METHOD OF COATING AND SMOOTHING WOOD SURFACE

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18 Claims. (Cl. 117—64)

The present application is a continuation-in-part of my co-pending U.S. application S.N. 150,709 filed Nov. 7, 1961, which was a continuation-in-part of my U.S. application S.N. 681,541 filed August 29, 1957, which, in turn, was a continuation-in-part of my parent U.S. application S.N. 611,874, filed September 25, 1956, all three now abandoned.

The present invention relates to the art of finishing wood panel and like products which present a smooth, regular, porous, firm, heat-insulating, flat-faced white-wood or equivalent surface. More particularly, the invention is directed to an improved method of rapidly processing said surface into a shiny substantially nib-free coated surface of stainable porosity which is stabilized against nib-raising and capable of receiving conventional finishing materials such as a top coat with or without an intervening base coat.

In the practical wood finishing art prevailing in and prior to 1954—1955, one conventional practice, for completing the preparation of a wood surface (such as a finish-sanded white-wood surface) for the reception of subsequent finish coats such as base coats and top coats, was to size-coat or wash-coat that surface for the purpose of stiffening and raising its nibs and then to cut off the upstanding nibs close to the surface by a sifting-sanding operation, which leaves the surface in a porous condition. The present invention is directed to the production of a porous more or less nib-free coated surface of improved characteristics by a novel method which involves the coating and rubbing of that surface.

An important object of the present invention is to provide a novel method of producing a rubber-coated white-wood surface which, in comparison with a sifting-sanded porous washed-coated or size-coated wood surface, is improved in one or more of the following respects: in smoothness; in shininess or gloss; in freedom from nibs; in attractiveness of appearance; in its ability to resist the penetration of liquids, including subsequent coating materials, and in the uniformity of its resistance; in its ability to produce equal or superior finishing results with less finishing materials; and in its stability against nib-raising.

More particularly, important objects of the present invention are: (1) to produce a smooth shiny substantially nib-free coated and rubbered wood surface of stainable porosity having a more uniform appearance than, and an increased gloss over, that which is possessed before the coating operation; (2) to produce a porous-coated surface which is stabilized against nib raising; and (3) to produce an otherwise superior surface finish suitable for various uses, including the application of conventional finishing materials and particularly suited for interior use.

Another important object is to accomplish all of the more important objects of this invention in a simple and inexpensive method capable of being rapidly performed in a production line.

The present invention resides in my discovery of an improved method for eliminating upstanding nibs from the flat face of a wood, hardboard, canvas, or other like cellulosic product, having a smooth regular porous firm white-wood or equivalent surface, as that product moves rapidly through a longitudinal path including a rubbing zone. In its preferred form, my improved method comprises: (A) coating said flat white-wood face of said product with a wood-finishing plastic material of the size-coat or wash-coat type, (1) which has a film-forming binder of a resinous nature, (2) which is capable of flowing under heat and pressure and thereafter assuming a hardened state, (3) which, when hardened, is in a solid state such that it is capable of flowing and penetrating said surface, and (4) which is capable of receiving overlying coatings of other wood-finishing materials including top coats and intervening base coats; and (B) as the coated product makes one pass through the rubbing zone, compressively buffing its flat coated face frictionally with a buffing medium (1) at a high buffing-speed and (2) at a heavy buffing-pressure, which is so elevated, above those usable for sifting-sanding, as to (a) render said buffing medium capable, during said one pass, of removing substantially all of any excessive coating material on the product, and (b) to cause said buffing medium to buff against the resistance of said flat white-wood face of said product, as distinguished from the resistance of said coating material on said product, (i) with a buffing force sufficient to pressure smooth the nib-coated surface into a shiny, porous and substantially nib-free state.

My improved method pressure smoothes said coated surface into a substantially nib-free state, having a more uniform appearance than (and a substantially increased gloss over) that of the same surface before the coating operation. The rubbered coating on that surface not only stabilizes it against nib-raising but renders it capable of accepting subsequent coating materials more uniformly than it could before the coating operation. The rubbing conditions also insure that the rubbered surface shall have a stainable porosity because, if that surface is not porous before the rubbing operation, it will become porous as a result of the rubbing operation, and if it is porous before the rubbing operation, it will remain porous after that operation. After one pass under most conditions of operation, the surface of the coating material is tack-free and hard.

An apparatus for practicing my invention is illustrated in the accompanying drawing wherein:

FIG. 1 is a somewhat schematic side elevation of a production line of presently preferred form for practicing my invention;

FIG. 2 is a somewhat schematic view of a device for practicing the coating step of my invention wherein a wood panel or the like is coated with a plastic material; and

FIG. 3 is a somewhat schematic view of the apparatus used for practicing that rubbing step of my invention wherein a coated panel or the like is rubbed to glossify its coating.

The production line shown in FIG. 1 includes suitable conveying means for carrying a wood panel or the like successively through the following equipment, viz: (a) a rubbing machine R1 of the type disclosed in the Alexander U.S. Patent No. 2,927,935, which machine uses the frictional heat and pressure of a high speed rubbing operation to pressure smooth, glossify and densify a thin surface layer of an uncoated or white-wood panel; (b) a coating machine C which operates to coat the rubbed white-wood surface with a suitable wood-finishing plastic material; (c) a pair of heaters H1 and H2 for heating the plastic coated surface primarily to drive off the solvent; if any and thereby prepare it for the next rubbing operation; (d) a rubbing machine R2, which may be the same as R1, for practicing the rubbing step of the present invention so as to achieve the objects of the present invention including the glossification of the surface of the
coated panel; and (e) another similar rubbing machine R3 for repeating the rubbing operation to improve the gloss.

The coating machine may be of conventional form. One such form as shown includes: a supply trough T for holding a supply bath of the plastic material; a plastic material applicator A in the form of a soft rubber roller coater having a diameter of about 6 to 10, said coater rotating on a fixed axis with its lower side immersed in the plastic material bath; a spring-loaded wiper W for wiping the plastic material deposited by the applicator A; and a spring-loaded drive assembly, including a drive roll D1 directly over the roller coater A and another drive roll D2 directly over the wiper W, for driving (through the coater) the wood product being coated thereby. The spring-loaded drive assembly is mounted on bracket B which can be vertically adjusted to produce a gap of desired size between the drive rolls D1 and D2 and their respective opposite, i.e. the roller coater A and the wiper W. The roller coater A and the drive rolls D1 and D2 are all driven at the same speed.

In initially preparing the coating machine for operation on a flat wood panel, for example, the drive assembly, which is heavily spring-loaded, is vertically adjusted to an elevation such as to provide a minimum gap over any smaller vertical width than the vertical thickness of the panel so that when the panel passes through the coater, it will raise the drive rolls D1 and D2 to a small extent but nevertheless large enough to insure a satisfactory pressure on both sides of the panel for panel driving and coating purposes. If the resulting wiper pressure is too heavy, the wiper W, which is more lightly spring-loaded, may be adjusted to insure a lighter pressure for wiping purposes. In other words, the yield of the wiper W to the pressure of the spring-loaded drive assembly may be adjusted. No claim of novelty is made as to the specific form of coating mechanism, the heaters, or the conveyors illustrated in the drawing.

After the panel (with its wiped coating) has passed through the heaters it is ready to be rubbed by the rubbing machine R3 which is shown in FIG. 3. The apparatus shown in FIG. 3 includes a pair of horizontally spaced and aligned conveyor sections or portions 1 and 2, each of which contains a plurality of freely rotatable rollers 3. The upper surfaces of the rollers 3 project slightly above the surface of the conveyor belt B to support a piece of plywood or a planar wood product such as a flat door or wall panel 4. Thus, the wall panel 4 is freely movable on the rollers 3. The adjacent spaced ends of conveyor portions 1, 2 are mounted on correspondingly spaced brackets 5, 6 which are secured by any suitable means, such as welding, to upstanding supporting members 7, 8 of inverted L-shape. The supporting members 7, 8 are also provided with upwardly turned lip portions 7a, 8a, respectively, which are spaced from each other to define an opening 9 between them.

The opening 9 is arranged to receive an arcuate portion of a cylindrical member or contact drum 10 fixedly mounted on drive shaft 11, which is driven by any suitable driving means such as a motor (not shown). This contact drum 10 is preferably approximately 16 inches in diameter but may be of any diameter desired according to the size of the apparatus shown in the drawing, and is preferably covered with one or more cylindrical layers or sleeves 10a, composed of rubber or other suitable yieldable material so that the roll can compel the belt to conform to uneven or irregular surfaces. If rubber is used it may be Vulcanized to the surface of the drum 10. The arcuate portion of the drum 10, which through the opening 9, is positioned for tangential engagement with the under surface of a panel positioned on the conveyor rollers 3.

In order to treat the surface of the panel 4 which has been preliminarily impregnated with plastic material, a continuous or endless surface treating belt 12, preferably composed of cork or containing a cork surface, is arranged around the periphery of the drum 10 and an idler drum 13, which is fixedly mounted for rotating movement on a shaft 14 supported in any suitable manner. The drums 10 and 13 are rotated by drive shaft 11 in the counterclockwise direction indicated by arrows I and J, the idler drum 13 being used to maintain the desired tension in the treatment belt 12.

It is preferable to employ a surface treating belt having a cork surface, e.g., as exemplified by the belts presently made under U.S. Patent 2,542,058, except that the very mild abrasive sometimes employed in such cork belts is unnecessary and may be omitted. Any other relatively nonabrasive "polishing" frictional belt material, such as canvas, or other cloth made of natural or synthetic fibers, may be employed so long as it is capable of frictionally developing the requisite temperature when the requisite operating conditions are employed, and of withstanding both the operating temperatures and pressures. For example, belts composed of asbestos cloth, popped perlite or expanded vermiculite may be used. The asbestos cloth belt should be sized in a 2% animal glue solution and then dried under tension in order to stiffen it and thereby prevent its wrinkling during use. The vermiculite and perlite particles should be uniformly sized and cut to the same manner as cork particles. This means that the particles should be of uniform size to get the highest percentage of rubber area and that the uniform size used should be small for hard wearing particles and progressively larger for the progressively "softer" wearing particles which tend more and more rapidly to wear out.

The panel 4 is rapidly moved from left to right along the conveyor by a feed roll 15, which is arranged above and in contact with the upper surface of the panel. The feed roll 15 is preferably covered with rubber in the conventional manner to increase traction and is driven in the direction of the arrow F by means of a shaft 16 on which the roll 15 is fixedly mounted. The shaft 16 is supported on any suitable type of resilient bearing pedestal (not shown) which permits a limited amount of vertical movement so that the roll 15 will exert a downward pressure on the work in the direction of arrow P. The weight of the roll itself may be augmented, if desired, by auxiliary weights, springs or other means for exerting the required downward pressure, which should be substantial. The shaft is preferably driven by means of a belt 17 or wall panel 4. Thus, the wall panel 4 is freely movable around the shaft 16 in such a manner as to pull downwardly on the shaft 16 as it is being driven.

In operation, a panel 4 is fed into the space between drums 10 and 15. The substantial pressure of the roll 15 against the panel forced the undersurface of that panel downwardly against the treating belt 12 as the panel passes therebetween. The panel is fed or propelled by the feed roll at a linear speed approximating the peripheral speed of the feed roll, there being relatively little or no slippage therebetween. The contact drum 10 drives the surface treating belt in a direction opposite to that of the panel and at a substantially higher speed. Under these conditions, a temperature, high enough to soften the applied plastic material, is believed to be momentarily produced on the surface of the panel along the line of contact between the belt and the panel.

When natural cork is treated in this manner, production may also soften the lignin in the surface wood and the surface wood itself momentarily, and more or less instantaneously, without softening the underlying wood structure of the panel. As a result of this softened surface wood condition, the pressure exerted against the panel along the same line of contact may compress and densify the softened surface wood without compressing or densifying the underlying wood structure. During the
rubbing operation, the softened plastic flows and more completely fills the pores of the surface layer. Since heat and pressure are thus applied to the panel progressively along its length, the surface of that panel is progressively filled in a like manner. The same operating conditions effective on natural wood are applicable to artificial wood products.

Natural wood, in its many available forms including plywood, and other artificial wood products, such as untempered hard board, chip stock and the like, may be satisfactorily treated in accordance with the method of this invention. A wide variety of plastic materials have been found to be suitable for the purposes of this invention. As used in this specification and in the appended claims the term "plastic materials" is intended broadly to include synthetic and natural materials of the size-coat or wash-coat type, having film-forming binders of a resinous nature, which embrace natural and synthetic resins, including cellulose derivatives, each binder of which (1) is capable of flowing and penetrating the wood to which it is applied, at least when dissolved or suspended in a liquid vehicle, (2) is either a solid or liquid after removal of the evaporable vehicle, (3) is capable of flowing under heat and pressure, and (4) thereafter assumes a rigid or hardened condition. In addition, in its final hardened form, it should remain hard at the temperatures to which it will be subjected, and it must be capable of satisfactorily accepting a top coating of lacquer, varnish or paint directly or with an intervening base coat. The plastic in its final form should be resistant to the solvents, plasticizers and other ingredients normally contained in accelerated finishing materials if they are to be applied.

Said otherwise, the foregoing "plastic materials" or "plastic additives" all are of the film-forming type. They must be thin enough to absorb and penetrate into the wood surface being processed. They constitute a synthetic or natural coating composition capable of forming a film (a) upon the evaporation of a liquid volatile in which its solids are dissolved (or suspended) or (b) by chemical reaction, such as polymerization, or (c) by evaporation and chemical reaction.

In the prior art practice of "eliminating" nubs, a thin penetrating coating designated "wash-coat" by some woodworkers and "size-coat" by others, is conventionally employed on white wood for the purpose of stiffening and removing the nubs to facilitate their removal by a scuff-sanding operation. Since the practice of my invention and the "prior art practice of "wash-coating" (or "size-coating") and scuff-sanding both involve the use of a penetrating coating placed on white wood for the purpose of promoting the production of a "nib-free" surface by a subsequent "rubbing" operation, I propose to use the term "nib-coat" to designate generally those penetrating coats, which, in accordance with my invention, may be employed on white wood for the purpose of preparing its surface for the removal of nubs therefrom or the embedment of the nubs therein (or both) by a compressive frictional rubbing operation.

The term "nib-coat" designates a coat of a thin surface-penetrating wood-finishing plastic material of the size-or-wash-coat type, which has a film-forming binder of a resinous nature, and which, when properly applied to white wood and compressively rubbed under frictional pressure, not only leaves the surface in a smooth shiny state of stable porosity capable of receiving a top coat (either directly or with one or more intervening coats of wood-finishing materials such as stains, fillers or sealers), but also substantially stabilizes that surface against nib-raising. Moreover, when the white wood surface, which existed before the nib-coating operation, is compared with the nib-coated surface, which emerges from the rubbing operation, it will be found that the nib-coated surface has a more uniform appearance and a substantially increased gloss. It also has the capability of accepting subsequent coats of wood-finishing materials more uniformly.

Plastic materials, which possess the qualifications necessary to function as nib-coats, embrace both the thermoplastic and thermosetting types of plastic materials. For most purposes, the thermosetting plastic materials are preferred.

Examples of suitable plastic materials which may be used for the purposes of this invention are the phenol-formaldehyde resins, such as phenol-formaldehyde, resins, phenol-formaldehyde resins, melamine-formaldehyde resins, urea-formaldehyde resins, heat-convertible alkyl, peroxide, methyl and polyester resins. The alkyl or polymerizable polymers that may be utilized are any of the unsaturated polyhydric alcohol polyacrylic acid polyesters made from unsaturated polycrylic acids and/or unsaturated polyhydric alcohols either in admixture with a cross-linking monomer such as styrene, dialyl phthalate, trially cyanurate, and others, which resins cure without giving off by-products, or in admixture with drying oil components to form more conventional alkyd resins which cure by splitting out water.

A preferred type of polyester is essentially a condensation product of a dihydric alcohol and a dicarbonyl acid, such as maleic acid or anhydride, or fumaric acid, a polyester of saturated dihydric alcohols such as the ethylene, propylene and butylene glycols, or without modifying amounts of saturated dicarbonyl acids such as phthalic anhydride, tetrachlorophthalic anhydrides, succinic acid, adipic acid, and others. These preferred polymers when mixed with a suitable monomer are preferably in thin liquid form or made into liquids by the use of suitable solvents or dispersed as an emulsion.

These polyester materials may be catalyzed with peroxide-type catalysts such as benozyl peroxide, ethyl ketone peroxide, hydroperoxides, metal driers such as cobalt naphthenate, etc., and cured at temperatures ranging from room temperature to 200° C. or more. Small proportions of trihydric alcohols or tricarbonyl acids, or alcohols and carboxylic acids of higher functionality, may be incorporated in the polyester molecule, if desired. A suitable resin is produced from glycerol and phthalic anhydride. It is possible to employ alkyd resins which, per se, are not heat-convertible if such resins are modified by adding a small proportion of a heat-convertible material thereto such, for example, as dimethyl phthalate, glycerol phthalate, etc.

Examples of suitable thermoplastic materials are the polyamides, and vinylidine chloride acrylo-nitrile resins commercially marketed under the trade names nylon and Saran, respectively, the trifluorochloro-ethylene resins marketed under the trade name Kel-F and vinyl chloro-acetate resins, vinyl-formal resins, methyl methacrylate and polymethyl alphachloro acrylate resins, etc. The above resins should be either in liquid form as produced or convertible into a liquid by the use of evaporable solvents, or dispersed as an emulsion in water. It is satisfactory to use partially condensed resins of the formaldehyde type in water solution; but, because water tends to cause raising of the surface grain, it is preferred to employ hydrocarbon, alcohol or other organic solvents when possible. When thermosetting resins such as the phenol-formaldehyde, melamine-formaldehyde, etc., are employed, it is preferable that the polymerization of the plastic solids be relatively far advanced so that while further polymerization occurs from the heat supplied by the friction member the quantity of polymerization necessary is kept near a minimum.

In the application of such plastic materials to wood surfaces, the plastic is preferably maintained in a sufficiently fluid condition to render it relatively easy to impregnate or interpenetrate the pores of the wood surface by merely brushing, rolling, or spraying the plastic on the surface to be treated. When thermoplastic materials or partially polymerized thermosetting materials are used,
the desired fluidity is obtained by dissolving or suspending them in a suitable liquid vehicle which is evaporated prior to the friction treatment.

Plastic materials or "nib-coats," as above defined, are characterized by the fact that their resin or plastic content is solubilizable (and thus capable of forming a continuous film when applied to a suitable surface) either upon evaporation of a liquid vehicle in which it is dissolved or suspended or by the polymerization or both, and that they are in a soft or softened state during the rubbing treatment and that they are hard or hardened, thereafter, at room temperatures or milder temperatures.

The best results are obtained with resins of which nih-coats are composed or both thermoplastic and thermosetting resins. I particularly prefer those which harden (or solidify) quickly either on application of heat or evaporation of solvent or both, because they permit the use of a rapid mass production process, such as that illustrated and described above.

When using the types of plastic materials specifically referred to hereafter, it has been found that the best results are obtained when the proportion of plastic solids in the solution (i.e., the starting composition) ranges between about 15% and about 50%. Excellent results are being obtained in commercial practice with compositions containing about 15% solids. In general, it is feasible to employ solutions containing the higher percentages of plastic solids on the more porous woods, such as Douglas fir, and other soft woods, and it is preferable to decrease the plastic solids as the porosity of the wood decreases.

The preferred quantity of plastic solids in the finished surface resulting from the method of this invention varies somewhat depending upon the amount of material more or less permanently taken up by the wood. For example, if the dry weight of plastic solids, after it has been applied to the wood, ranges from ½ pound to 7½ pounds per 1000 square feet of wood surface, the dry weight of the plastic solids taken up by and remaining with the wood at the end of the rubbing operation will inherently vary from about .5 pound per 1000 square feet for the dense, close grained woods to about 1.25 pounds for the softer, more porous woods such as Douglas fir, pine and laurel.

After the plastic solution has been applied to the wood surface, the solvent or vehicle normally employed in it, may be removed by any conventional method of drying including drying in the air, countercurrent forced air drying, heating, etc. When heat is used and the plastic is thermosetting, the temperature of the plastic should be kept below the temperature at which it will cure to rigid form during the drying operation. Unless the solvent or vehicle is first evaporated from the plastic material on the surface, the contacting of that plastic-impregnated surface with the high-speed frictional surface tends to cause gumming of the frictional surface and in the case of some solvents would cause a fire hazard and is therefore undesirable.

The method of this invention impregnates only a very thin surface layer of wood. Where natural wood densification occurs, it also is limited to said very thin surface layer. Although it is not known for certain it is believed that the high temperature which results from the treatment with the apparatus shown in the drawing, in conjunction with the simultaneously applied pressure, responsible for the uniform distribution in the surface layer of the various plastic materials including those which have not heretofore been considered satisfactory for the purpose. It is believed that a portion of the generated heat first softens the applied plastic material, simultaneously softens the lignin in the natural wood adjacent to the surface and, in the case of thermosetting plastic materials, a portion of the heat functions to further polymerize or cure the plastic solids and thus advance them toward a hard insusceptible condition in situ in the pores of the surface wood. One of the virtues of the process is that when a thermosetting resin is used, which will cure slowly at room temperature, the friction treatment need only cure the outermost surface of the plastic, and this is accomplished in a small fraction of a second.

Although it is difficult to determine the precise temperature that is necessary to initiate or to complete the curing reaction with any appreciable velocity, it is believed that a temperature of around 500° F, 525° F., a temperature well above the conventional softening temperatures for thermosetting resins and the curing temperatures for milder resins. The preferred operating temperatures may exceed the above range so long as the contact temperature is reduced sufficiently to prevent charring of the surface wood in all instances and scorching in those instances where it is objectionable.

In operating the apparatus of the drawing for treatment of natural wood, the work feed rate, the belt speed and the pressure must be correlated to effect the softening of the above mentioned plastic materials and to produce the desired improvement of the desired thin layer without charring and in most cases without scorching the wood.

Since the desired results are believed to be achieved when the temperatures developed are high and since only a very thin layer of wood is heated, it is desirable to complete the treatment with the apparatus of the drawing within less than one half of a second, and it is preferable to decrease the plastic solids as the porosity of the wood decreases.

The temperature developed during the treatment for any given rate of work feed and width of pressure contact depends on the pressure and the belt speed, increasing as either or both of these factors increase and vice versa. I believe that that best results are achieved when the temperature developed closely approaches the scorching temperature of the wood for the treatment time employed. The presence of residual evaporable solvent or other vehicle in the plastic on the surface at the instant of contact by the friction member holds down the temperature which is attained since a portion of the Joss is employed in completing the evaporation of that solvent. For this reason it is preferred that the applied plastic material be substantially free of evaporable vehicle or solvent before contact with the friction member. For this reason it is also undesirable to apply the process of this invention to green wood or wet wood.

A single pass of the treated surface beneath the roll at a feed rate of 90 feet per minute or more is insufficient to completely polymerize or cure some thermosetting plastic materials to their hard insusceptible condition. In order to polymerize or cure the surface in such cases or to greater depths in others, the work feed rate may be decreased or the surface may be passed beneath the roll repeatedly. For melamine-formaldehyde and urea-formaldehyde plastic materials, a satisfactory cure of at least the outer surface has been obtained by a single pass through the apparatus at a belt speed of about 4000 feet per minute and a work feed rate of 90 feet per minute, but a slight improvement in surface appearance is noted on a second pass. Additional passes may be required when phenol-formaldehyde, polyamides or polyester resins are employed, and may also be required if any significant quantity of evaporable vehicle
remains in the plastic when it is given the first treatment. The maximum pressure exerted during the treatment of natural wood may be varied widely. The actual maximum pressure exerted by the apparatus of the drawing is 5500 pounds per square inch, but since it varies over the narrow band of contact from zero at the extreme edges of the band to a maximum pressure at the center. The pressure is believed to cause a flow of the heated plastic and either rub off softened plastic material which lies on the surface or force it into the pores of the wood or both. Excellent results have been obtained when the diameter of drum 10 is 16 inches and the downward pressure exerted by roller 15 ranges from 75% pounds to 15 pounds per linear inch of contact between the belt and the wood surface along the length of the roller.

Pressures of this order substantially exceed the s Buffing pressure used on size-coated or wash-coated wood. My experience indicates that the highest of the Buffing pressures is substantially below one pound per square inch (1 psi) and therefore substantially less than one pound per linear inch along a one inch (1") wide band of rubbing contact of the character involved in my invention.

Rubbing pressures of the above-noted order also render the buffing medium inherently capable of removing substantially all of any excess coating material on the panel during one pass of the panel through the rubbing zone and they cause the buffing medium to work compressively against the resistance of the wood, as distinguished from the resistance of the coating material. For example, if an excess amount of coating material was so deposited on the wood as to form a continuous unabraded overlying film, my buffing medium will not buff the top surface of that overlying film. On the contrary, it will inherently press downwarthly through that film until it works against the resistance of the underlying wood as distinguished from the resistance of the overlying film.

As a consequence of the pressures employed, the buffing medium normally will be effective to remove most if not all of the excess material and to press smoothly the nib-coated surface into a shiny porous substantially nib-free condition. Usually the coating material is in a hardened tack-free state.

Under proper conditions of belt speed and work speed the pressures may be greater or less than the indicated range of 75% to 15 pounds per linear inch. In fact, for example, the drum 10 is of larger diameter than 16 inches, thus increasing the width of the band of contact, the maximum pressure may have to be increased by increasing the force exerted by roller 15 in order to obtain the desired degree of plastic impregnation and permanent compression of the surface wood. It will be apparent that the belt speed, work feed rate and the pressure can be altered relative to each other within the general limits above given to establish the best operative conditions for the particular plastic and wood to which it is applied.

A number of examples are set forth below which contain typical representatives of the plastics and operating conditions which can be employed in carrying out the method of this invention. It is to be understood that the scope of the invention is not intended to be limited to the particular materials or conditions employed therein.

Example I
A plastic solution was prepared by admixing:

| Parts by weight | Phenol-formaldehyde resin in alcohol, 68% resin solids (Plyphen-5025) | 100 |
| Parts by weight | Denatured ethanol or methanol | 172 |

1 Obtained from Relieghold Chemical Company.

The resin mixture was applied to the surface of a number of 2' x 4' panels of Douglas fir plywood, gum and birch by wiping to obtain 2½ pounds of plastic solids (dry weight) per thousand square feet of surface. The alcohol solvent was evaporated until the surfaces were only slightly tacky to the touch. The substantially dry plastic-impregnated surfaces were then contacted with the apparatus of the drawing by passing the belt 12 over the surface four times under the conditions specified in Example I. The nib-coated panels, thus treated, were primed and painted with the enamel paint used in Example I, the total quantity of primer and enamel being at the rate of 360 square feet per gallon. Portions of the untreated plywood of the same type were primed and painted with the same primer and enamel paint; and, in order to obtain comparable sealing and a comparable enamel coated surface, it was necessary to apply paint at the rate of 240 square feet per gallon, or one-third more primer and paint.

After the painted surfaces had thoroughly dried, test panels from the treated surfaces were subjected to outdoor weathering by vertically disposing the panels on the southwest wall of a building, located near Louisville, Kentucky, for five months, extending from March to
August. For comparison purposes, untreated plywood stock and panels of untreated surfaces painted in an identical manner were positioned adjacent to the panels treated in accordance with this invention. At the end of five months’ exposure to the weather, an inspection of the panels revealed the following. The surface of the painted untreated plywood stock was substantially covered with checks and cracks and was badly discolored. The painted stock treated in accordance with this invention was free of checks and cracks and for all practical purposes had the same appearance as it had when placed outside.

**Example III**

A plastic solution was prepared by admixing:

<table>
<thead>
<tr>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea-formaldehyde resin solution in alcohol (50% by weight resin solids—Beckamine P-3350)</td>
</tr>
<tr>
<td>Denatured ethanol or methanol</td>
</tr>
<tr>
<td>Acid accelerator (Beckamine Accelerator P-198)</td>
</tr>
</tbody>
</table>

1 Obtained from Rechhold Chemical Company.

The plastic solution was applied to the surfaces of a number of 2’ by 4’ panels of Douglas fir plywood, walnut and gum, by wiping to obtain about 2½ pounds of plastic solids (dry weight per thousand square feet of surface). After coating, these panels were treated in exactly the same manner as was used in treating the panels of Example I. A similar reduction in the quantity of paint was observed. The water absorption tests on the treated panels gave results substantially identical to those set forth for the panels in Example I.

The following examples are examples of plastic solutions which were used in accordance with the manipulative steps of the method as set forth in Example I, except as indicated, and substantially comparable results were obtained in each case to those obtained in Examples I and II.

**Example IV**

<table>
<thead>
<tr>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkyd resin-monomeric styrene modified (Polyline 8237)</td>
</tr>
<tr>
<td>Acetone</td>
</tr>
<tr>
<td>Accelerator (A mixture consisting of 60 parts by weight dimethylethyl ketone, peroxide and 40 parts by weight dimethyl phthalate)</td>
</tr>
</tbody>
</table>

1 Obtained from Rechhold Chemical Company.

The coated and dried panels were passed twice through the apparatus of the drawing, but good results were obtained on the first pass.

**Example V**

<table>
<thead>
<tr>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea-formaldehyde resin (65% urea-formaldehyde resin solids in water—Plyamine P-631)</td>
</tr>
<tr>
<td>Water</td>
</tr>
<tr>
<td>Catalyst (TB6-6388)</td>
</tr>
<tr>
<td>Catalyst (TB6-3994)</td>
</tr>
</tbody>
</table>

1 Obtained from Rechhold Chemical Company.

The panels were passed twice through the apparatus of the drawing. This resin is a colloid suspension in water when applied to the wood, but the water is evaporated prior to the friction treatment.

**Example VI**

<table>
<thead>
<tr>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinlydene chloride acrylo-nitrite resin (Saran F-122-A-20 Latex 52% solids)</td>
</tr>
</tbody>
</table>

1 Obtained from Dow Chemical Company.

The panels were passed once through the apparatus of the drawing. This resin is an emulsion in water when applied, but the water is evaporated prior to the friction treatment.

In the comparative water absorption test no evidence of penetration by moisture was observed after 24 hours.

**Example VII**

<table>
<thead>
<tr>
<th>Parts by weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polyamide resin (Zytel #61)</td>
</tr>
<tr>
<td>Denatured ethanol</td>
</tr>
<tr>
<td>Water</td>
</tr>
</tbody>
</table>

1 Obtained from E. I. Du Pont de Nemours & Co.

The alcohol and water are heated to about 150° F. and the dry resin (nylon) stirred in the hot liquid until it dissolves. The resulting solution is then applied to the wood.

When using a thermoplastic material, having a softening temperature higher than the curing temperatures of the phenol-formaldehyde resins, it is advisable to increase either (a) the length of the rubbing time (or the width of the rubbing band) or (b) the magnitude of the rubbing pressure or both. A plastic material of this higher softening character is exemplified by trilinurochloroethylene resins, such as Kel-F available from the M. W. Kellogg Company.

While the reason for the beneficial results which flow from the use of the process on natural wood are not fully understood, it is believed: that the frictional buffing member in compressively rubbing against the resistance of the wood, may to some extent either (a) wipe the surface-cleaningly unsetting unsoared plastic plastic solids of the wood or (b) rub it off or (c) do both; and that, at the same time, it may soften the natural wood lignin in a thin surface layer of very small depth and density that very thin surface layer without densifying the remainder of the wood. This results in a thin, highly glossified outer wood surface which is relatively heavily impregnated with plastic. Moreover, there is ordinarily no visibly intact film of plastic on the surface of the wood remains its natural appearance, except for enhanced gloss. Finally, when a thermosetting resin is employed, the frictionally developed heat partially or completely cures the resin, thus producing a finished product in much less time and with less effort and equipment than required for prior resin coated or impregnated wood products.

The practice of my invention inherently produces a porous surface. In fact, in most cases, the coated surface should be porous before the rubbing operation. In all cases, it is porous after the rubbing operation. It will be apparent that my process differs (a) from the sand sanding of porous surfaces, such as wash-coated wood, (b) from the sealer sanding of impervious surfaces, such as the surfaces of sealer coats or equivalent films on wood, and (c) from other correspondingly light-pressure sanding, buffing and other rubbing operations of impervious coating surfaces, such as the surfaces of top coats. My practice differs from said sanding and other processes in that it requires a substantially higher rubbing pressure and produces a distinctly superior result.

When natural wood, treated by this process, is intended for interior use, it may be used, if desired, without any finish coat other than that provided by the nib-coat, or it may be provided with a wax finish. In either event, it retains fully its natural wood appearance. It has been found that it may be stained by incorporating a stain in the plastic material or by applying a stain to the finished product. While the porosity of the surface (produced in accordance with the practice of the present invention) will vary with variations in the wood and in the operating conditions of the process, such surface will have sufficient porosity to accept soluble stains. In addition it will accept pigmented stains employing fine pigment particle sizes but will not satisfactorily accept some of the more pigmented stains. Besides stains, insecticidal, fungicidal and other special purpose materials may be used.

The foregoing process has become known as the "super microseal" process. From the foregoing, it will be understood or observed: (1) that the super microseal process is useful in eliminating upstanding nibs from the surface
of cellulosic and other firm porous heat-insulating materials such as wood, untempered hardboard, chipboard and like products presenting a relatively smooth regular porous firm heat-insulating surface, one that preferably is flat and substantially planar; and (2) that the belt 12 moves toward and along the surface of the product being rubbed through a concavo-convex path and has its convex side pressed against said product surface by a rotating rubber covered contact drum 10, which thus functions as a yielding backing member for the belt.

The results obtained by the practice of the invention, on a ligno-cellulosic or other lignified surface containing the plasticizable binder of natural wood, may be improved by initially rubbing the white wood preceding the nib-coating step, using the process of Alexander Patent No. 2,827,935, now known as the “microseal” process, which is substantially the same as this super microseal process except that the coating step is omitted. Where microsealing precedes super microsealing, microsealing may flatten all nubs within reach of the surface rubbing medium. In that event, super microsealing, in accordance with the nib coat practice of this invention, eliminates “upstanding” nubs by embedding the flattened nubs in the coating material, one having such nubs from rising after the rubbing or buffing operation.

Normally the best results can be obtained by: microsealing the natural wood to glossify its surface; nib-coating the glossified surface with the plastic material to permeate that surface; drying the nib-coated surface; rubbing the permeated surface in the manner described above; and then repeating the rubbering operation. As a matter of fact, these rubbing operations may be preceded by coarse and fine (or polish) sanding operations and all such operations may be performed on a single conveyor line providing a constant speed ranging up to 160 feet per minute or more. Again the machines for sanding and rubbing may all be of the character shown in the drawing. Naturally coarse and polish (or fine) sanding belts, such as 60 and 200 grades, respectively, normally will be used on the coarse and polish-sanding machines, while each rubbing machine will have a rubbing belt 12 or its equivalent. All buffing belts may travel at the same speed or in the same speed range running from about 1700 to 5000 linear feet per minute.

The drying operation preferably should proceed somewhat gradually. Good results have been obtained with two products, one having a drying temperature approximating 100 to 120° F. and the other a drying temperature approximating 200 to 250° F.

My invention contemplates the use of belts which move through a blunt-nosed “concavo-convex” path, i.e. one having a flat-faced apex and of corresponding flat-faced backing members providing wider bands of rubbing contact in order to increase the total frictional heat generated.

If the plastic material is too viscous, the solids deposit may be too heavy. The solution to this problem is either to rub the panel with one or more additional rubbering operations, or to thin down the plastic solution in order to reduce the amount of solids deposited.

The final super-microsealed surface, produced in accordance with the practice of this invention, acts like a conventionally sealed surface in that it stabilizes the wood surface against fiber raising and prepares it for the direct reception of a top coat or other finish coat. Unlike a conventionally sealed surface, however, it is not actually sealed, but remains porous. This is one of the advantages of this process since the treatment may be applied at the factory and the panel subsequently stained and finish coated in the job without the necessity of sealer coats and sealer sanding operations.

The quality of a super microsealed surface progressively improves with a progressive improvement in the quality of the starting white wood surface. Consequently, while rough sanded panels ranging from 1/0 to 3/0 and polished sanded panels ranging from 4/0 to 6/0 may be super microsealed, the recommended practice is to microseal all starting white-wood panels before super microsealing them.

The minimum super microsealing pressure will vary with such factors as the specie of wood, the type of nib-coat used, the softness/hardness or plasticity of the nib-coat material when rubbed and the product-feed and rubbing-belt speeds employed in practicing the process. Consequently, the minimum super microsealing pressures may range upwardly from a limit as low as 30 lbs. per foot in some cases to a top limit in other cases which should not go much, if any, higher than 60 lbs. per ft. A 90 lb. per ft. pressure is recommended. Rubbing pressures in excess of 180 lbs. per ft. may be employed but normally they do not provide any improvement in operation or result sufficient to justify their use. Their use should be considered if the heaters are to be reduced or eliminated.

Since the rubbing medium functions to remove substantially all of any excess coating material, the better practice presently indicated is to apply the minimum amount of coating material which will consistently produce good results with relatively little waste. This amount will vary not only with the specie of wood but also with the solids content of the plastic or nib-coat used (softness/hardness) of the nib-coat material when rubbed, and the product-feed and rubbing-belt speeds and the rubbing-pressure used in practicing the process. In some cases, the minimum amount of material (which should be used) will normally be at the heretofore indicated low limit of about 4/2 lb. In other instances, one having a drying medium to permit the rubbing medium to rub against the resistance of the wood as distinguished from the resistance of the coating material but also permit the rubbing medium to pressure smooth it under compressive rubbing conditions. The coating material may, however, be dry, tacky or even wet but a wet coating is not recommended.

The first rubbing operation should pressure rub it into a porous and substantially nib-free state and should pressure smooth it into a shiny state, which preferably should be uniform since its attractiveness will be in direct proportion to its uniformity. Preferably the rubbed coated surface should be dry to the touch after the first rub, but, again, it may be tacky or wet to a lesser degree than it was immediately before the first rub. If dry, it may (if desired) be placed in use "as is," i.e. without a base or top coat. If not dry, it should not be placed into use "as is" without further processing it into a dry state and this may be most conveniently done by one or more additional rubs.

If the super microsealed product, resulting from one or more nib-coat rubbing operations, is to be "pre-finished," i.e. top coated at the factory, the nib-coat should preferably be dry after the last rub. However, it may be pre-finished in a tacky or wet state, so long as the operators observe the wood-finishing conditions, which govern the application of one coat safely upon another. Waxes cannot be used as nib-coats because subsequent coats, such as base coats and top coats, will not adhere satisfactorily to a waxed surface.

Resins, derived from the natural polymer cellulose, and spirit varnishes can be used as nib-coats. Thus, nitro-cellulose lacquer solutions and spirit varnishes both make excellent nib-coats.

Resinous materials, such as drying oils and the oil varnishes, can also be used but they usually are not as satisfactory as the other materials mentioned.
Representative examples of the use of (a) liquid resins, i.e. polyester and epoxy resins without solvents, (b) nitrocellulose lacquer solutions and spirit varnishes, and (c) oil varnishes and drying oils follow.

Example VIII

A low-viscosity polyester-resin-forming material in a liquid state (free of volatile liquid) was prepared by mixing 100 grams of Reichhold Polyolite 8048 with 1/2 gram of catalyst (60% methyl ethyl ketone peroxide). This volatile-liquid-free resin-forming liquid was cloth-wiped over a 2 x 4 x 1/4" Birch plywood panel to produce a spread of about 6 lbs., or 1,000 ft.², or 22 grams per 6" square. The difference between the weights of the resin container and the wiping cloth before and after spreading indicated that 21.2 grams were spread. Immediately after the coating operation, the panel was subjected to 4 passes or rubs. The results are tabulated as follows:

<table>
<thead>
<tr>
<th>Condition of nib-coated surface</th>
<th>Wet, etc.</th>
<th>Remove sub. all excess</th>
<th>Press. smooth</th>
<th>Degree of shine</th>
<th>Nib-free</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Before 1st rub...</td>
<td>Slightly tacky.</td>
<td>Yes</td>
<td>Yes</td>
<td>Fairly good</td>
<td>Yes</td>
</tr>
<tr>
<td>(b) After 1st rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Good</td>
<td>Yes</td>
</tr>
<tr>
<td>(c) After 2d rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Very good</td>
<td>Yes</td>
</tr>
<tr>
<td>(d) After 4th rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Very good</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Example IX

A low viscosity epoxy-resin-forming material in a liquid state (free of volatile liquids) was prepared by mixing 100 grams of Reichhold Epotuf 37-128 with 50 grams of Reichhold hardener #2611. The conditions were the same except that (a) the coating was air dried for 1½ hrs., (b) 20.1 grams were spread, and (c) the Birch panel was twice rubbed. The results were substantially the same as those tabulated through the second rub of Example VIII, the coating being slightly tacky after the first rub and the degree of shine being "fairly good" and "good," respectively, after the first and second rubs. A corresponding test on a Douglas Fir panel gave similar results.

Example X

A 22% solids nitrocellulose lacquer solution, obtained from the Pittsburgh Plate Glass Co., was diluted with lacquer thinner to make a solution containing 15% nitrocellulose solids. This solution was wiped on a 2/0 and 4/0 panel sanded 1" x 1/2" x 1/4" Birch plywood panel. The spread rate provided 3 lbs. of dry material per 1000 ft.² of surface (3.4 grams wet spread). About 1½ minutes were required to perform the test piece coating operation.

The test piece was then passed through the plant SMS (i.e. super microsil) drying oven (22 secs, at 250° F.) and then passed (twice) over the cork belt. The condition of the coated surface was noted as follows:

1. Immediately after spreading—slightly damp to the touch; nibs are present; not glossy.
2. After heating in plant SMS oven but before first pass—dry to the touch; nibs are present; not glossy.
3. After first pass on wide belt machine—dry to the touch; nib free; glossy (good SMS).
4. (a) After second pass on wide belt machine—dry to the touch; nib free; glossy (a little more than after first pass) (good SMS).

Example XI

A shellac varnish (identified as Sherwin-Williams Pure White Shellac, 3 lb. cut, 30.5% solids) was cloth wiped over a 1" x 1/2" x 1/4" Birch plywood panel to produce a spread of 5.6 grams wet spread which, on a dry solids basis, equals 2½ lbs. per 1,000 ft.². The panel was allowed to dry at room temperature overnight. After one rub, it had uniform shine quality which rated Fair. Two weeks later it was re-rubbed twice under the same conditions and rated Good after each rub.

Example XII

Sherwin-Williams 100% "Rexpur" spar varnish, composed of 55% non-volatiles (linseed oil, tung oil and phenolic resin) and 45% volatiles (mineral spirits) was cloth wiped and re-wiped over three 1" x 1/2" x 1/4" Birch plywood panels in amounts providing the smooth and uniform wet spreads hereinafter indicated, viz:

Panel 2—1.5 grams of wet spread providing 1.2 lbs. of dry solids/1000 sq. ft.
Panel 3—3.9 grams of wet spread providing 3.1 lbs of dry solids/1000 sq. ft.
Panel 4—9.1 grams of wet spread providing 7.3 lbs. of dry solids/1000 sq. ft.

The results are tabulated as follows:

<table>
<thead>
<tr>
<th>Condition of nib-coated surface</th>
<th>Wet, etc.</th>
<th>Remove sub. all excess</th>
<th>Press. smooth</th>
<th>Degree of shine</th>
<th>Nib-free</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Before 1st rub...</td>
<td>Slightly wet.</td>
<td>Yes</td>
<td>Yes</td>
<td>Fairly good</td>
<td>Yes</td>
</tr>
<tr>
<td>(b) After 1st rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Good</td>
<td>Yes</td>
</tr>
<tr>
<td>(c) After 2d rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Very good</td>
<td>Yes</td>
</tr>
<tr>
<td>(d) After 4th rub...</td>
<td>Dry.</td>
<td>Yes</td>
<td>Yes</td>
<td>Very good</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Condition of nib-coated surface</th>
<th>Wet, etc.</th>
<th>Remove sub. all excess</th>
<th>Press. smooth</th>
<th>Degree of shine</th>
<th>Nib-free</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Before 1st rub...</td>
<td>Very wet.</td>
<td>Yes</td>
<td>Yes</td>
<td>Fairly good</td>
<td>Yes</td>
</tr>
<tr>
<td>(b) After 1st rub...</td>
<td>Wet.</td>
<td>Yes</td>
<td>Yes</td>
<td>Poor</td>
<td>(0)</td>
</tr>
<tr>
<td>(c) After 2d rub...</td>
<td>Slightly wet.</td>
<td>Yes</td>
<td>Yes</td>
<td>Poor to fair</td>
<td>(0)</td>
</tr>
<tr>
<td>(d) After 4th rub...</td>
<td>Slightly tacky.</td>
<td>Yes</td>
<td>Yes</td>
<td>Fairly good</td>
<td>Yes</td>
</tr>
</tbody>
</table>

1. After the 1st rub of #4, the nib-coated surface probably had some excess but, if so, such excess was not visible as such; hence most of it was rubbed off during the 1st rub.
2. After each of the 1st and 2d rubs of #4, if any nibs were present, I was unable to detect them.

Example XIII

Archer-Daniels-Midland Co. “Pol-mer-ik” linseed oil (free of volatile liquid) was cloth wiped over a 1"x1/2"x1/4" White Birch plywood panel in an amount providing a wet spread of 1.7 grams equalling a dry spread of 2¼ lbs. per 1000 ft.². After drying overnight, it was twice rubbed producing a surface, which rated Poor. Two weeks later it was thrice rubbed and rated as a high average. An average finish commercially produced in the plant is a good finish; hence, a high average is very good.

Similar tests using domestic tung oil sold by Solvent Services, Inc. and dehydrated castor oil sold by Reliance...
Varnish Company were rated after each of 2 rubs as low average which is equivalent to fair. While these panels would not normally be recommended for use "as is," they could be satisfactorily employed in top coated panels such as prefinished panels.

It may be noted that all panels for Examples 8–13 appeared to be substantially nib-free after the first rub.

Having described my invention, I claim:

1. An improved method for eliminating upstanding nibs from the flat face of a wood, hardboard, chipboard and other like cellulose product, having a smooth regular porous firm whitewood or equivalent surface, as the product moves rapidly through a longitudinal path including a rubbing zone, comprising:

   (A) nib-coating said flat white-wood face of said product with a wood-finishing plastic material of the type,
   (1) which has a film-forming binder of a resinous nature, and
   (2) which is capable of flowing under heat and pressure and thereafter assuming a hardened state,
   (3) which, when applied, is in a fluid state such that it is capable of flowing and penetrating said surface to form a nib-coat,
   (4) which is capable of receiving overlying coatings of other wood-finishing materials including top-coats and intervening base coats, and
   (5) which comprises a low viscosity resin-forming material in a liquid state free of volatile liquid; and
   (B) as the coated product makes one pass through said rubbing zone, compressively buffing its flat nib-coated face frictionally with a buffing medium
   (1) at a high buffing-speed and
   (2) at a heavy buffing-pressure, which is so elevated, above those usable for scuff-sanding, as
   (a) to render said buffing medium capable,
   during said one pass, of removing substantially all of any excess coating material on the product, and
   (b) to cause said buffing medium to buff against the resistance of said flat white-wood face of said product, as distinguished from the resistance of said coating material on said product,
   (i) with a buffing force sufficient to pressure smooth the nib-coated surface into a shiny, porous and substantially nib-free state.

2. The method of claim 1 wherein:
   (A) said nib-coating step is performed with a volatile-liquid-free drying oil; and
   (B) said buffing step is repeated at least once.

3. The method of claim 1 wherein:
   (A) said nib-coating step is performed with a low viscosity polyester-resin-forming material in a liquid state free of volatile liquids.

4. The method of claim 1 wherein:
   (A) said nib-coating step is performed with a low viscosity epoxy-resin-forming material in a liquid state free of volatile liquids.

5. An improved method for eliminating upstanding nibs from the flat face of a wood, hardboard, chipboard and other like cellulose product, having a smooth regular porous firm whitewood or equivalent surface, as the product moves rapidly through a longitudinal path including a rubbing zone, comprising:

   (A) nib-coating said flat white-wood face of said product with a wood-finishing plastic material of the type,
   (1) which has a film-forming binder of a resinous nature, and
   (2) which is capable of flowing under heat and pressure and thereafter assuming a hardened state,
   (3) which, when applied, is in a fluid state such that it is capable of flowing and penetrating said surface to form a nib-coat, and
   (4) which is capable of receiving overlying coatings of other wood-finishing materials including top-coats and intervening base coats; and
   (B) as the coated product makes one pass through said rubbing zone, compressively buffing its flat nib-coated face frictionally with a buffing medium
   (1) at a high buffing-speed and
   (2) at a heavy buffing-pressure, which is so elevated, above those usable for scuff-sanding, as
   (a) to render said buffing medium capable,
   during said one pass, of removing substantially all of any excess coating material on the product, and
   (b) to cause said buffing medium to buff against the resistance of said flat white-wood face of said product, as distinguished from the resistance of said coating material on said product,
   (i) with a buffing force sufficient to pressure smooth the nib-coated surface into a shiny, porous and substantially nib-free state.

6. The method of claim 5 wherein:
   (A) said nib-coating step is performed
   (1) by applying said plastic material in an amount providing, on a dry weight basis, not less than about ½ lb. of binder per 1000 square feet of coated surface, and
   (2) by allowing said plastic material to absorb into and interpenetrate a thin layer of said coated surface.

7. The method of claim 5 wherein:
   (A) said nib-coating step is performed with the amount of said plastic material on said surface controlled to provide a porous coat prior to the buffing step.

8. The method of claim 5 wherein:
   (A) said nib-coating step is performed
   (1) with said plastic material containing said binder combined with an evaporable liquid vehicle; and
   (B) said method includes the step of evaporating substantially all of the evaporable liquid prior to the buffing step.

9. The method of claim 8 wherein:
   (A) said nib-coating step is performed with a plastic material binder
   (1) which hardens upon the evaporation of said liquid vehicle.

10. The method of claim 8 wherein:
    (A) said nib-coating steps is performed with said plastic material containing a partially polymerized thermosetting binder.

11. The method of claim 8 wherein:
    (A) said nib-coating step is performed with said plastic material containing a thermoplastic binder.

12. The method of claim 8 wherein:
    (A) said buffing step is performed with a buffing medium,
    (1) which maintains, in said rubbing zone, a band of buffing contact,
    (a) which, in the direction of its length, extends across the longitudinal path of product movement, and
    (b) which, in the direction of its width, extends along said path,
    (c) the buffing contact time being of the order of a fraction of a second for each inch of contact band width.

13. The method of claim 12 wherein:
(A) said buffing step is performed
(1) with a buffing contact time of not more than 1/2 second.

14. The method of claim 12 wherein:
(A) said buffing step is preformed with a buffing medium:
(1) having a relatively non-abrasive rubbing surface which is yieldably pressed, by a backing member, against, and into intimate flattened contact over, said contact band.

15. The method of claim 15 wherein:
(A) said nib-coating step is performed
(1) with said plastic material containing said binder combined with an evaporable liquid vehicle,
(2) with the amount of said plastic material on said surface controlled to provide a porous coat for the buffing operation,
   (a) the amount applied, on a dry weight basis, being not less than about 1/2 lb. of binder per 1000 square feet of coated surface, and
   (3) by allowing said plastic material to absorb into and interpenetrate a thin layer of said coated surface;
(B) said method includes the step of evaporating substantially all of the evaporable liquid prior to said buffing; and
(C) said buffing operation is performed with a buffing medium,
   (1) which maintains, in said rubbing zone, a band of rubbing contact,
      (a) which, in the direction of its length, extends across the longitudinal path of product movement, and
      (b) which, in the direction of its width, extends along said path,
      (c) the buffing contact time being of the order of a fraction of a second for each inch of contact band width.

16. The method of claim 15 wherein:
(A) said buffing step is performed
(1) with a buffing contact time not more than 1/2 second, and
(2) with a buffing pressure sufficient to rub the exposed surface of said nib-coat into a tack-free state.

17. The method of claim 16 wherein:
(A) said buffing step is performed with a buffing medium,
(1) having a relatively non-abrasive heat-insulating buffing surface
   (a) which is yieldably pressed against, and into intimate flattened contact over, said contact band.

18. An improved method for eliminating upstanding nibs from the flat face of a wood, hardboard, chipboard and other like cellulosic product, having a smooth regular porous firm white-wood or equivalent surface, as the product moves rapidly through a longitudinal path, comprising:
(A) nib-coating said flat white-wood face of said product with a wood-finishing plastic material of the type,
   (1) which has a film-forming binder of a resinous nature,
   (2) which is capable of flowing under heat and pressure and thereafter assuming a hardened state,
   (3) which, when applied, is in a fluid state such that it is capable of flowing and penetrating said surface to form a nib-coat, and
   (4) which is capable of receiving overlying coatings of other wood-finishing materials including top-coats and intervening base coats; and
(B) compressively buffing said flat nib-coated face frictionally a sufficient number of times to render said face shiny, porous and substantially nib-free, said buffing operation including, as the coated product makes one pass through a buffing zone, the step of buffing said coated face frictionally with a buffing medium
   (1) at a high buffing-speed and
   (2) at a heavy buffing pressure, which is so elevated, above those usable for a scuff-sanding as
      (a) to render said buffing medium capable, during said one pass, of removing substantially all of any excess coating material on the product, and
      (b) to cause said buffing medium to buff against the resistance of said flat white-wood face of said product, as distinguished from the resistance of said coating material on said product,
      (1) with a buffing force sufficient to pressure smooth said nib-coated surface.

No references cited.

WILLIAM D. MARTIN, Primary Examiner.
MURRAY KATZ, Examiner.