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Williams

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[54] **LAMINATE OF COTTON PAPER CORE WITH RESIN PHOSPHORESCENT MATERIAL SCRIBED TO EXPOSE CORE**

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[52] **U.S. Cl.** ..... **161/2,** 161/184, 161/191, 161/265, 161/410, 161/413, 161/270, 161/259, 8/1 W, 117/33.5 R, 156/67

[51] **Int. Cl.** **B44f 1/04**

[58] **Field of Search** ..... 8/1 W, 4, 116 P; 161/184, 270, 164, 191, 410, 413, 2, 5, 6, 259, 265; 117/33.5 R; 156/67, 62

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[57] **ABSTRACT**

A phosphorescent material is added to the resin which is utilized to coat the core material in an engraving stock. After the surface material of the engraving stock is scribed into words or signals and the core material is exposed, the latter will phosphoresce in a subnormal amount of light.

1 Claim, No Drawings

LAMINATE OF COTTON PAPER CORE WITH RESIN PHOSPHORESCENT MATERIAL SCRIBED TO EXPOSE CORE

This invention relates to articles of manufacture and more particularly to engraving stock. More specifically the invention relates to engraving stock in which the core material is coated with a resin which contains a phosphorescent dye material.

Engraving stock, which is a high pressure laminate, usually comprises a core material which is bonded to a cover material, the cover material either covering one side of the core or both sides. The cover material is usually available in a wide variety of grains or colors and the core material is usually in a contrasting color. By scribing the cover material by any means, such as an electric saw, sand blasting or machine engraving by pantograph, will result in an article of manufacture comprising multi-colored signs, etc. The thus formed engraving stock may be used as an effective means of communication or identification and may be employed as directional signs, room numbers, name plates, control panels, plaques, diagrams, directories, etc., said signs being placed on a wall surface or door in office buildings, hotels and motels, hospitals, schools, etc. However, the signs, room numbers, name plates, etc., usually require a relatively large amount of light in order that the signs may be legible or easily visible.

In some instances, however, it is impossible to provide an adequate source of light whereby the signs, numbers, etc., are readily visible; an example of this would be the cockpit of an airplane in which, especially during flights at night, it is impractical or hazardous to have the necessary amount of light present in the cockpit which would permit a reading of the instruments or signs. This would also apply to the bridge of a ship, such as ocean-going passenger liners, freighters, oilers, etc., or the cockpit of a pleasure boat such as a yacht or motorboat in which an absence of light in the bridge of the ship or cockpit of the boat is necessary, in order that an adequate watch may be had on the water ahead. Another illustration of an area in which an absence of light is desirable are places of entertainment in which the stage is illuminated by means of spot lights or foot lights and the remaining area surrounding the stage outside of the immediate area is in either total darkness or very dim light. In instances where the absence of light is desirable or required, it is therefore necessary that directional signs, signals, numbers, etc., be illuminated by some other means.

It is therefore an object of this invention to provide an engraving stock which may be utilized for directional signs, numbers, etc. in areas subject to either a subnormal amount of light or an absence of visible light.

In one aspect an embodiment of this invention resides in an article of manufacture which comprises a laminate consisting of a resin coated core material and a surface material bonded to each other, said surface material being scribed to expose the core material, said resin which coats said core material containing a phosphorescent material which is internally activated to luminesce in a subnormal amount of light.

A specific embodiment of this invention is found in an article of manufacture which comprises a laminate consisting of an epoxy resin coated cotton paper and a surface material bonded to each other, said surface material being scribed to expose said resin coated cotton

paper, the epoxy resin which coats said paper containing a non-thermally degradable phosphorescent material, which is internally activated to luminesce in a subnormal amount of light.

Other objections and embodiments will be formed in the following further detailed description of the invention.

As hereinbefore set forth the present invention is concerned with an article of manufacture, and more particularly to engraving stock which contains incorporated therein a phosphorescent material. The desired engraving stock which contains the phosphorescent material may be prepared by admixing a phosphor which is non-thermally degradable in nature with a resin such as an epoxy resin, a phenolic-melamine resin, a vinyl resin, etc., in an amount in the range of from about 1 percent to about 3 percent by weight of the resin solids. The aforesaid mixing can be accomplished by any manner known in the art including physical mixing, by stirring, or by any other adequate means. Examples of phosphors which are not thermally degradable under the conditions of curing hereinafter set forth in greater detail will include inorganic sulfides which have been activated with other elements. Particular examples of synthetic phosphors which may be utilized will include the alkaline earth sulfides such as beryllium sulfide, calcium sulfide, strontium sulfide, barium sulfide, etc. which have been activated with various elements such as bismuth, copper, manganese, cerium, europium, samarium, etc. In addition it is also contemplated within the scope of this invention that other sulfides such as zinc and cadmium sulfide which have been activated with bismuth, phosphorous, ammonia, etc. may also be used.

The mixture which results from the admixture of the resin with the phosphorescent material is then utilized to coat the core material of the engraving stock. One method of effecting this coating or impregnation is to charge the core material which, as hereinbefore set forth, may comprise a cotton paper or any other type of paper to a tank containing the resin-phosphorescent material mixture. Following this passage through the tank, the coated core material is passed through squeeze rolls, the space between said rolls being of various thicknesses which will control the amount of resin mixture which will remain on and coat the paper core material. After passage through the squeeze rolls whereby the excess resin mixture is removed, the coated core material is thereafter passed into a curing oven wherein the resin is cured. In one embodiment the curing oven will comprise two heating zones, the initial heating zone being maintained at a temperature from about 220°F to 240°F. After passage through this heating zone, the resin coated core material is passed through a second heating zone at a slightly elevated temperature, the temperature of the second heating zone being from 240° to 260°F. After passage through the curing oven, the core material which is coated with the cured resin, the latter containing the phosphorescent material, is recovered. Thereafter, the core material is cut into the desired size and shape and a sufficient number of the core material sheets are stacked to give the desired thickness of the core. If so desired, in another embodiment of the invention, it is possible to utilize a core material which has not been coated with the phosphorescent containing resin for the desired number of sheets in the inner core, thus only utilizing

the resin coated core material as the outermost ply in the finished core laminate. While it is possible to utilize various colors for the core material, the preferred color for the core material will be white, in order that it may afford the greatest contrast when utilizing cover material of various other colors.

After completion of the preparation of the core material with the predetermined number of ply to effect the desired thickness of said core, a surface material which may also be of paper, plastic or any other suitable material is bonded to the core material. In the preferred embodiment of the invention the surface material will be wood grained, leather grained or of a contrasting color such as yellow, red, blue, green, gray, black, brown, etc. when compared to the color of the core material in order that, after being scribed, the core material will permit the various signs, numbers, names, etc. to be easily legible in ordinary light. The laminate thus prepared which comprises the two surface coatings and the core material is placed between stainless steel plates which have been treated with a release material such as a stearic acid solution to facilitate removal of the stock after lamination and subjected to a sufficient amount of pressure for a predetermined period of time whereby an effective bond is formed by the surface material and the core material. As an example of this step of the process, the laminate may be subjected to a hydraulic pressure of from about 1,000 to about 2,000 pounds per square inch at a temperature in a range of from about 270° to about 280°F. for a period of from about 0.5 to about 1 hour. One percent strength is utilized to release the thus formed lamanate from the stainless steel plates. As hereinbefore set forth, it is to be noted that a required characteristic of the phosphorescent material which is admixed with the resin is that it must be nonthermally degradable under the coating conditions and in the pressure conditions which are required to effect the preparation of the desired laminate, that is, said material must be able to withstand a temperature of approximately 300°F. and still retain its ability to luminesce.

The thus formed laminate is then scribed by various means hereinbefore set forth in greater detail such as by an electric saw, sand-blasting, pantograph engraving, etc., whereby the desired sign, number, name, diagram, design, emblem, trademark, etc. is transcribed through the surface material and the core material of contrasting color is exposed.

When utilizing the engraving stock in an area in which there is an absence of said light, the phosphorescent containing resin which coats the core material will luminesce and thus illuminate the desired sign, etc. This luminescence will take place due to the activation of the phosphor, usually by natural light which has impinged on the exposed surface of the resin coated core material of the engraving stock during the daylight hours. However, if the particular engraving stock is positioned so that it is impossible to activate the same by exposure to natural light the phosphor may be radiated with an exciting light to activate the luminescence of the phosphor. This exciting or activating light may be provided for by a light source such as an ultra-violet light having a wave length less than about 4,000A. and usually in a length from about 25000A. to about 4,000A. The ultra-violet light may emanate from a low pressure mercury vapor lamp where the predominate emission is a wave length of 2,537A., or from a high pressure mercury vapor lamp, a tungsten lamp, a carbon lamp, etc. The thus activated phosphorescent material will reflect a useful visible light of constant intensity and will therefore render the desired sign, number, name, design, etc. visible and readable.

As an illustrative example of an article of manufacture of the present invention a core material comprising a cotton paper is coated with resin mix which has been prepared by physically admixing an epoxy resin, such as that resulting from the reaction between chlorohydrin and bisphenol-A, and 2 percent by weight of a fluorescent material comprising strontium sulfide which is activated with bismuth. The coating step in the preparation of the article of manufacture of the present invention is effected by feeding the cotton paper through a tank of the resin-phosphor mix and thereafter pressing the coated paper through squeeze rolls whereby the excess mix is removed from the surface of the paper. Following this, the coated paper is passed through a curing oven which has a temperature at the inlet portion of the oven of 230°F and a temperature of 250°F adjacent to the outlet portion of the oven. After removal from the curing oven, the core material which is coated with the aforementioned resin-phosphor mix is placed between two layers of a surface material which also comprises a cotton paper and which is of a contrasting color such as black as compared to the color of the core material which is white. The three-ply of the laminate are pressed between stainless steel plates which have been treated with a release material comprising a 1 percent stearic acid solution and pressed for 40 minutes at a temperature of 50 pounds of steam and a temperature of 280°F., the hydrogen pressure which is maintained during the 40-minute period being 1,400 per square inch. At the end of the 40-minute press period, the stainless steel plates are removed and the stock is recovered. The resulting laminate is scribed by means of pantographic engraving whereby the surface material is removed to expose resin coated core material, the particular design being scribed on the core material being a directional arrow. The engraving stock is then cut to the desired size and placed on a wall by any means known in the art such as by the use of wood, sheet metal or machine screws, double sided pressure sensitive tape, or by the use of an epoxy adhesive that will adhere to plaster, paint, wood, glass, metal laminate, or whatever the surface of the wall may comprise. The engraving stock will luminesce in the absence of light due to the phosphorescent material contained in the resin which coats the core material and thus will afford a directional signal in the absence of light. Alternatively if there is no natural light source available to excite the phosphor, said phosphor will luminesce when exposed to the activating rays emanating from an ultra-violet light source.

It is to be understood that the above example is given merely for the purpose of illustrating the present invention and that the novel articles of manufacture are not necessarily limited thereto.

I claim as my invention:

1. An article of manufacture comprising a laminate consisting of a resin coated cotton paper core material and a surface material bonded to said core material, said resin selected from the group consisting of epoxy resin and phenolic-melamine resin, said resin containing a phosphorescent material selected from the group consisting of strontium sulfide activated with bismuth, barium sulfide activated with bismuth and zinc sulfide activated with bismuth, said surface material being scribed to expose said core material, said phosphorescent material being adapted to be internally activated to luminesce in a sub-normal amount of light.

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