent to remain in said chamber for a brief period of time and then causing the resulting products to flow continuously from the chamber through a pin hole opening and to fall onto the object being covered.

Signed at New York city in the county of New York and State of New York this 12th day of September, A. D. 1921.

BLASIUS BART.