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METHOD OF REMOVING EXCESS IMPREGNANT FROM IMPREGNATED WOOD

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1 This invention relates particularly to the removal of excess impregnant from impregnated wood, such as wood that has been subjected to a preservative treatment, for the purpose of minimizing subsequent bleeding of impregnant onto the surface of the treated wood, and this application is a continuation-in-part of my copending application Serial No. 602,687, filed June 30, 1945, allowed September 16, 1949, and now abandoned.

In the preserving of wood by impregnation with chemicals such as creosote, there has long existed a major commercial problem of removing the excess impregnant or otherwise preventing the treated wood from "bleeding." This bleeding or exuding of the creosote onto the outer surface of the treated wood commonly occurs during the subsequent commercial use of the treated product, such as for example creosoted telephone poles and railroad cross-ties. It presents an objectionable wet or sticky surface that interferes with the successful and intended use of the treated wood product. Creosoted telephone poles create a particular problem since they are commonly installed in locations where the wet creosote on a pole which has bled may easily soil the clothing or other property of persons who must pass the pole, so that it presents a constant public annoyance. For this reason creosoted poles are now prohibited in sections of certain cities. Many prior attempts have been made to overcome this bleeding characteristic but no adequate solution to this problem has heretofore been provided.

In accordance with the present invention, I have discovered that by subjecting the wood (previously impregnated with a preservative such as creosote) to an atmosphere of highly heated organic vapor, the excess impregnant is substantially and effectively removed, not only from the outer surface of the wood but also from the outer layers of the wood fibers. As a result of this treatment, the surface of the treated wood is "stripped" clean, and the removal of the excess impregnant adjacent the surface substantially minimizes the usual tendency for the impregnant to bleed onto the outer surface during the subsequent commercial use of the treated wood.

The method of my invention may be applied to any and all types of wood or other material impregnated with preservatives or other compounds that form an excess deposit of the impregnant on the surface of the treated material at the time of or subsequent to the impregnation treatment. In the case of massive forms of wood,

2 such as poles, cross-ties, and lumber for construction of bridges, piles, etc., the impregnation treatment may advantageously be carried out by the well known Rueping process. This process and the equipment for carrying it out are disclosed in Max Rueping U. S. Patents Nos. 709,799, granted September 23, 1902; Reissue 12,707, granted October 22, 1907; and 1,008,864, granted November 14, 1911.

My method of treating the impregnated wood may follow immediately after the last step in the above Rueping process, that is, when the creosoted wood is ready to be removed from the cylinder in which the creosote impregnating treatment has been carried out. By suitable modification of the Rueping cylinder, the treated wood may remain in that cylinder and the highly heated organic vapor, which I use, passed into the cylinder and brought into cleaning contact with the freshly creosoted wood. However, my process may be carried out later, if desired, and in equipment separate from the Rueping apparatus.

An apparatus suitable for carrying out the method of my present invention is disclosed in my copending application Serial No. 579,851, filed February 26, 1945, now U. S. Patent No. 2,435,218. In that application, the apparatus is used for drying green or wet wood with organic vapor. This or some conventional drying treatment, such as yard drying or kiln drying, would normally be carried out on the wood before it is impregnated with creosote or other preservative, since dry wood is substantially more receptive than wet wood to the impregnation treatment. The voids remaining in the structure of the wood after the water has been removed therefrom by the drying operation, are then capable of taking up substantial amounts of the creosote or other impregnant.

If the prior drying operation is carried out in my above mentioned apparatus, the subsequent impregnation and cleaning operations may then follow in the same equipment. An alternative procedure would be to impregnate the dried wood in a Rueping cylinder and then place the impregnated wood in my above mentioned apparatus and carry out the cleaning operation therein with the hot organic vapor.

The operation of my method involves the heating of the impregnated wood with the hot organic vapor which performs the dual function of expanding the cellular structure in the outer layers of the wood and the impregnant therein so that it is forced to the surface of the wood; and, concomitantly, extracting this impregnant

from the surface of the wood by solvent action of the organic vapor as it condenses on the cooler surface area of the wood, which condensate and extracted excess impregnant may be readily drained from the wood and recovered separately from the organic compound or solvent being vaporized for heating the impregnated wood. As a result, this method has the unique feature of providing a continuously fresh supply of organic solvent condensate for extracting the excess impregnant, so that the extracting medium is always maintained at full strength in marked contrast with the usual liquid phase extraction methods.

The type of compound used for the organic vapor and the operating temperature thereof will vary with the impregnant which is being removed in the cleaning operation. The following illustrative but non-limiting examples of materials and procedures which I have used with success, are given for a more detailed understanding of my invention.

Example I

Telephone poles were impregnated with creosote by the conventional Rueping process, using commercial creosote which contains a wide range of fractions from low boiling up to heavy tars and oils. The excess creosote was removed practically and effectively, in accordance with this example, by subjecting the creosoted poles to an atmosphere of the selected organic vapor. In this example the vapor was obtained by heating light, low boiling fractions of creosote. Satisfactory fractions are those having initial boiling points of between 240° F. and 320° F. or somewhat higher.

In this specific case, a creosote fraction having a boiling point of approximately 270° F. was used. The hot vapor of this material was passed into the cylinder containing the creosoted poles and the vapor thus brought into intimate contact with the poles on which the vapor condensed to form a liquid extractant for the excess creosote. This treatment was continued for about half an hour to one hour until the temperature of the cylinder reached the boiling point of the liquid extractant. The flow of hot vapor was then stopped, and a vacuum of about 20-26 inches was applied on the cylinder for about 20 minutes. This vacuum treatment removed the condensed extractant from the surface of the wood. At the end of this treatment, the vacuum was broken and the cylinder and poles were allowed to cool.

After cooling, the poles were removed and were ready for commercial use. The surface of these poles was stripped clean of the excess impregnant normally remaining on the surface and in the exterior layers of the poles, and bleeding did not occur in subsequent use of the poles.

Example II

In this example the product treated was railroad cross-ties, and the treating vapor was a petroleum fraction; boiling at 320° F., the same general procedure as given under Example I above, was carried out; the vapor treating time in this case being one hour and the vacuum treatment being carried out for a half an hour. The cross-ties so treated were clean of excess impregnant and did not bleed subsequently.

The term "organic vapor" as used herein is intended to cover any and all suitable vapors of

organic compounds that will not deleteriously affect the wood or other material treated but will function, as described hereinabove, both to expel the excess impregnant from the outer layer of the material being treated, and to extract and remove the excess impregnant from the surface of the material; the "organic vapor" being further characterized by being heated to a temperature sufficiently high to swell the outer layer of the material or the excess impregnant therein and to enable it to be extracted and become transported away from the material. In addition to the above examples of hydrocarbons, the organic vapor may be obtained from one or more of the following: Coal tar and light petroleum fractions, e. g., benzene, toluene, xylene, and mesitylene; the coal tar fractions containing these compounds being generally designated as benzol, toluol, xylol, and high flash naphtha. Examples of petroleum fractions are those containing heptane through dodecane, which comprise the group commonly included in the range from V. M. P. naphtha through Stoddard solvent. In addition to the above example of commercial creosote for the preservative or impregnant, the following compounds may also be used: Synthetic resins, waxes, asphalt, and pitches.

The temperature range of from about 240° F. to 320° F., as specified in the above examples, for the boiling point of the organic compound or solvent used in carrying out the vapor treatment of the present invention, is the practical operating range and will be found to cover substantially all the compounds that may be usefully employed in the process under normal conditions. The upper limit is determined by the fact that the temperatures reached during the process should not be high enough to cause damage to the wood, which would occur at about 400° F., and which places a preferable upper limit on the boiling point of the organic solvent used at about 320° F., as noted above. A solvent having a somewhat higher boiling point may be used, as already mentioned, if special circumstances in a given instance make this particularly desirable, but usually better results will be obtained if the upper temperature limit of 320° F. is closely observed.

The lower temperature limit is determined in the usual case by the fact that with the lower boiling solvents correspondingly low flash points are encountered, which beyond a certain point render the process unduly hazardous. For this reason, it is recommended that the process not be operated with a solvent boiling below the above indicated lower limit of 240° F., unless the solvent used is a nonflammable type, such as perchlorethylene. A temperature of 240° F. indicates, according to the empirical rule developed by the petroleum industry, a flash point of about 50 to 55° F., which is a minimal value if proper safety precautions are observed in a processing operation of this sort.

Of course if a nonflammable type of solvent is used, the limitations imposed by these safety considerations are eliminated, and the lower temperature limit then becomes a matter simply of providing adequate heating to effect the desired expansion and extraction of the impregnant. However, under these circumstances the practical operating temperature range will usually remain approximately the same because of the necessity for using elevated temperatures to obtain effective heating. For example, preservative impregnation of wood with creosote is generally carried out at a temperature of about 180

to 200° F., so that the wood will have been heated to a temperature of this order during the impregnation treatment and it will consequently be necessary to employ an operating temperature of from 25 to 50° F. higher at the least in order to obtain any material effect in expansion of the impregnant in the outer layers of the wood.

Between the above noted limits, as long as the organic compound used is a solvent for the particular impregnant to be removed, and boils at a temperature sufficiently high to heat the impregnated material so that excess impregnant in the outer layers of the material is expanded or swelled and thereby forced to the surface of the material, the organic compound may otherwise be selected on the basis of such practical factors as cost, relative effectiveness, ease of handling, and the like.

It should also be noted that the above recommended temperature range of from about 240° F. to 320° F. for the boiling point of the organic solvent used, assumes that the process is operated at atmospheric pressure. This will usually be the case as a matter of convenience, and also because the vapors of organic solvents suitable for use in the process are characteristically several times heavier than air which makes it possible to expel air from the system by venting it to the atmosphere (at an appropriate point in the solvent recovery line, for example), and thereby avoid the danger of damage to the wood through oxidation at the elevated operating temperatures.

On the other hand, if it were particularly desired to use a certain solvent having a boiling point substantially above the recommended temperature range, this could be done by operating the process under vacuum. For example, a creosote fraction boiling at 450° F. could under a 24-inch vacuum be made to boil at about 320° F. Evidently, too, the boiling point of a low boiling solvent might be raised to come within the recommended temperature range by operating the process under pressure, although this would not usually be desirable because of the above noted hazard involved in handling the more highly volatile, low boiling solvents. The important point to notice, however, is that the temperature limitations recommended above should be understood to correspond to the pressure in the closed space used for carrying out the process, and while the process will normally be carried out more conveniently at atmospheric pressure, vacuum or pressure conditions could obviously be established to obtain fully comparable results with organic solvents having divergent boiling points.

I claim:

1. The method of removing excess impregnant from wood subjected to preservative treatment and thereby minimize bleeding of the impregnant onto the surface of the treated wood, which comprises heating the treated wood in a closed space by introducing into said closed space vapors of an organic solvent for the preservative impregnant having a boiling point within the range from about 240° F. to 320° F., and continuing introduction of said organic solvent vapors until the temperature in said closed space reaches the boiling point of said organic solvent, whereby the excess impregnant in the outer layers of the wood is expanded and forced to the surface of the wood, and said excess impregnant is extracted by condensate of said organic solvent formed on the surface of the wood in said closed space.

2. The method of removing excess impregnant from wood subjected to preservative treatment and thereby minimize bleeding of the impregnant onto the surface of the treated wood, which comprises heating the treated wood in a closed space by introducing into said closed space vapors of an organic solvent for the preservative impregnant having a boiling point within the range from about 240° F. to 320° F., continuing introduction of said organic solvent vapors until the temperature in said closed space reaches the boiling point of said organic solvent, whereby the excess impregnant in the outer layers of the wood is expanded and forced to the surface of the wood, and said excess impregnant is extracted by condensate of said organic solvent formed on the surface of the wood in said closed space, and then impressing a vacuum on said closed space following heating of the wood to remove all condensed extractant from the surface of the wood.

3. The method of removing excess impregnant from wood subjected to preservative treatment with creosote and thereby minimize bleeding of the creosote onto the surface of the treated wood, which comprises heating the creosote treated wood in a closed space by introducing into said closed space vapors of a light creosote fraction having an initial boiling point within the range from about 240° F. to 320° F., and continuing introduction of said vapors until the temperature in said closed space reaches the boiling point of said light creosote fraction, whereby the excess creosote impregnant in the outer layers of the wood is expanded and forced to the surface of the wood, and said excess creosote impregnant is extracted by condensate of said light creosote fraction formed on the surface of the wood in said closed space.

4. The method of removing excess impregnant from wood that has been subjected to an impregnation treatment and thereby minimize subsequent bleeding of the impregnant onto the surface of the treated wood, which comprises heating the treated wood in a closed space by introducing into said closed space vapors of an organic solvent for the treating impregnant having a boiling point within the range from about 240° F. to 320° F. at the pressure in said closed space, and continuing introduction of said organic solvent vapors until the temperature in said closed space reaches the boiling point of said organic solvent at the pressure in said closed space, whereby the excess impregnant in the outer layers of the wood is expanded and forced to the surface of the wood, and said excess impregnant is extracted by condensate of said organic solvent formed on the surface of the wood in said closed space.

5. The method of removing excess impregnant from impregnated wood and thereby minimizing subsequent bleeding of the impregnant onto the surface thereof, which comprises heating the impregnated wood in a closed space by introducing into said closed space vapors of an organic solvent for the impregnant having a boiling point at the pressure in said closed space not higher than about 320° F. so that said heating is carried out at a temperature substantially below the temperature at which said wood would be damaged by heating, but said boiling point being not less than 25° F. to 50° F. higher than the initial temperature of said impregnated wood whereby said wood is heated by said vapors so that excess impregnant in the outer layers of the wood is

effectively expanded and forced to the surface of said wood, continuing introduction of said organic solvent vapors until said excess impregnant is extracted to a desired extent by condensate of said organic solvent continuously formed on the surface of said wood in said closed space for solvent action at full strength, and draining and recovering said condensate and extracted excess impregnant from said wood.

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