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FINISHING SYSTEM

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7 Claims. (Cl. 117—57)

This invention relates to finishing systems for decorative and protective coatings and more particularly to such systems for finishing wood surfaces with baking or force dried coating compositions.

In the process of finishing wooden articles such as toys, tool handles, etc., with baking or force dried finishing compositions, difficulties are encountered in producing smooth, high gloss finishes. The coating material during the drying at elevated temperature or baking usually results in a blistered film which is consequently rough and possesses poor appearance. It is occasionally possible, in cases in which woods of very dense structure are finished to obtain a relatively blister-free and fairly smooth film as a decorative and protective coating. The present general practice in finishing wooden articles with baking coating compositions is to kiln dry the article and later applying the finishing composition at room temperature. This treatment, however, does not overcome the difficulty of producing a satisfactory smooth finish of the desired appearance. The use of force dried or baking enamel compositions is desirable in the wood finishing industry for economic reasons and further because such compositions produce coatings of improved appearance and increased service life.

With the present and prospective shortage and difficulty of obtaining metal for the manufacture of various commercial articles, it becomes increasingly necessary to use wood in place thereof. There follows then the desirability of obtaining means for producing decorative and protective coatings on the wooden surfaces which will be equal to or compare favorably with finishes produced by similar compositions used on metal surfaces.

The principal object of this invention is therefore the provision of means for obtaining on wooden surfaces smooth decorative and protective finishes by the use of force dried or baking enamel coating compositions.

Another object is the provision of such means for producing satisfactorily smooth decorative and protective coatings on fibrous base material, such as those prepared from pressed wood fibres, wallboard, etc.

Still another object is the provision of a finishing system for wood and similar fibrous material which is simple, practical and economical.

Other objects will be apparent as the description of the invention proceeds.

These objects are accomplished by the use of a finishing system which includes (*a*) heating the article to be finished at a temperature equal to or above that at which the subsequent coating composition is to be baked, (*b*) applying the coating composition while the article is at substantially the same temperature at which it is heated, i. e., before it has appreciably cooled, and (*c*) baking the article to which the coating composition has been applied. Subsequent coatings may be thereafter applied without the preheating step.

The invention will be more fully understood by the following examples which are given by way of illustration and not limitation except insofar as defined in the appended claims. The parts are by weight.

Example I

A panel of birch wood which had been previously filled by conventional means well known in the wood finishing art was heated in a hot air oven, the temperature of which was maintained at approximately 280° F. for about 45 minutes. The panel was removed from the oven and the filled surface immediately sprayed with a synthetic resin pigmented primer composition, the temperature of the panel remaining at approximately 270° F. The primer composition was composed of the following ingredients and prepared by means well known in the art of preparing such compositions.

Primer composition

	Parts
Barium base titanium dioxide pigment	45.0
Urea - formaldehyde - monohydric alcohol resin	4.0
45% soya bean oil modified glyceryl phthalate	19.0
Butyl alcohol	2.0
Hydrocarbon solvent	30.0
	100.0

The primed birch panel was then baked for approximately one hour at 270° F. after which it was removed from the baking oven, allowed to cool and subjected to a light sanding treatment on the primed surface. To the primed and sanded surface was then applied by means of spraying a pigmented enamel and the composition baked for one hour at approximately 260° F. The composition of the pigmented enamel was as follows:

Pigmented enamel

	Parts
Titanium dioxide pigment	30.0
Melamine-formaldehyde-butanol resin	7.0
Urea-formaldehyde butanol resin	11.0
43% Dehydrated castor oil modified glyceryl phthalate	14.0
Butyl alcohol	18.0
Aromatic hydrocarbon solvent	20.0

The finished panel possessed a smooth, blister-free, high luster and hard surfaced finish which

would be considered highly acceptable in the wood finishing industry. A similar birch wood panel treated in the same manner and with the same compositions, but allowed to cool to a temperature well below that at which the primer or other composition was applied as above, possessed a roughened surface due to the blister formation during the baking operation. Such a finish would not be acceptable in the wood finishing industry particularly where finishes similar to those obtained on metal surfaces are desired.

The preliminary filling operation may be omitted if desired and its use will be determined largely by the type and character of the wood being finished. Under certain conditions the primer enamel coating may be dispensed with and the finishing enamel applied directly to the pre-heated wood while still at a temperature approximately equal to or above that at which the enamel is to be baked. Primer coatings are, however, preferred where particularly good adhesion of the finish to the wood is desired or necessary and where optimum appearance and filling are desired. Such modifications will be readily apparent to those skilled in the art of applying finishing compositions and are well within the purview of the present invention. Further the primer composition and the final enamel may be applied in a heated condition if desired. After the application of the primer or other composition to the preheated hot wood and the composition is baked, subsequent applications of finishing compositions may be made without repeating the preheating operation. The finish may be applied in a single coat or in a plurality of coatings.

EXAMPLE II

A panel of poplar wood was heated for approximately 30 minutes in a hot air oven at a temperature of about 225° F. The heated panel after being removed from the oven was immediately sprayed with a pigmented primer composition as follows:

Primer composition

	Parts
Barium base titanium dioxide pigment	45.0
Urea-formaldehyde-butanol resin	7.0
35/14% linseed oil/China-wood oil modified glyceryl phthalate	14.0
Raw castor oil	2.0
Butyl alcohol	7.0
Hydrocarbon solvent	25.0
	100.0

The sprayed panel was baked at approximately 225° F. for about 45 minutes, after which it was removed from the baking oven, allowed to cool to approximately room temperature and then subjected to a sanding treatment.

The cooled, primed and sanded surface was then coated by spraying with a pigmented enamel composition of the following formula:

Enamel composition

	Parts
Titanium dioxide pigment	29.0
Urea-formaldehyde-butanol resin	14.0
43% dehydrated castor oil modified glyceryl phthalate	20.0
Butyl alcohol	11.0
Hydrocarbon solvent	26.0

The coated panel was then baked at about 225° F. for about one hour. The resulting finish was continuous, smooth and free from blisters, and possessed a high luster. It was hard and tough and excellently adhered to the wood surface.

A similar poplar panel finished according to the same procedure and with the same compositions with the exception that after the preheating step the panel was allowed to cool to approximately room temperature before the primer composition was applied, yielded, in contrast, a very unsatisfactory product. The finish on this panel was blistered and rough and possessed in general an unacceptable appearance.

The examples show the application of the finishing system of the present invention to birch wood as representative of a hard, dense type wood and to poplar wood representing the softer, less dense type wood. These two types of wood are the most commonly used in industries where finishing with a decorative and protective composition is desirable or necessary. Other commonly used woods are maple, clear white pine, gumwood, etc. The present invention is applicable alike to the hard, dense types as well as to the softer and more porous types of wood. The time and temperature of heating before the application of the coating composition which is later to be baked will be governed by the particular type of wood to be coated and the temperature at which the coating composition is to be baked. The selection of the proper conditions will be readily apparent to those skilled in the art. Temperatures ranging between 160° F. and 325° F. have been found to be satisfactory for the most types of wood and decorative and protective coating compositions commonly used. The use of temperatures appreciably above 325° F. is not practical and most baking type decorative and protective coating compositions are formulated to be baked at not lower than 150° F. It is important that the entire mass of the wooden article to be coated reaches the temperature to which it is subjected in the pre-heating treatment and that it is not permitted to cool appreciably below the temperature at which the subsequently applied coating composition is to be baked before the coating composition is applied. The time of preheating will also be governed to some extent by the size, thickness, previous treatment, etc., of the wooden article. For example, it has been found that a panel ⅛ inch in thickness requires approximately 30 minutes preheating time whereas a similar panel 1 inch in thickness requires approximately 55 minutes preheating time for satisfactory results.

As previously noted the wooden article may or may not be treated with fillers as desired or found to be necessary.

Various types of baking decorative and protective coating compositions, usually referred to as enamels, may be used in the practice of the present invention. In addition to those noted in the examples may be mentioned baking enamels of drying and semi-drying oil modified alkyd resins; urea-formaldehyde-monohydric alcohol resins; phenol and substituted phenol-formaldehyde resins; amino triazine and substituted amino triazine-formaldehyde resins; oleoresinous vehicles containing drying oils as China-wood, linseed, etc.; oils with natural or synthetic resins; and mixtures thereof are some which are suitable. Particularly useful are the so-designated high temperature bake compositions, the use of which heretofore as a wood finish has been materially restricted or not practically feasible be-

cause of the unsatisfactory results produced. While it is usually desirable to use the coating compositions pigmented, they may in certain applications be used unpigmented. In such instances it is usually desirable or necessary to use a filler on the wood before the preheating treatment and subsequent application of the finishing composition. Where a priming composition is used it has been found advantageous to use such compositions as have a high or relatively high pigment to vehicle ratio. For example, a pigment/vehicle ratio of 2:1 has been found to yield preferred results. Ratios higher than 2:1 yield satisfactory results with respect to smoothness of finish and general appearance and present surfaces materially improved for easy sanding but there may be a slight sacrifice in toughness of coating.

The finishing compositions may be applied by any of the well known conventional means as by spraying, dipping, brushing, roller coating, etc., the particular means chosen being governed by the article to be finished, available equipment, economic considerations, etc.

The present invention is useful in the finishing of various articles of wood in common use which require hard, tough and smooth finishes having decorative as well as protective properties. Among such articles may be mentioned kitchen cabinets and general utility cabinets, wood furniture, toys, bowling pins, bar and counter fixtures, office furniture, wood refrigerator cabinets, etc. Many other applications will be apparent to those skilled in the art of decorative and protective coating compositions. The invention is particularly useful where so-called high bake enamels are desired or necessary to be used.

The principal advantage of the present invention is the provision of means for producing on wooden surfaces hard, tough and smooth decorative and protective finishes. A further advantage is that force dried or baking enamels, particularly high bake enamels may be used for finishing wood surfaces resulting in smooth finishes free from blisters and other surface imperfections commonly met with in the usual wood finishing systems. Another advantage is the provision of a finishing system for fibrous woody materials as compressed wood fibre panels, wall board, etc. A still further advantage is the provision of a finishing system for wood in which baking compositions may be used to produce uniformly satisfactory results and which is simple, practical, and economical. The advantages offered by the present invention are of particular significance and importance under present conditions of the scarcity of metal usually used in the fabrication of many commercial articles. This scarcity has necessitated extensive replacement of metal by wood which has presented new and difficult finishing problems since the usual metal finishing systems are not ordinarily applicable to the finishing of wood.

It is apparent that many widely different embodiments of this invention may be made without departing from the spirit and scope thereof, and therefore, it is not intended to be limited except as indicated in the appended claims.

I claim:

1. The process of coating wood surfaces which comprises heating the said surface to a temperature between about 150° F. and 325° F., applying thereto while hot an enamel composition containing a film-forming agent dispersed in a solvent, said film-forming agent being one which dries to a tough durable film without decomposition at temperatures between 150° F. and 325° F., and maintaining the said temperature while the coated surface is exposed until the enamel is substantially dry.

2. The process of claim 1 in which the coating composition contains urea-formaldehyde resin.

3. The process of claim 1 in which the coating composition contains an oil modified alkyd resin.

4. The process of claim 1 in which the coating composition contains a drying oil vehicle.

5. The process of claim 1 in which the coated surface is heated to about 225° F. for about one hour after the composition has been applied.

6. In the process of finishing wood surfaces which have been primed and are subsequently coated with a liquid baking type enamel, the improvement which comprises heating the said wood surface to about 150° F. to 325° F. before and while the enamel is applied, and thereafter maintaining a baking temperature while the coated surface is exposed until the enamel is substantially dry, said enamel containing a film-forming agent which dries to a tough durable film without decomposition at temperatures between 150° F. and 325° F.

7. The process of finishing wood surfaces which comprises heating the said surface to a temperature of approximately 280° F. until thoroughly heated, applying a primer composition thereto at about 280° F. which has approximately the following composition:

	Parts
Pigment	45.0
Urea-formaldehyde-monohydric alcohol resin	4.0
Soya bean oil modified glyceryl phthalate	19.0
Solvent	32.0

allowing the coated surface to cool, sanding the primed surface, heating the surface to about 260° F. and while at such temperature applying an enamel having substantially the following composition:

	Parts
Pigment	30.0
Melamine-formaldehyde-butanol resin	7.0
Urea-formaldehyde-butanol resin	11.0
Dehydrated castor oil modified glyceryl phthalate	14.0
Solvent	38.0

and maintaining the said temperature until free from solvents.

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CERTIFICATE OF CORRECTION.

Patent No. 2,363,658. November 28, 1944.

GERARD QUICK DECKER, 3RD.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 42, claim 7, for "about 280° F." read --about 270° F.--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 20th day of February, A. D. 1945.

Leslie Frazer

(Seal) Acting Commissioner of Patents.