Patented Jan. 17, 1933 1,894,669

UNITED STATES PATENT OFFICE

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METHOD OF ELECTROPLATING AND COMPOSITIONS FOR USE THEREIN

No Drawing. Application filed March 23, 1928. Serial No. 264,270.

This invention relates to methods of electroplating and of electro-cleaning and to compositions for use therein.

In my Patent No. 1,545,942, granted July 14, 1925, I have described and claimed a brush for use in electroplating. In my work making use of a brush in the electroplating and electro-cleaning of metals, I have discovered that improved results can be obtained in using the electrolyte in the form of a viscous composition, which is preferably composed of a colloidal or emulsoid solution carrying the plating compound, to be electrolyzed. Under the term "plating compound" I include any compound or mixture usable for deposition, with such addition agents, catalysts, or the like as may be usual or desired.

My composition is preferably prepared for commerce in a stiff condition, and is preferably made up so as to be non-caking and easily soluble in water.

In making up my composition, the plating compound is mixed with a viscous water-soluble or miscible constituent, or constituents, of which there are a large variety suitable for the purpose. The plating compound is preferably added to the viscous carrier in concentrated form, and, in the form prepared for commerce, the viscous constituent is sufficiently thick to give a composition of approximately the consistency of ordinary plastic shoe-blacking. The viscous constituent may be varied to suit the nature of the plating compound added thereto. For electrolytic cleaning, my composition is made up in a manner similar to that for plating, except for the substitution of a compound suitable for cleaning.

My composition is accordingly compact in volume, easy to pack, does not leak, and in using the same, there is a freedom from spattering or spilling, which results in less loss and inconvenience from dripping and less mess as compared with the use of the ordinary fluid solutions.

Furthermore, the viscous ingredients combined with the rubbing action improve the smoothness and brilliance of the plating.

My present invention, as the result of said discoveries, provides an improved process of electroplating whereby greater uniformity of plating conditions, and consequently more uniform and perfect deposits, may be obtained by the use of an applying implement and my present plating compositions than by using ordinary plating baths or solutions. The invention further provides a process whereby electroplating may be carried out more readily, and with greater neatness and facility than heretofore carried out with plating baths or solutions.

The invention further provides an improved process of electro-cleaning whereby the cleaning of surfaces may be effected more rapidly, thoroughly and neatly than heretofore.

The invention further provides a novel composition for electroplating and electro-cleaning.

According to my present invention, I mix or suspend the plating compound with a suitable viscous constituent or constituents, and take some of it up in or on the applying implement carrying a suitable electrode. I prefer to use as the applying implement, a brush, dauber or the like, containing a suitable electrode, and work the composition into the brush up to and around the anode contained therein, prior to applying the brush, dauber or the like to the object to be plated.

The surface to be plated is first carefully prepared, as by cleaning and such other preparatory processes as may be necessary or desired, and then the plating is effected by wiping or rubbing the surface to be plated with the applying implement carrying the composition. The electrode of the applying implement is connected in circuit before use

and the object to be plated is also either connected in the circuit, or to a ground circuit if not already grounded, usually as cathode.

Potential differences and current densities greater than in ordinary bath plating may be and preferably are used, good uniform adhesive plate being obtained. The action of the plating implement, coupled with the association of the plating compound with the viscous carrier, prevents treeing and makes possible deposits of unusually good appearance and properties. The time for plating is also reduced.

I may and preferably do use current densities at which considerable hydrogen is liberated at the cathode, and I find that by my process adherent deposits, even of nickel, can be obtained which are adherent, non-peeling and bright. The quality of the plating deposits is excellent, as plated sheets may be bent sharply enough to stretch the metal beneath the plate without detaching the plated deposit, and on a highly polished surface the deposit is so bright as to require no subsequent polishing.

I also find that with my plating composition the lading of the air with objectionable vapors such as are given off by liquid plating baths is imperceptible, as the bubbles formed by the gases resulting from the dissociation of the electrolyte are held by the solution while under action on the surface being plated, forming a soapy residue on the surface being plated or cleaned.

It is convenient to use an already prepared composition in carrying on electro-plating according to the present invention, though the ingredients may be mixed in or on the applying implement, or otherwise, at the time of use. It is also convenient to manufacture and distribute my new composition in the form of a firm or stiff composition, about of the consistency of ordinary plastic shoe blacking. This does not leak and is readily packed and shipped in slip cover containers. This also provides for the retention of a homogeneous distribution of the ingredients in the mixture, after mixing and standing, and is also a convenient form for use with an applying implement. Moreover, the result is assured that there is always a uniformity of the electrolyte, as the applying implement receives a full supply of a uniform electrolyte each time that it is replenished from the container, and there does not result a depletion, as occurs in a bath where the ingredients consumed in plating result in a depletion of the metallic content of the bath. In the use of my composition in its preferred form, the brush or the like is first dipped in water and afterward rubbed over the surface of the composition of stiff consistency, the water dissolving or diluting the composition and the bristles working the composition to a creamy or paint-like consistency, which can be used without dripping, and enables the electroplating to be carried out overhead, and otherwise, with substantially the same facility and neatness as the application of a coat of paint to a surface with a paint brush.

In the case of prepared compositions, it is desirable to prevent it hardening on standing. In many cases it will be desirable to add a non-drying or moderately hygroscopic substance, to prevent hardening, and for this purpose I may use any suitable substance. I prefer to use a sugar or sugar solution or honey, and more particularly cane-sugar or other syrup.

I may also make use of jellies, such as obtained from fruits, and containing sugars, and obtain at once a sugar-containing colloid as the viscous constituent.

The viscous constituent is preferably a colloid or emulsoid having adhesive properties. Gelatines of animal or vegetable origin, such as obtained from animal tissues, hides, etc. and from sea-weed such as Irish moss, are examples.

In forming my composition, using gelatine as the colloid, I dissolve the gelatine in about double its weight of water and add an amount of the hygroscopic substance which will prevent hardening on shelf-standing. The amount of hygroscopic substance is variable, depending on the substance and the amount of water already contained therein. In the case of cane syrup added to gelatine solution, I preferably use an amount equal to or somewhat more than is equal to the weight of the gelatine solution.

To this mixture I then add the desired plating compound (conveniently one of the prepared mixtures sold by chemical and electroplating supply houses, and containing such addition agents, catalysts or the like as may be usual or desired in such mixtures) until the composition stiffens up to the desired consistency, the preferred consistency, as stated above, being firm or stiff, about that of ordinary plastic shoe blacking.

A particular example of composition is as follows:

Gelatine	2 ounces (weight)
Cane syrup	9 ounces (weight)
Water	4 ounces (weight)
Prepared nickel salts	Enough to give a stiff consistency.

A mode of procedure in carrying out electroplating with said composition, is to dip a brush, dauber or other applying implement (such for example as that shown in my Patent No. 1,545,942) into water and then into the stiff composition. The applying implement is worked around over the surface of the composition, taking up enough of the composition to form a some-

what thin viscous solution therein or thereon.

The brush (connected with the current) is then daubed, rubbed or wiped over a prepared metallic surface. The painting action is systematically followed and repeated over a given surface under plating conditions. Any suitable potential difference and current density may be employed. For example, the potential difference between the electrodes may be 18 volts, and with 1 square inch surface contact between the brush and cathode surface a current density of approximately 3 amperes per square inch is obtained, using the above composition.

In carrying out electrolytic cleaning, I preferably use an acid or a salt solution (as for example acetic acid or an ammonium salt) with the applying implement, for example a brush, and preferably use this acid or salt in admixture with a viscous constituent, preferably a colloidal solution, such for example as a gelatine solution, and preferably also with an ingredient to prevent hardening on standing, the composition being preferably made up as heretofore described, substituting the acetic acid or other appropriate compound for the plating compound. The composition is preferably taken up at a creamy consistency, either by having the composition at such consistency or reducing it to such consistency with water.

The applying implement is connected in circuit and wiped or rubbed over the surface to be cleaned, the current releasing hydrogen on the metal surface, and the combined action of hydrogen bubbles and mechanical action of the applying implement, effect cleaning much more rapidly and thoroughly than is carried out in a bath. Either direct or alternating current may be used in the cleaning process or method.

Moreover, I may also add a compound having a chemical cleaning action, as for example, an ammonium salt, and thereby obtain a combined mechanical, electro-chemical and chemical cleaning action.

By using a composition comprising a viscous constituent as the carrier of the acid (or other compound) cleaning may be readily carried out neatly on articles in situ. dropping or corrosive liquid being avoided by exercising reasonable care. Dispersion of corrosive vapors to the atmosphere is also much diminished.

Various other forms of the composition than the specific composition set forth herein may be used, without departing from the idea of invention, and the process may also be practiced in other forms than that herein specifically set forth.

What is claimed is:—

1. A method of electroplating with a brush having free bristles between or among which the electrolytic solution is carried, and an electrode among the bristles, comprising impregnating the spaces between the bristles with a solution containing a dissolved compound of the metal to be deposited and a substance for increasing the viscosity of the solution to counteract the flow of the solution away from the bristles and the electrode therein under pressure applied to the brush in its application, and passing current from the electrode in said brush to a conducting surface to which the solution-laden brush is applied.

2. A method of electroplating with a brush having free bristles between or among which the electrolytic solution is carried, and an electrode among the bristles, comprising impregnating the spaces between the bristles with a solution containng a dissolved compound of the metal to be deposited and a colloidal substance for increasing the viscosity of the solution to counteract the flow of the solution away from the bristles and the electrode therein under pressure applied to the brush in its application, and passing current from the electrode in said brush to a conducting surface to which the solution-laden brush is applied.

3. A composition for use with a brush in electro-deposition under the action of an electro-motive-force imposed from a source outside of a water solution of a metal compound constituent of the composition, and the constituents of which composition are electro-chemically inactive among themselves in water solution, containing a water soluble compound of a metal to be deposited, and a colloid.

4. A composition for use with a brush in electro-deposition under the action of an electro-motive-force imposed from a source outside of a water solution of a metal compound constituent of the composition, and the constituents of which composition are electro-chemically inactive among themselves in water solution, containing a water soluble compound of a metal to be deposited, and a colloid, and sufficient water to form with said constituents a stiff paste, the constituents being thoroughly intermixed, whereby a uniform distribution of the constituents is obtained in the composition and maintained during handling of the composition during long standing of the composition prior to use, said paste requiring dilution with water for use.

5. A composition for use with a brush in electro-deposition under the action of an electro-motive-force imposed from a source outside of a water solution of a metal compound constituent of the composition, and the constituents of which composition are electro-chemically inactive among themselves in water solution, comprising a water soluble compound of a metal to be deposited, a colloid, and a hygroscopic substance, and

sufficient water to form with said constituents a stiff paste, the constituents being thoroughly intermixed, whereby a uniform distribution of the constituents is obtained in the composition and maintained during handling of the composition during long standing of the composition prior to use, said paste requiring dilution with water for use.

In witness whereof, I have hereunto signed my name.

FREDERICK CONLIN.