Patented Jan. 28, 1947 2,414,808

UNITED STATES PATENT OFFICE

2,414,808

WOOD TREATMENT

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No Drawing. Application June 22, 1943, Serial No. 491,858

3 Claims. (Cl. 144—309)

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This invention relates to the treatment of wood and more especially to the treatment of wood with urea at high steam pressures to increase the flexibility and plasticity of the treated material.

Since the original discovery of the plasticizing properties of urea, this compound has been applied to the treatment of both solid wood and sawdust. The plasticizing properties of urea were discovered as the result of the development of processes for the chemical seasoning of wood by the application of urea. While experimenting with these seasoning processes, it was found that green wood which had been soaked in a concentrated solution of urea and then dried became flexible and plastic when reheated to a temperature of approximately 212° F.

Although this prior process was a distinct advance in the art of bending wood, it is necessarily expensive because of the length of treatment required and the fact that it was thought that the wood must be completely dried and reheated before bending. The use of urea in high concentration was also believed to be necessary.

One of the objects of the present invention is to overcome these disadvantages of the prior art.

Another object of this invention is to provide a process for increasing the flexibility and plasticity of wood by treatment with urea at high steam pressures.

With these and other objects in view, which will become apparent from the subsequent description, the present invention comprises the treatment of wood at high steam pressures and in the presence of urea to increase the flexibility and plasticity of the material. During this treatment the saturated condition of the treated material is maintained by the high pressures employed. It has been found that under these conditions an appreciably lower concentration of urea may be employed than that hitherto deemed necessary, and that the time required for treatment is substantially less than those previously employed. Wood of any type, grade, or degree of seasoning may be treated in this manner.

After this treatment the product is sufficiently flexible while hot for bending operations and upon cooling is of sufficient plasticity to retain the new shape. This eliminates the necessity for drying and reheating the material and, therefore, further shortens the required time of treatment.

In general, any specie of wood of "piece" size may be rendered flexible and plastic by this process, as, for example, pieces of wood of sufficient size to render them suitable for use as ribs for ships or smaller pieces of strip size such as those

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employed as hoops for baskets and other receptacles.

In fact, the process is especially adaptable for the treatment of wood for use as hoops for receptacles. In this connection, it has been found that wood strips of inferior materials such as green pine and low grade gum and poplar can be used as hoops, if treated in the manner which is to be subsequently described, although hitherto such materials were useless for such a purpose.

In practicing the invention, wood pieces of the desired dimensions are enclosed in a container and subjected to a steam treatment, at high pressure and in the presence of urea, for a sufficient period to render the treated material flexible without causing disintegration of the fiber cells which would destroy the plasticity of the material. The term "high pressure," as used in this application, includes pressures of 50 pounds per square inch or more.

In practice the green material and urea, preferably in crystal form, are enclosed in a container and the steam introduced. During the steaming operation, the condensate and urea form a solution in which the treated material becomes immersed. After the treatment has been completed, the solution is drawn off and, if desired, new crystals may be added for treatment of the next batch of material. However, it has been found that the required concentration of urea is sufficiently low to permit the same solution to again be introduced, after the new batch of material has been placed in the container. Usually several batches may be treated before it is necessary to introduce additional crystals.

In the treatment of wood, especially of strip size, such, for example, as are suitable for use as hoops for wooden receptacles, including baskets, it has been found that a steam pressure within a range of from 100 to 125 pounds per square inch should be preferably employed. Steam at such pressures in a closed receptacle raises the temperature to a range of from 327.8 to 344.4° F., depending upon the pressure within the previously stated range which is employed. For this reason, care must be taken to prevent disintegration of the fiber cells of treated material, due to over-treatment, which would result in a decrease and in such cases in a complete loss of plasticity. It has been found that treatment for 40 minutes is the average required for pine pieces or strips and that gum and poplar require, respectively, 35 and 30 minutes as an average, when pressures within the range mentioned above are employed. The period of treat-

ment required will, however, vary with the pressure employed, higher pressures calling for a shorter period of treatment. The length of treatment is also dependent, to a limited extent, upon the urea concentration which is present.

It is practical to employ solutions containing very low concentrations of urea in this treatment. For example, in the treatment of the above mentioned woods in strip size, it has been found that concentrations as low as 4 ounces of crystal urea to 1 gallon of water are sufficient. This will give a hydrometer reading of 9½ on the specially constructed instrument used for this purpose. If desired, solutions of any higher concentration may be employed. Ordinarily, twice this concentration is employed for heavier pieces to avoid necessitating an increase in pressure or length of treatment over the preferred range that was previously mentioned.

The following examples are given to illustrate an application of the described invention:

Example I

Four bundles of green pine strips weighing approximately 200 pounds were placed in a cylinder 6 inches in diameter and 61 inches long. The average strip was approximately 60 inches long, ¾ of an inch wide and ¼ of an inch in thickness. Five pounds of urea crystals were also added and the aperture in the cylinder sealed. The material was then steamed at a pressure varying between 125 pounds and 135 pounds per square inch maintained for 40 minutes. After drawing off the condensate, the bundles were removed and the strips put through a machine in which they were bent to form hoops for baskets and nailed securely in place. Upon cooling, the strips retained their newly acquired shape with an average shrinkage of approximately 6%.

The process was then continued by charging the cylinder with a second load of bundles. In this case, however, the previous condensate was admitted to the cylinder after it was closed and a sufficient quantity of crystals added to obtain a hydrometer reading of 9½. The steam was then introduced in the manner previously described.

Example II

A bundle of oak beams weighing approximately 70 pounds was placed in the previously described cylinder. The average beam was approximately 10 inches in diameter and had a length of approximately 60 inches. Ten pounds of urea crystals were also added and the aperture of the cylinder was sealed. The material was then steamed at a pressure of 125 pounds per square inch maintained for 40 minutes. After drawing off the condensate, the bundle was removed. It was found that the beams could be readily bent into the form of ribs such as employed for ship construction.

While the previously mentioned examples are given to illustrate adaptations of the invention to the basket-making and shipbuilding arts, it is obvious that the process may be employed for rendering wood flexible or plastic for any purpose. The shortened period of treatment required, the elimination of the drying and reheating steps that have previously been employed and the opportunity to use urea in reduced concentrations are a few of the advantages of this process. The utilization of inferior grades of wood is also an important advance. It is believed that the resulting economies in the material, time, labor, and apparatus are readily apparent.

I claim:

1. A process of increasing the flexibility and plasticity of green pine strips having dimensions suitable for use as hoops for receptacles, comprising steaming the selected material at a pressure of from 125–135 lbs. per square inch for approximately 40 minutes in a closed receptacle and in the presence of approximately 5 lbs. of urea for each 200 lbs. of green pine strips to render the material flexible without destroying the grain structure, and then bending the resulting product while still hot to the desired shape and securing it in this position to the selected receptacle.

2. A process for increasing the flexibility and plasticity of wood strips of suitable dimensions to be used as hoops for receptacles or the like, comprising steaming the selected material under a pressure of from 50 to 135 lbs. per square inch in a closed receptacle in the presence of an aqueous solution containing a sufficient quantity of urea to maintain a concentration of at least 4 ounces of urea to the gallon of water during the process, continuing the treatment for a period of not more than one hour to render the material flexible without destroying the grain structure, and then bending the resulting product while still hot into the desired shape, and securing it in this position to the selected receptacle.

3. A process for increasing the flexibility and plasticity of wood strips of suitable dimensions to be used as hoops for receptacles or the like, comprising steaming the selected material under a pressure of from 50 to 135 lbs. per square inch in a closed receptacle in the presence of an aqueous solution containing a sufficient quantity of urea to maintain a concentration of at least 4 ozs. of urea to the gallon of water during the process, continuing the treatment for a period of from thirty minutes to one hour to render the material flexible without destroying the grain structure, and then bending the resulting product while still hot into the desired shape, and securing it in this position to the selected receptacle.

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