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FINISHING PROCESS

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This invention relates to finishing and has for an object the provision of an improved method for finishing the surfaces of articles. More particularly, the invention contemplates the provision of an improved method for finishing the surfaces of articles with liquid coating compositions. The invention further contemplates the provision of an improved method for treating coated articles to produce lustrous and substantially imperfection-free surfaces.

It is customary to finish the surfaces of articles of manufacture such, for example, as the metal fenders and bodies of automobiles by applying thereto liquid coating compositions which form adherent films. In carrying out the heretofore customary finishing process, a surface to be finished may be provided with a prime coat or a surfacer coat or both prior to the application of the finishing coat. After the preparation of the surface as, for example, by the application of one or more prime coats and/or one or more surfacer coats, the finishing coat may be applied by spraying the surface with a suitable liquid coating composition such, for example, as a lacquer containing nitrocellulose. The coated article may then be subjected to a low-temperature air-drying or heat-drying operation to vaporize the solvents contained in the lacquer and produce a substantially solid and continuous, adherent film comprising the non-volatile components of the lacquer.

The resulting lacquer film usually has a rough surface occasioned by uneven flowing, uneven surface shrinkage, and by an accumulation of spray dust, dust from the air, and other foreign particles deposited from the atmosphere of the shop.

It is customary, therefore, to smooth the outer surface of the film by sanding in the presence of water or other liquid sanding medium, after which the job must be cleaned up and allowed to dry. This operation is then followed by the application of a spray mist coat of lacquer thinner to accomplish the substantial removal of sandpaper marks. Thereafter the coated surface is allowed to dry, and, after drying, it is polished through the medium of appropriate polishing compounds.

The heretofore customary mist coating and polishing are relatively slow and costly procedures requiring considerable time and extreme care in their execution. Furthermore, many articles of manufacture, in the finishing of which my process may be used to great advantage, are encumbered with extending appurtenances such as moldings, flanges, knobs, causing the detail of polishing in accordance with heretofore customary processes to be quite difficult.

The present invention is based on my discovery that beneficial results may be obtained by subjecting a film of finishing material to a controlled heat treatment. Thus, for example, I have discovered that by subjecting a film of finishing material to a controlled heat treatment, imperfections such, for example, as abrasive marks in its outer surface may be substantially obliterated, and a lustrous surface may be produced. As a result of my discovery, finishing processes may be simplified through the elimination of operations such as the mist coating and polishing operations of heretofore customary finishing processes, and surfaces of exceptional quality, smoothness and lustre may be obtained.

In carrying out a process in accordance with my invention, I apply to a suitably prepared surface a finishing film comprising one or more layers of a coating composition containing one or more substances capable of softening under the influence of heat without harmful physical alteration. For the purpose of eliminating imperfections in the outer surface of the film, the film is heated to a temperature at which the materials thereof are softened to the extent that sufficient flowing to substantially obliterate the imperfections is accomplished. Heating may be carried out in any suitable manner and in any suitable apparatus. I prefer to heat the films with access of air to provide for beneficial oxidation and/or conversion of the materials of the film which may result in products of increased hardness upon cooling.

A wide variety of liquid coating compositions may be employed in carrying out the method of my invention, but I prefer to employ a composition containing one or more synthetic resins of the proper type which may vary in physical properties from being substantially hard to the liquid type at normal temperatures, but which soften sufficiently to permit slight flowing at relatively high temperatures, and which through the continued application of heat are oxidized and/or converted to compounds of increased hardness at normal temperatures. Some of the most desirable compounds of the aforementioned types are synthetic resins of the modified phthalic anhydride glycerine type. Liquid coating compositions which are suitable for use in carrying out the process of the invention may also comprise, in addition to the aforementioned type of synthetic resin, nitrocellulose, gums, solvents, diluents, etc. which are commonly employed in forming the coating compositions at present known as lacquers.

I have successfully employed liquid coating compositions of the following types in carrying out the process of the invention.

Example I

Nitrocellulose	1.82%
Glycerine-phthalic anhydride-linseed oil fatty acid resin	23.27%
Lacquer thinner	74.00%
Carbon black pigment	.91%

Example II

Nitrocellulose	1.82%
Gum damar	1.86%
Glycerine-phthalic anhydride-linseed oil fatty acid resin	21.41%
Lacquer thinner	74.00%
Carbon black pigment	.91%

Example III

Glycerine-phthalic anhydride-linseed oil fatty acid resin	17.75%
Titanium dioxide pigment	6.25%
Toluol	38.00%
Xylol	38.00%

Example IV

Glycerine-phthalic anhydride castor oil resin	19.40%
Nitrocellulose	1.30%
Chrome green pigment	.83%
Titanium dioxide pigment	1.05%
Lamp black pigment	.14%
Chrome yellow pigment	.57%
Lacquer thinner	76.71%

The above mentioned pigments may be ground to a proper fineness by methods commonly in use in the preparation of pigmented lacquers and enamels.

In coating compositions of the type described in the foregoing examples, the nitrocellulose may be of any suitable viscosity. In general, nitrocellulose of from half second to fifteen second viscosity is entirely suitable.

In carrying out a complete process of my invention for finishing metal surfaces, I may apply to the surface to be coated or finished one or more layers or films of a suitable liquid coating composition in the usual manner to produce a finishing film of suitable thickness. After the finishing film has been formed, it may be subjected to a drying operation to increase its hardness sufficiently to permit the proper sanding operation. The drying operation should not be carried to the point which will prohibit, through oxidation and/or conversion, suitable flowing out of abrasive marks in the subsequent heat treatment as is herein described. The sanding operation may be conducted with a view to eliminating only the most apparent imperfections and without attempting to avoid the formation of abrasive marks. The roughly sanded surface may then be cleaned of the slush resulting from the sanding operation, after which said surface may then be exposed to the action of heat at a temperature sufficiently high to effect flowing of material of the film to substantially obliterate the abrasive marks. In general it is desirable to subject the sanded film to the action of heat at temperatures of from 160° Fahrenheit to 250° Fahrenheit for periods of from one-half to three hours.

I claim:

1. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of a liquid coating composition comprising a synthetic resin, subjecting the outer surface of the film to an abrasive treatment, and heating the resulting film to obliterate abrasive marks.

2. In a process involving the application of a film of coating composition comprising a synthetic resin to a surface, and treatment of the film with an abrasive, the improvement which comprises heating the film after the abrasive treatment to produce a smooth lustrous surface.

3. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising a synthetic resin of the phthalic anhydride glycerine type, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature at which the physical condition of the film is modified to the extent that abrasive marks are substantially eliminated.

4. The method of finishing a surface of an article of manufacture which comprises

applying to the surface a film of liquid coating composition comprising a synthetic resin, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature of about 160 F. to about 250° F. to modify the physical condition of the material thereof and effect the substantial elimination of abrasive marks.

5. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising a synthetic resin of the phthalic anhydride glycerine type, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature of about 160° F. to 250° F. to modify the physical condition of the material thereof and effect the substantial elimination of abrasive marks.

6. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising nitrocellulose and a synthetic resin, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature at which the physical condition of the film is modified to the extent that abrasive marks are substantially eliminated.

7. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising nitrocellulose and a synthetic resin of the phthalic anhydride glycerine type, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature at which the physical condition of the film is modified to the extent that abrasive marks are substantially eliminated.

8. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising nitrocellulose and a synthetic resin, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature of about 160° F. to about 250° F. to modify the physical condition of the material thereof and effect the substantial elimination of abrasive marks.

9. The method of finishing a surface of an article of manufacture which comprises applying to the surface a film of liquid coating composition comprising nitrocellulose and a synthetic resin of the phthalic anhydride glycerine type, treating the film to increase its hardness, subjecting the outer surface of the hardened film to the action of an abrasive to produce a relatively smooth surface, and heating the resulting film to a temperature of about 160° F. to 250° F. to modify the physical condition of the material thereof and effect the substantial elimination of abrasive marks.

10. The method of finishing a surface which comprises applying to the surface a film of a composition comprising one or more synthetic resins capable of softening under the influence of heat without harmful decomposition and which upon subsequent cooling form products of increased hardness, subjecting the outer surface of the film to the action of an abrasive to eliminate roughness, and heating the resulting film to a temperature at which the materials thereof are softened to the extent that sufficient flow to obliterate abrasive marks is accomplished.

In testimony whereof I affix my signature.

FRANK M. CRYSTLER.