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SIMULATED HAMMERED METAL FINISH

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The present invention relates to a simulated hammered metal finish and the method used in producing such finishes.

It has been proposed to finish a material in simulation to hammered metal by employing a paint or lacquer containing a finely divided metal powder, a soluble base such as a resin, either natural or synthetic, and one or more volatile solvents for the base. Such finishes are described in general in patent to Ariotti No. 2,151,312 and in the patent to Hoffman et al. No. 2,113,449. It was found that the metal powder, particularly in the case of an aluminum powder, became concentrated at the surface of the coating and that if the coating were applied by spattering, the metal particles gathered around the edges of the spattered drops and the coating dried with the metal in this position. The composition was usually pigmented to give a contrasting dark background to the metal particles. The result of such a coating was the production of a series of irregular rings of metal in the center of which the dark color of the pigment was visible. The effect is highly ornamental and is strikingly similar to the finish produced by laboriously hammering a soft metal with a round-headed hammer or with a machine producing an equivalent modification of the surface.

The coating in the process just described had to be applied in the form of relatively large drops by a spattering step. The necessity for spattering the coating rendered it difficult to obtain a uniform protective coating on the material as will be understood. The obtaining of the effect required the production of more or less discrete drops of the coating composition and this made the resulting coating discontinuous. In order to overcome this, a light undercoating was first used at times.

An object of the present invention is to produce a hammered metal finish in which the coating composition is applied smoothly and uniformly and the hammered metal effect is produced upon the surface of the coating.

Another object of the invention is to produce a hammered metal finish in which the coating is continuous and protects the material after the fashion of an ordinary painted or lacquered finish.

According to the present invention, a coating composition comprising any suitable soluble base, such as a cellulose derivative or a natural or synthetic resin, a finely divided metal powder such as aluminum bronze, and if desired, suit-

able dark colored pigments together with solvents and thinners, is applied to the material to be coated in a uniform manner such as by a mist spray. This coating is continuous and smooth and adequately covers the underlying material. At this stage in the process no hammered metal effect is visible. The coating is allowed to dry partially, for example, until it becomes tacky, and then a solvent for the base is spattered onto the tacky surface. The solvent acts to dissolve the base where it strikes the surface and the metal powder flows to the surface of the solution and gathers around the edges of the drops. After the solvent evaporates, the surface of the coating appears like hammered metal.

If desired, a light mist undercoating can be applied to the material and allowed to dry completely before the principal coating is applied. This primer coating can be either of the same composition as the principal coating or of different composition. The purpose of such a primer coating is to prevent the solvent which is later spattered upon the principal coating from penetrating down to the material thereby weakening the covering effect of the coating. Where the primer coating is allowed to dry completely before the principal coating is applied, it acts to prevent this undesirable effect of the solvent. It will be understood that this light coating is not necessary in all cases and that where it is omitted the thickness of the principal coating and the amount and character of the solvent which is spattered upon it can be controlled so as to prevent the weakening of the covering as described.

The hammered metal finish can be applied to many types of materials. Preferably the material to be ornamented has a smooth, relatively hard surface, such as metal, metal foil, regenerated cellulose sheets, wood, wood already lacquered or otherwise coated with a smooth, hard surface of enamel, varnish, or the like, glass, ceramic ware, etc. The finish can also be applied to fibrous materials such as cloth, woven fabrics, paper and the like after they have been provided with a smooth, hard surface of lacquer or the like which is not softened or dissolved excessively by the ingredients of the compositions used in producing the finish.

The coating composition can be made up in a great variety of ways. The base can be any of the well known soluble lacquer or varnish bases, either natural or synthetic. The various cellulose derivatives such as nitrocellulose, cellulose acetate, ethyl cellulose and the like are suitable

bases. Either a natural or a synthetic resin itself can be used or it can be modified with a drying oil to form a varnish base. As examples of suitable resins which can be used are phenol formaldehyde, urea-formaldehyde, butyl methacrylate, or polybasic acid-polyhydric alcohol resins, either modified or unmodified by numerous materials known in the art. Such modifiers include drying oils, drying oil fatty acids, non-drying oils, non-drying oil fatty acids, rosin, natural resins such as copals or a resin such as shellac. Any of the modified alkyd resins can have further additional phenol modification or treatment. Another synthetic resin that can be used as a base is a cumarone-indene resin reacted or cooked with a drying oil such as linseed oil. Similarly, other resins such as the phenol aldehyde resins, copals and other natural resins can be cooked with an oil to produce a suitable base. The base can be either of the air-drying type or of the type which must be baked to set.

Preferably the base material is pigmented in order to simulate more closely a genuine hammered metal finish. Dark pigments usually are selected so as to give contrast with the metal powder used. Thus, in the preferred practice, a black pigment is used in conjunction with aluminum bronze as the metallic powder whereby a black hammered metal finish is obtained. Similarly, in producing a hammered copper finish, a brown or pink pigment is used in conjunction with copper powder. In place of using a pigment to obtain the desired colored finish, various soluble dyestuffs can be incorporated into the coating composition. These and other modifications will be obvious to those skilled in this art. The pigment or dye can be added to the composition at any stage in its preparation but preferably it is incorporated into the base material by grinding to form a synthetic enamel.

As the metal powder, aluminum powder in the form known to the art as aluminum bronze is preferred. This is not a granular material but consists of flakes produced by a hammering process rather than by grinding. However, one can use copper, brass, bronze, gold, or any other decorative flake metallic powder although aluminum powder produces the best results because it tends to float readily on account of its low specific gravity and because its color produces a closer simulation of a hammered metal effect than do the other powders enumerated. The finer the powder is, the better are the results. In any event, the powder must be of such a fineness that it will have a tendency to float to the surface of the composition particularly when it is diluted by spattering a solvent thereon. Stearic acid is commonly used as a lubricant in the production of metallic powder in the form of flakes and is commonly present in small quantities in the commercial product. This material has been found desirable in the composition according to the invention and in some cases it is beneficial to add small amounts of stearic acid to the composition in order to increase the floating tendency of the metal powder and thus to improve the resulting finish.

The coating composition also contains one or more thinners and solvents. As will be understood by those skilled in this art, the choice of thinner and solvent is very wide and will be dictated in a particular case by the nature of the base selected. Solvents for the lacquer and varnish bases are well known in this art and it is not deemed necessary to describe them further

here. The following specific examples will indicate a few of the solvents and thinners available.

Example 1

A base material containing an alkyd resin can be formulated as follows:

	Pounds
Alkyd resin.....	61
Toluol.....	14
Pigment.....	20
Aluminum bronze powder.....	5
	100

Example 2

A further base composition can be made up containing a urea-formaldehyde resin as follows:

	Pounds
Urea-formaldehyde resin.....	60
Butyl alcohol.....	3
Toluol.....	12
Pigment.....	20
Aluminum bronze powder.....	5
	100

Example 3

An oil varnish base can be made according to the following composition:

	Pounds
Long oil varnish.....	18
Short oil varnish.....	37
Mineral spirits.....	6
Toluol.....	14
Pigment.....	20
Aluminum bronze powder.....	5
	100

Example 4

Another synthetic resin base, containing in this instance a methacrylate resin, can have the following composition:

	Pounds
Methyl ethyl ketone.....	20
Toluol.....	20
Butyl alcohol.....	5
Butyl methacrylate.....	30
Pigment.....	20
Aluminum bronze powder.....	5
	100

Example 5

A base containing nitrocellulose can be made up as follows:

	Pounds
Methyl ethyl ketone.....	25
Butyl acetate.....	14
Toluol.....	16
Nitro cotton (6 second).....	20
Pigment.....	20
Aluminum bronze powder.....	5
	100

Example 6

A base composition containing ethyl cellulose of medium viscosity and 47% ethoxy content can be formulated as follows:

	Pounds
Toluol.....	30
Denatured alcohol.....	20
Butyl alcohol.....	5
Ethyl cellulose.....	20
Pigment.....	20
Aluminum bronze powder.....	5
	100

The above six examples show variations in the base composition which can be used according to the invention. These examples are however not limiting of the invention but merely serve to indicate to those skilled in this art the wide variety of materials from which the coatings can be made.

The base compositions of Examples 1 to 6 can be treated according to this invention by spattering with solvent alone if desired. In many cases, however, better results are obtained where the spatter coat itself contains small amounts of film-forming materials similar in nature to those found in the base coatings. In all cases, however, the viscosity of the spatter coating should be very low—preferably not more than about 40 centipoises. The following examples indicate various types of spatter coatings made up with small amounts of film-forming ingredients.

Example 7

	Pounds
Toluol	90
Alkyd resin solution (50% solids by weight) ..	10
	100

Example 8

	Pounds
Toluol	87
Butyl alcohol	3
Urea-formaldehyde resin solution (50% solids by weight)	10
	100

Example 9

	Pounds
Toluol	90
Short oil varnish (45% solids by weight)	10
	100

Example 10

	Pounds
Methyl ethyl ketone	95
Iso-propyl methacrylate solution (60% solids by weight)	5
	100

Example 11

	Pounds
Ethyl acetate	90
Nitro cotton solution (6 second nitrocellulose 1 pound per gallon)	10
	100

Example 12

	Pounds
Toluol	90
Ethyl cellulose solution (medium viscosity ethyl cellulose of 46-47% ethoxy content, 1 1/2 pounds per gallon)	10
	100

The spatter coatings can be pigmented or dyed to produce any color desired or bronze powder can be added. In the following example a spatter coating composition is shown which contains aluminum bronze.

Example 13

	Pounds
Ethyl acetate	95
Aluminum bronze powder	5
	100

In carrying out the method of the present invention, a suitable coating composition such as one of those of Examples 1 to 6 is applied to the selected material in a manner designed to give

a smooth uniform coating. Preferably, the composition is applied by spraying as a fine mist spray. A relatively heavy coating is applied in case no preliminary coating is used. This coating is then allowed to dry partially for a suitable period of time, depending on the nature of the composition, until the surface assumes a tacky condition which can be determined by the feel of the surface. While the surface is tacky, and before it dries completely, a spatter composition, of the type described for instance in Examples 7 to 13, is projected upon the surface. Preferably, this spatter composition is applied by spraying in a spray gun provided with a spattering cap although other means can be employed to obtain the coarse distribution necessary. After applying the spatter composition, the coating is allowed to dry. If a coating base is used which requires setting by baking, then the baking is done after the spatter composition has dried.

In many cases it will be found desirable for finer and more uniform work to apply a preliminary coating either of the same composition as the principal or base coating or of other suitable materials and to allow this preliminary coating to dry completely. This preliminary coating can be quite thin but should be applied uniformly as by a mist spraying operation so as to obtain complete coverage. The preliminary coating is then allowed to dry completely, the time necessary being dependent of course upon the nature of the composition. After drying, the preliminarily coated material is then subjected to the steps described above for applying the principal coating and the spatter composition. In such a case, however, it is possible to use a smaller quantity of the principal coating composition and yet obtain a finish which will protect the material.

It will be seen therefore that according to the present invention as distinguished from the prior art, a base composition of normal solids content is applied after the fashion of an ordinary lacquer, that is, it is uniformly applied as a smooth coating, as for example by a mist spraying operation. This base coating contains the metal particles which are later to be displaced to form the hammered metal finish but in the manner of application the base coating is merely a uniform lacquer covering. Before the base coating has completely dried, however, another composition which is essentially composed of a solvent for the binder in the base coating is spattered upon its surface. This spatter coating redissolves some of the binder at the surface of the base coating and allows the metal particles to flow outward around the rims of the drops to produce the typical crater-like formation which is identified with the hammered metal finish. The spatter composition would not of itself produce the hammered metal finish. Even in the cases in which the spatter coating contains a small amount of a binder or a small amount of the metal powder it is so dilute that if spattered by itself upon an untreated material no hammered metal finish would result, and, as a matter of fact, the solids content of the spatter composition is so low that no satisfactory coating of any type would result. By incorporating into the spatter composition small quantities of binder, an additional amount of solids is applied, however, which reinforces the film at the points where it is weakened by the impingement of the drops of spattered solvent.

The final hammered metal finish produced ac-

ording to the invention embodies the ornamental effect desired but produces a more uniform coverage of the material and results in a finish of better wearing qualities and of a more highly protective nature.

The invention is susceptible of numerous variations which will be apparent to those skilled in this art. The examples set out above are not intended as limiting the invention which is to be taken as limited only by the scope of the following claims.

We claim:

1. The process for producing a simulated hammered metal finish upon a surface, which comprises applying to the surface a uniform unspattered coating of a composition containing a finely divided metal powder and a soluble base selected from the group consisting of varnish bases and lacquer bases, said composition having a normal solids content for a coating composition and being capable of drying to form a protective and ornamental coating, allowing said coating to dry only partially, and then spattering

the partially dried coating with a liquid of not over 40 centipoises viscosity consisting essentially of volatile solvent for the said soluble base to cause drops of said liquid to impinge upon the partially dried coating at separated points to redissolve the said soluble base only at such points and permit the metal powder at the point of impingement to flow and assume the crater-like appearance of hammered metal, and thereafter drying the coating completely.

2. A process as in claim 1 wherein the said finely divided metal powder is aluminum bronze powder.

3. A process as in claim 1 wherein the said composition contains a coloring agent having a color providing contrast with the color of the said finely divided metal powder.

4. A process as in claim 1 wherein the said spatter liquid contains a small proportion of solids but the viscosity of the said composition does not exceed 40 centipoises.

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