June 29, 1937. R. FORTUNE 2,085,463

CELLULOSIC PRODUCT

Filed Feb. 2, 1935 2 Sheets-Sheet 1

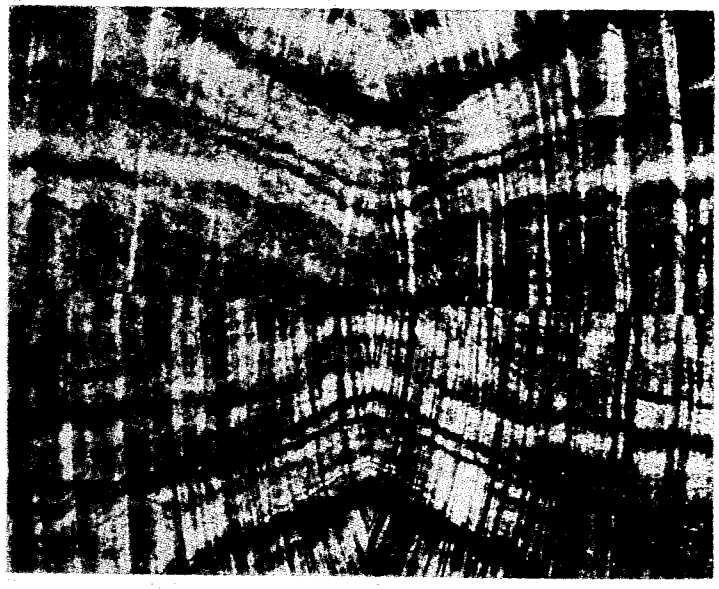


Fig.1.

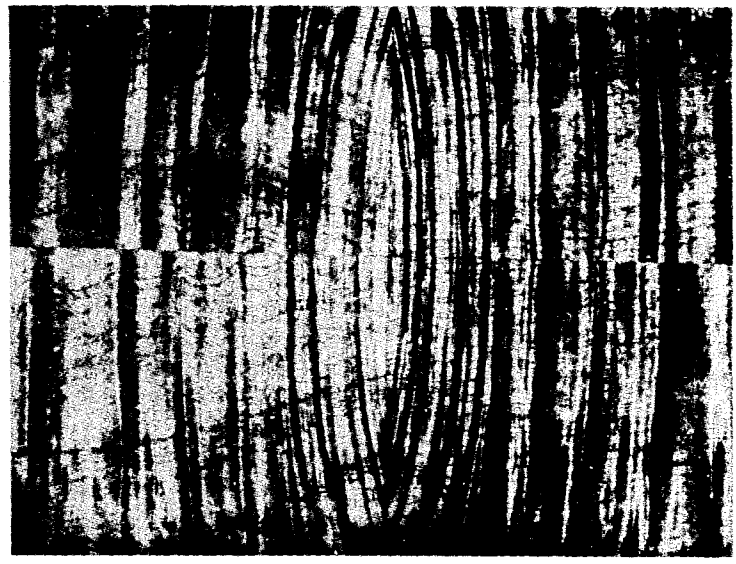


Fig.2.

INVENTOR.

BY Russell Fortune

Wood & Wood

ATTORNEYS

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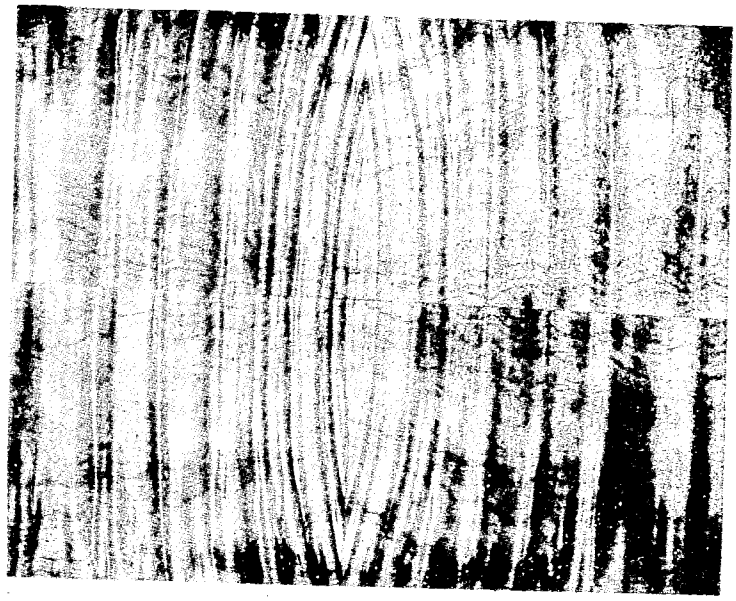


Fig. 3.

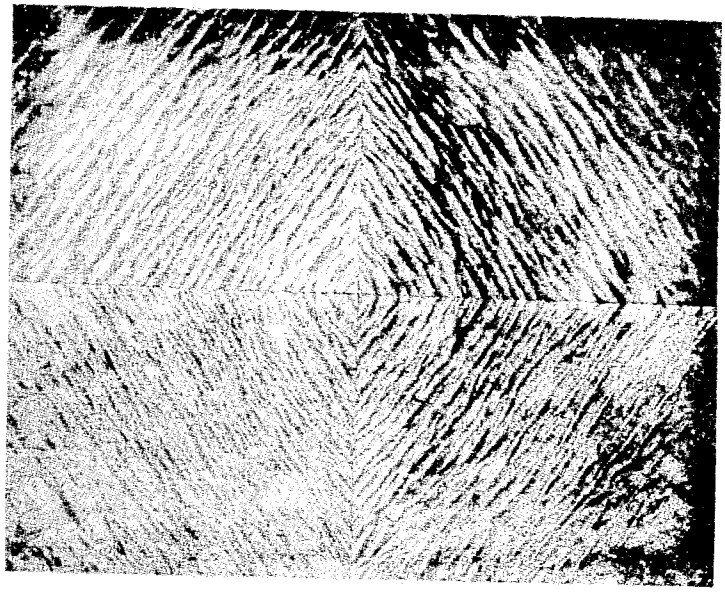


Fig. 4.

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Patented June 29, 1937

2,085,463

UNITED STATES PATENT OFFICE

2,085,463

CELLULOSIC PRODUCT

Russell Fortune, Indianapolis, Ind.

Application February 2, 1935, Serial No. 4,720

9 Claims. (Cl. 20—39)

This invention relates to a new composition of matter manufactured from natural wood and conforming to it in grain structure but different from it in composition, texture and appearance.

Natural wood is a complex substance, the constituting components of which have never been fully determined. It is the present theory that natural wood consists primarily of cellulose and lignin. The structure of the cellulose molecules and the way in which they are united are not known. The term "lignin" is used, in general, to characterize the portions of the wood other than cellulose. While this description of the nature of wood is a broad generalization which attempts to comprehend many conflicting chemical theories as to the nature of wood, still it is adequate for the purpose of explaining this invention to the extent permitted by the present knowledge of wood chemistry.

Wood is used not only for many structural purposes but likewise extensively for decorative effects which may be obtained by its use. Furniture and wood paneling are outstanding examples of the use of wood for this latter purpose. Natural wood, however, has some very definite limitations, both from the point of view of the interior decorator and the furniture manufacturer. In the first place, the color of any given piece of wood is the result of the operation of nature and varies with the specie of tree, its age, the soil in which it grew, climatic conditions which prevailed during its growth, and the portion of the tree from which it was cut. It has been conventional to stain woods variously but in each case the original color of the natural wood has imposed a limitation on the color range to which it could be stained. Also, from the point of view of the manufacturer, it has always been difficult to match woods so that supplying additional pieces or replacing pieces in a given furniture suite was possible.

Of late, there has been a decided trend toward painted wood because the latter inherently avoids the limitations of natural wood as to color. The painting of wood, however, sacrifices its greatest feature of natural beauty, the inherent pattern or figure. Modern interior decoration requires greater latitude and delicacy of color than is possible in natural wood and on this account attempts have been made to substitute synthetic resins or metal products for wood, in furniture, paneling, and the like. However, products of this nature are cold, hard and lacking in natural beauty so that interiors done in these newer materials usually seem impersonal, and cold or unhome-like.

The wood products of this invention retain the character of the natural wood and hence its inherent wood-like quality, but on the other hand are not limited by the natural color of the wood. These products are derivatives of natural wood which retain the cellulosic orientation of the natural wood fibre. They are so modified chemically and/or physically as to other components that a section presents a surface radically different from ordinary wood in appearance, and appeal to the eye. Otherwise expressed, the products of this invention comprise the cellulosic components of natural wood disposed in relation to one another as by nature, but substantially divested of pigmented lignin. The term "pigmented lignin" is used herein to describe natural colors occurring in the wood, whether they be actual components of the lignin itself or dyestuffs of nature deposited in the wood. The pigmentation of wood is no better understood than the chemistry of the lignin (concerning which little is known), and, moreover, the nature of the pigmentation seems to vary from one specie of wood to another. However, the products of this invention may be made from a great variety of woods including oak, maple, beech, aspen, mahogany, ash, koa, Oriental wood, red wood, bubinga, poplar, American walnut, madrone, Oriental silkwood, silky oak, and other woods native to various parts of the world. In all cases the products of this invention are characterized by the substantial absence of pigmented lignin, an absence which imparts a characteristic sheen to the cellulosic structure and paves the way for any desired artificial pigmentation. Therefore, the terminology "natural wood cellulosic structure substantially divested of pigmented lignin" is intended to comprehend not only wood products which are substantially colorless, but also products which have an artificial color which is independent of the original wood color.

The terminology is likewise used to distinguish the products of this invention from ordinary paper, which is a cellulosic structure divested of pigmented lignin but is not the natural wood cellulosic structure inasmuch as the latter is destroyed in the pulping operation.

Since the products of this invention are manufactured from natural wood and since the chemical components of the latter have not been accurately determined, it is impossible to describe the products of this invention as compositions of matter except in relation to the properties of the

natural wood from which the products are derived. Since each variety of natural wood differs chemically from each other variety, and since each specimen of each variety differs from other specimens from different trees of the same variety, it is necessary to make a comparison between samples of wood treated to provide the products of this invention and untreated samples of wood.

The products of this invention are distinguished from the natural wood from which they are made by absence of the characteristic color of the original wood, a lustrous surface, lesser specific gravity, greater permeability and absorbing capacity, and an optical effect which is impossible to describe adequately or to reproduce fully by drawing or photograph.

Natural wood is characterized by the fact that it is differentially pigmented, these differences of pigmentation dominating the visual effect commonly called the wood pattern. If a sample of almost any variety of wood be examined carefully, it will be observed that the pattern is primarily constituted by variations of color ranging from a light brown or yellow through darker browns to black, the particular range in each case being determined by the nature of the wood. Many varieties are of reddish tone or vary from red to red-brown. The products of this invention, on the contrary, are usually a substantial monotone as to color. However, the character of the wood, particularly if it be pronounced, stands out by virtue of variations in the fibre structure of the wood which causes certain portions of the surface to reflect and absorb light differently. While differential light reflection and absorption exists in natural wood, this factor is subordinated from the point of view of appearance by the color intonation. When this latter factor is removed, the appearance of the wood is dominated by the variegations of the relatively light reflective and absorbent areas.

While it is difficult to offer complete and adequate explanation of the difference between the appearance of the wood products of this invention and natural wood, particularly the aesthetic effect, still certain definite changes in light reflectivity have been noted and are mentioned as proffer and partial explanation.

The wood products of this invention (unless artificially colored) have a higher coefficient of light reflection than the original wood from which they are made. As a result the pattern of the wood may provide greater contrasts of reflection and absorption than is possible when the coefficient of reflection is lower. On this account, the pattern of the wood in many specimens stands out very strikingly to the eye. This increase in the coefficient of reflection takes place, to a substantial extent, in the green to yellow chromatic wave lengths, the range to which the retina of the eye is most sensitive. Therefore, the wood products of this invention, while characteristically wood-like because of the accentuation of the wood pattern, still have a characteristic appearance of their own due to their relatively high coefficient of reflection in the chromatic range to which the eye is most sensitive. On this account the products appear live, interesting, scintillating or stimulating in comparison with the more subdued appearance of natural wood.

The use of any great amount of natural wood in interior decoration, whether in paneling or in heavy furniture, produces an effect which is sombre, dignified and, in some cases, actually depressing. On this account natural wood has been used extensively in executive offices, directors' rooms, men's clubs, hotel lobbies, and other formal interiors. Painted woods, on the other hand, have been used more for drawing rooms, bedrooms, and more feminine interior decoration. The wood products of this invention may be used for practically any type of interior decoration, but are particularly suitable for more gay, lively and colorful schemes of decoration.

The products, when not artificially colored, have a sheen and luster akin to that of mercerized cotton, rayon or satin, and whether the effect be due to a more translucent nature of the surface or the greater coefficient of reflection in the color ranges to which the eye is particularly sensitive, still the fact remains that the surfaces are more arresting and interesting to the eye than ordinary wood surfaces. Even if these surfaces be artificially colored, this last specified property of the surfaces is not lost but is, in some cases, actually increased so that whether the surfaces be white, green or black in actual color, they have a certain aesthetic property in common which differentiates them from natural wood.

Unless artificially pigmented, the wood product of this invention is more translucent than the material from which it was made and on this account the surface has the appearance of greater depth. The difference between the transparency or translucency of the products of this invention and corresponding properties of natural wood are accentuated if thin sections be soaked in water. In the case of natural wood, the transparency or translucency is not materially affected, whereas the products of this invention transmit light to a very marked degree when wet out with water. With many varieties of wood, bewildering light effects take place at the surface which cannot be accurately described. For instance, a given portion of the wood appears white when light is reflected from it on one angle, and pale yellow or gold from another angle. On some specimens the grain seems to stand out in white and cream in a given light, but on changing the angle of light the design reverses and the portions which seemed cream become white, and vice versa. With many varieties of wood, for example, maple, the pattern may appear in light and shadow, an effect which the eye interprets as relief. In fact it is difficult to believe some samples are smooth at the surface, except by touching them.

It must be understood throughout this description that the color effects are described from the point of view of an observer, not from the point of view of spectral analysis. By variations in the length of treatment different spectral color readings may be obtained, or by artificial pigmentation various colors are produced, but in all cases the natural color of the wood is substantially nullified so that the finished product without artificial coloration bears no color resemblance to the natural product from which it was made, or with artificial coloration does not resemble the natural product with similar artificial coloration.

Since this invention provides a product characterized by the pattern of the natural wood of a color to the taste of the designer or decorator, the invention has application to the veneer field. At the present time cabinet work and paneling is fabricated with veneers because veneer panels are stronger and have less tendency to warp or check than single thickness panels, and also it is possible to obtain more artistic effects from veneers because of the facility with which wood

patterns may be matched or related. Veneers, in general, are thin sheets of wood ranging roughly from one-eighth to one-onehundredth of an inch in thickness. Obviously, veneers may be made thicker but such a practice would utilize more of the expensive wood and serve no useful purpose at the present stage of development of the veneer art. Veneer may be made up into veneer panels with other layers of wood (laminated structure) or may be attached under pressure to a solid piece of wood or core. Other types of backing for the veneer may, of course, be employed such as canvas, sheet metal composition materials, synthetic resins or the like, although attachment of the veneer to a wooden backing is more common at the present time.

The veneers of this invention are preferably one-eighth to one-onehundredth of an inch in thickness and substantially uniform in composition throughout. This latter feature precludes the possibility of migration of pigmented lignin within the cellulosic structure. The increased porosity or permeability of the veneer of this invention facilitates its attachment to the core or backing and thereby provides a veneer product of greater strength and durability than those previously available. This feature likewise makes possible the use not only of stains normally employed for natural wood, but likewise special finishes or impregnating treatments which may be desirable either to modify color or to modify the textural appearance. The veneer product of this invention is, therefore, superior to natural veneers, both from the point of view of the manufacturer endeavoring to do good, lasting veneer work, and from the point of view of the designer attempting to achieve unusual or artistic effects.

The veneers of this invention are thin parchment-like products, limp when wet, hard when dry, in most cases less brittle than the corresponding natural veneer, and of equal or superior toughness. The specific gravity of the veneers of this invention is usually about 2 to 25% less than the corresponding veneers of equal thickness from natural wood, though loss of weight depends in each case upon the nature of the wood and the degree of the treatment.

It is recommended that the veneers of this invention be of substantially uniform color and texture throughout, that is, relatively homogeneous products. This provides a product which may be sanded or finished to varying depths without alteration of visual characteristics.

The exact nature of the components removed from the wood by the treatment is a matter of speculation. Since the cellulosic structure seems to be structurally intact save for a slight shrinkage or contraction, it would seem that a portion of the lignin is absent. Whether or not the lustrous appearance of the surface is accounted for by lignin removal or chemical change of the cellulose and/or lignin in the nature of hydrolysis, oxidation or chlorination, is impossible to determine. It appears that the products of this invention are intermediate natural wood and paper, the cellulosic structure or grain structure conforming to that of natural wood, the color and texture approaching that of paper.

The veneers of this invention may be constituted by the mild application of incipient paper making chemical processes which remove ligneous color physically and/or chemically without disrupting the cellulosic structure. The components of the wood which are modified and/or removed are those which are soluble in a dilute aqueous solution, the constituting components of which are chlorine gas and an alkali. Various chemicals may, of course, be combined to provide a solution chemically equivalent to the one described. One solution which has been found suitable for making veneer products of this invention is constituted by 100 gallons of water, 5 pounds chlorine gas, 10 pounds technical caustic soda (76%), 37.5 pounds soda ash (58%).

The natural veneer sheets are treated in a bath of this solution over a period of from 4 to 72 hours, the exact length of treatment depending upon the type of wood being treated, its thickness, the ratio of square footage of wood to quantity of solution, and the precise nature of the product desired. For instance, as an example, I have treated maple veneer, one-twenty-sixth of an inch in thickness, of a type known in the trade as Oregon blistered maple, in a bath of this composition for eighteen hours and obtained a remarkably white, lustrous veneer product. In this treatment, 50 square feet of this veneer were used to 100 gallons of solution.

In all cases, a low temperature, such as 120° F., is recommended for drying, though with specialized equipment higher temperatures may be employed.

In the accompanying drawings I have attempted to illustrate my invention as fully as possible.

Figure 1 is a photographic reproduction of a panel faced with natural Hawaiian koa veneer. The veneer was obtained from a half-round cut from stump wood.

Figure 2 is a photographic reproduction of a panel faced with a product of my invention made from successive sheets from the same flitch of Hawaiian koa with which the panel shown in 1 was faced. This veneer was treated in a solution similar to that described in the foregoing example for approximately forty hours, fifty feet of the natural wood being treated in 100 gallons of solution.

Figure 3 is a photographic reproduction of a panel faced with a product of my invention treated similarly to the product shown in Figure 2 but additionally soaked in a 10% solution of copper sulfate for a period of approximately twelve hours.

Figure 4 is a photographic reproduction of a panel faced with a product of my invention made from American maple cut from a tree having a curly grain. This product was obtained by treating the natural veneer in a solution similar to that described in the foregoing example for a period of twenty-eight hours, sixty feet of the natural wood being treated in 100 gallons of solution.

Referring to Figure 1 it will be noted that the natural veneer of the Hawaiian koa of the example is characterized by substantially longitudinal streaks, which in natural color usually are brown. The panel shown in Figure 2, faced with a product of my invention made from sheets successive in the flitch to those sheets used to face the panel shown in Figure 1, may be characterized by a differently appearing texture and by transverse grain pattern. The longitudinal markings appearing in the panel facing reproduced as Figure 1 are relatively imperceptible and the relatively imperceptible transverse markings of the facing shown in 1 appear to dominate or characterize this product of my invention.

Since white furniture is very much in vogue at the present time and since the relatively white wood or veneer constitutes a starting point from which a variety of artificially colored woods may be made, the appended claims are directed generically to the new composition of matter of this invention, regardless of color, and specifically to a colorless wood product. Claims directed to a preferred process of de-colorizing wood appear in my copending application, Serial No. 123,555.

Having described my invention, I desire to be limited only by the ensuing claims:

1. As a new article of manufacture, a sheet of facing veneer structurally intact but of reduced lignin content and devoid of color intonation.

2. A treated veneer product produced from commercial veneer from which a portion of the lignin has been removed, and also characterized by visual accentuation of the original fibre structure and organization on a substantially colorless background having a lusterized surface.

3. A flat and lustrous veneer product produced from commercial veneer but retaining the original fibre structure and character configuration, said product being relatively de-pigmentized, slightly shrunk, characterized by increased activity of water absorption, and having the property of uniformly receiving coloring matter.

4. A substantially colorless chemically treated veneer from which a portion of the lignin has been removed, and which, compared to untreated veneer, exhibits retained original fibre structure and inherent pattern but is characterized by a highly lustrous surface, a contrasting variation in light-absorbent properties between different components of the pattern and increased activity of water-absorption.

5. A veneer surface produced from commercial veneer, said product being free of synthetic coloring matter, characterized by disappearance of the original dominating color matter, substantially even distribution of any remaining natural coloring matter, visible accentuation of the pattern on a background of uniform tone, said veneer surface being lustrous and having an increased coefficient of light reflection with respect to the natural wood from which the veneer was constituted.

6. A sheet of veneer produced from a commercial face veneer from which a portion of the lignin has been removed, characterized by visual accentuation of the original fibre structure and organization, having a lustrous surface and being of substantially uniform composition, texture and color in cross section.

7. As a new article of manufacture, a piece of wood structurally intact as to fibre arrangement as compared to natural wood, substantially devoid of color intonation throughout, having a lignin content lesser in amount than natural wood, and bearing artificial coloration throughout its cross section in uniform tone.

8. As a new article of manufacture, a veneered panel which comprises, a backing and a facing annexed thereto and insulated therefrom by an adhesive, said facing comprising a cellulosic derivative of natural wood exhibiting the fibre orientation and inherent pattern of natural wood but devoid of the natural color of natural wood.

9. A flat lustrous veneer facing produced from commercial veneer, retaining and exhibiting undisturbed fibre orientation and inherent pattern and having a fibre structure in which the natural pigmentation is replaced by artificial coloration throughout.

RUSSELL FORTUNE.