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CHEMICAL PLATING

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One principal object of this invention is to combine a metal cleaning material with chemical plating material in a dry form with a means of dispensing and application which affords the advantage of guaranteeing to the user a complete non-scratching plating process.

A second object is to utilize a chemical plating material in which if decomposition sets in, the resulting decomposition product retains the non-scratching characteristic and further provides a mild abrasive as an added ingredient of the cleaning material.

An additional object is the prevention of decomposition by adding means to the compounded material which prevent the reflective redistribution of light rays and consequently the decomposition of light sensitive ingredients in the chemical plating material.

A further object is the providing of a handy portable means for quick chemical plating of objects with various metals such as copper, silver, gold etcetera, the applicator being retained in the dry form until it shall be desired to be used.

In demonstration of the above objects, and by way of example, following formulas are to be given, of novel nature and contributing to the art of metal finishing and preservation.

As is well known in the electroplating art, there are a considerable number of ways in which certain metals such as silver, gold, nickel and copper may be deposited by wet contact with a plating solution through immersion, or rubbing in paste form.

Accepted theory for such action is that salt solutions of metals to be deposited will form a metallic coating provided the electromotive potential of a solution is rated higher than that of the base metal on which the coating is to be laid. Coatings made by simple immersion or rubbing, though usually only a few milli-microns thick have, nevertheless, a certain commercial utility.

Compounding of contact plating pastes and solutions with mild abrasives which clean the surface to be coated in addition to providing an electro-depositing action, is old and well-known in the art, and is not claimed as novel in the invention to be described.

A typical formula for immersion or contact plating with silver is herewith given, in order to present a clear exposition of the invention. A quantity of chloride of silver is first dissolved in a saturated solution of potassium or sodium cyanide. The proportions may vary with the desire of the compounder, and the requirements of the material. A useful ratio of the two respectively, is one to three, which provides a quantity of "free cyanide" which not only accelerates the plating action but also aids in quick removal of oxides, sulfides and other compounds from the surface of the metal to be coated.

At this point the cleaning compound is added. By example, whiting or precipitated chalk is mixed in with the solution. As is well known, this material is calcium carbonate, non-soluble in pure water, but going into solution in the presence of carbon dioxide. The quantity may equal by weight that of the metal salts and is not critical in effect.

The addition of a small amount of carbon bisulphide or carbon disulphide may be made at this point. Its presence provides a control for the grain or crystal size of the deposited silver, tending to cause such formation to yield a bright mirror finish. Further, a quantity of the sulphide will break down releasing sulfur dioxide and yielding a small amount of carbon dioxide for taking some of the calcium carbonate into the solution, the net effect having a tendency to stabilize the silver salt, and delay decomposition, especially if the mixed material has to withstand heat. The formed fine emulsion of the carbon disulphide appears to retard crystal size and growth, but an oversupply will yield an undesired dark deposit.

The formula is now ready for the use of addition agents utilized for masking the light transmission throughout the mixed material which up until this point is a grayed white, the salt solution being transparent and the whiting providing a high degree of light transmission by particle reflection.

Carbon in the form of lampblack or in precipitated colloidal form is now added. The proportion of such carbon is not critical except that sufficient is used to cover against light. This material is not only a mild abrasive, chemically inert to the ingredients of the solution, possessing unique hiding power against light transmission which would decompose the silver salts, but also adds absorptive power to the formula against impurities and undesirable quantities of sulphides.

As a further hiding and homogenizing means small quantities of soluble aniline dyes, such as the rosanilines are added to the solution, to assist in light protection, and to initiate a binder characteristic in the paste being formed. These may also take the form of the naphthalene-diazo-acidic dyes, either sulfo, carboxylic, amino or hydroxyl types, or the naptho-sulfonic groups;

napthionic crocein; or the Neville-Winther azo dyes. Preferably such dyes are soluble in water, or else adsorbable into the carbonates. A sufficient quantity of dissolved sugar of the non-granule-forming type, such as levulose sugar may be added for providing a binder, although this latter may be found not necessary in practise. The aniline is preferably of the violet-blue-green end of the color spectrum for obvious reasons.

A summary of the ingredients of the described formula to the present state is now given:

a. Electroplating materials
b. Cleaning materials
c. Brightening agents
d. Light hiding substances
e. Binder materials

The mixture as now described is in the form of a semi-liquid paste, and being thoroughly mixed, is ready for combining with the applicator material.

In the following silver plating formulas, fresh precipitate of silver chloride, described preceding, is intended to be used.

Mix into a water paste the following; by weight:

	Parts
Silver chloride	2
Calcium carbonate (whiting)	3
Sodium chloride (C. P. salt)	2
Potassium carbonate	4

If for any reason, the above group is not sufficiently non-poisonous, the following is recommended:

	Parts
Silver chloride	1
Argol (potassium bitartrate)	2
Sodium chloride (C. P. salt)	2
Calcium carbonate (whiting)	1

The samples of various formulas are stated in order to suggest a wide utility for my invention, the article of which may include them in combination with the additive ingredients noted herein.

Sheets or continuous strips of non-siliceous paper, fiber or cloth are coated with the paste, or dipped in it, and allowed to dry. These may be of vegetable fiber such as cotton linters; or of artificial form, as for example the material known commercially as cellulose sponge, and that known as Japanese tissue. No claims are made for a specific method of coating or preparing such applicator material, in that machines for like purpose are commonly used for many similar processes. One process employs a roller which picks up a unit quantity of liquid and lays it on the continuous skein of such fibrous material, excess liquid being removed by a straight edge or knife. Other sheeting processes work directly from pulp to final sheet form, all ingredients being in the pulp tank.

In the latter type of process, all the materials to be included in the applicator are mixed in the pulp tank, and a continuously moving screen of wire or felt picks up the pulp, passing through drying boxes and wringer rollers, as is commonly known in Fourdrinier paper making machine practise, with equipment known to the trade as "Harper", "Yankee" and others.

Low temperature drying means are used, to avoid excessive decomposition of the metallic salts included in the materials. The copper or brass wire screening of such a machine is coated with the metal of the salt sclution being worked either before the pulp is started flowing, or else the wire is allowed to be coated by the pulp material itself, whereafter, in a short time, further deposit ceases.

Finished sheeting may be crepe or corrugated, as desired. To facilitate porosity, freezing of the sheet prior to drying may be utilized. Cotton rag stock, or cellulose fiber mixed with wool, such as is the bases for unsized blotting paper filter paper and "filter mass", are acceptable pulp bases for my process, the only restriction being that the material shall be non-siliceous or non-scratching. The resistivity of the cellulose fiber to chemical action determines that the pulp shall contain a fairly high percentage of cellulose fiber material. Further the power of attraction to metal salts and bases in solution of cellulose, gives a holding power to the base, which increases the efficiency of my process. Absolutely pure cellulose fibers may be obtained by boiling cellulose pulp with dilute sodium hydroxide, washing, and moist exposure to chlorine gas.

Such sheets may be transversely cut or perforated to facilitate removal of unit quantities from the whole by the user. The final article consists of a roll, or stack of impregnated sheets, in dry form. In the case of the silver formula described preceding, the material in the roll would in time deteriorate because of the action of light rays, and especial novelty is claimed for the peculiar protective characteristic of my article.

The technique of my combinations may be applied to other than silver plating means, and it is my purpose to claim the features of novelty as applicable to contact plating processes since these features embrace a scope of use beyond the simple coating of silver, for example.

The completed dried article is boxed, sealed and stored until required for use. The operator has only to moisten the article with a liquid which has the power of putting the metallic salts into solution. In the description of the contact silver plating process given preceding, such a liquid is ordinary water, or distilled water. Other liquids and solutions may be used, as for example, a sensitizing solution of potassium or sodium cyanide.

Now it should be clearly understood that the types of ingredients described herein may be mixed with the fibrous carrier in a manner similar to commonly known paper manufacture, wherein a continuous skein is drawn through a pulp tank containing all of the ingredients including the carrier fibers, the materials being somewhat more intimately mixed than in the first described method. The pulp drawn out on the skein is formed in a layer of uniform thickness, dried and boxed, just as described preceding wherein the fiberbase is separately coated.

The following formulae describe the extension of my invention to copper, tin, and gold plating, as examples of the application and use herein described.

Stannous chloride, 2½ parts; cream of tartar 4 parts (by weight) dissolved in water, will deposit tin on brass and other metals if the applicator or article is kept hot, at or near the boiling point of water. Zinc filings or dust, mixed with the above and intimately mixed with the fibers of the applicator along with the chloride and tartrate, accelerate the action.

Cream of tartar 3 parts; 1 part carbonate of copper in a water solution; mixed slowly with calcium carbonate (whiting) until chemical ac-

tion ceases; yields tartrate of copper, which dissolved in 1/5 part caustic soda, and 1/16 part potassium cyanide solution, provides a contact copper plating means for zinc, brass and other objects. Rubbing action may be continued, at room temperatures until a deep red color of the copper deposit is discernable.

For iron or steel objects to be copper coated quickly, equal parts of commercial sulfuric acid and copper sulfate dissolved in warm water, mixed with lampblack or similar inert cleaner agent, and combined with the fibrous applicator material yields a good, adhering coat, but continuation of the process too long causes granules and flakes to form.

Metals to be gilded are first coppered, and heated in boiling water. One solution for gold plating them is made with potassium cyanide 2 parts and chloride of gold 1 part, in water. The quantity of free cyanide present, determines the speed at which gold plating is accomplished and it may be increased 5 to 10 percent, in practise, without disturbing the other factors. Three parts of water, 3½ parts of calcium carbonate and ⅛ oz. cream of tartar, with the above, forms a proper mixing paste for the above combination, which with the fiber applicator, provides an exceptionally handy means to perform the work.

Chemical deterioration of these solutions is slow, and properly protected against light, in the dry form, in the applicator, as described in this specification, combined with protective and cleaning agents, the resulting commercial article has a wide spread utility. The maintaining of lamp reflectors in constant service, such as in lighthouses, airport beacons, automobile headlamps, the quick spot cleaning and surface repair of jewelry, cutlery, and metal fittings of every nature, under normal and special service conditions where corrosion destroys not only beauty, but also utility; is the main object of my invention in providing my combinations of portable and non-technical means whereby these services are supplied.

I claim:

1. A contact plating applicator comprising, a light-sensitive metallic salt capable of contact deposition, a cleaning agent, a light hiding or absorptive means and a paper in which said salt, said agent and said means are impregnated.

2. A metal polishing and plating article comprising a cellulose fiber base, a light-sensitive metal salt capable of contact deposition, a cleaning agent capable of removing atmospheric oxides, a light protective means combined with said agent, said fiber being impregnated with said salt, said agent and said means in finely divided dry form.

3. A metal polishing and plating article comprising a cellulose fiber, a metallic salt capable of contact deposition, and a cleaning and protective compound composed of a carbonate and colloidal carbon in dry form.

4. In the chemical plating art, in combination, an article compounded of a non-siliceous fiber, a metallic salt capable of contact deposition, a carbonate, a soluble sugar, and carbon in finely divided form, the compound forming a means of cleaning and chemically plating of a conductive surface.

5. In the electro-deposition art, in combination, a conductive light-sensitive metallic salt solution and suspended colloidal carbon in said solution acting also as a deoxidizing agent.

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