

UNITED STATES PATENT OFFICE

2,503,443

PROCESS FOR IMPREGNATING WOOD WITH SODIUM THIOSULFATE

William A. Knapp, New York, N. Y., assignor to
Allied Chemical & Dye Corporation, a corpora-
tion of New York

No Drawing. Application November 29, 1946,
Serial No. 713,091

1 Claim. (Cl. 117—147)

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This invention relates to processes for increas-
ing the flexibility of wood.

Various methods are known for rendering wood
more flexible and pliable. For example, in the
manufacture of basket hoops where flexibility
of the wood strips employed therefor is an im-
portant feature, treatment with urea, thiourea
and combinations thereof have been practiced
to produce a softening effect on these strips to
thus render them sufficiently flexible for subse-
quent bending operations and prevent excessive
breakage. However, these treating agents fre-
quently darkened the wood under treatment, and
moreover are relatively high-priced materials.

One object of my invention is to provide low-
cost processes for rendering wood flexible with-
out disadvantageous darkening of the wood.
Another object is to afford processes for render-
ing wood strips or sheets flexible for subsequent
bending operations without excessive breakage.

Other objects will appear from the following
description of my invention.

I have found that when wood is subjected to
the action of an agent selected from the group
consisting of water soluble thiosulfates, dithio-
nates and polythionates, its flexibility is markedly
increased and its color is not deleteriously im-
paired.

As applied to wood strips such as may be em-
ployed in the manufacture of basket hoops,
briefly my process is carried out preferably in
the following manner.

Wood strips are placed in a rack in layers and
each layer or a series of layers is sprinkled with
an appropriate amount of one of the above agents
such as sodium thiosulfate in crystalline powder
form. The rack is then transferred to an auto-
clave into which steam at superatmospheric pres-
sure is introduced. The steam condensate dis-
solves the sodium thiosulfate producing a solution
which impregnates the wood. After a suitable
period of such immersion in an atmosphere of
steam, the steam is exhausted from the autoclave,
the rack removed, and the wood strips bent into
the desired shapes usually before cooling. Only a
very small amount of condensate remains in the
bottom of the autoclave after the steaming and
chemical impregnation period. Thus, practically
the entire quantity of softening agent used is
absorbed by the wood.

In an alternative method of procedure, wood
in any desired form such as strips or sheets may
be rendered flexible by immersion in an aqueous
solution of one of the above agents, e. g. sodium
thiosulfate, for a period of time before being

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placed in the autoclave to be acted upon by
steam. The concentration, temperature, and time
of treatment in such a solution may be varied
within wide limits as desired. Normally, time of
treatment in this solution decreases as the con-
centration and temperature of the solution in-
crease. However, concentration and temperature
should not be made so high as to weaken or dis-
color the wood being treated. In a modification
of the latter procedure, an aqueous solution of
the softening agent may be sprayed on the sur-
face of the wood or wood strips and the latter
thereafter subjected to steaming in the auto-
clave.

To obtain good results it is desirable to steam
the wood already having the softening agent ap-
plied thereto in any one of the above noted ways.
Preferably, the treating agent is sprinkled in pow-
der form on the wood which is then subjected to
steaming. The action of the steam brings about
a thorough absorption of the softening agent into
the wood in a minimum of time. However, some
softening and flexibility of the wood is obtained
by merely immersing it in an aqueous solution of
the softening agent preferably at elevated tem-
peratures and soaking therein for a period of
time without subsequent steaming. This feature
is also considered a part of my invention.

The agents employed for producing this soften-
ing effect include any of the soluble salts of thio-
sulfuric acid such as sodium thiosulfate, $\text{Na}_2\text{S}_2\text{O}_3$;
potassium thiosulfate, $\text{K}_2\text{S}_2\text{O}_3$; and ammonium
thiosulfate, $(\text{NH}_4)_2\text{S}_2\text{O}_3$; soluble salts of dithionic
acid such as sodium dithionate, $\text{Na}_2\text{S}_2\text{O}_6$; potas-
sium dithionate, $\text{K}_2\text{S}_2\text{O}_6$; and ammonium dithio-
nate, $(\text{NH}_4)_2\text{S}_2\text{O}_6$; and soluble salts of poly-
thionic acid such as sodium pentathionate,
 $\text{Na}_2\text{S}_5\text{O}_6$; potassium tetrathionate, $\text{K}_2\text{S}_4\text{O}_6$; and
ammonium trithionate, $(\text{NH}_4)_2\text{S}_3\text{O}_6$. Although
the use of the alkali metal salts such as the
sodium salt is preferred, the ammonium salts as
well as salts of other metals imparting sufficient
solubility in water to the softening agent may be
employed with effect. I prefer to employ an
alkali metal thiosulfate in my process in the form
of one of its most readily available salts, sodium
thiosulfate, e. g. the hydrated $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

The amount of softening agent used may be
varied within rather wide limits. In general, for
example, the amount of sodium thiosulfate
($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) to be absorbed or impregnated
into the wood may range from 1 to 6 pounds per
cubic foot of wood. In terms of for instance wood
strips $\frac{1}{4}$ inch $\times$ $\frac{1}{8}$ inch $\times$ 5 feet long, $\frac{1}{2}$ to 3

pounds of sodium thiosulfate per 100 such strips may be utilized.

The steaming process may be allowed to proceed at varying pressures and for different lengths of time provided the combination of temperature thus produced and length of time of treatment are not such as to char the wood by the action of the steam. Thus, in operations such as illustrated in the following example, steam pressures up to 150 lbs. gauge and steaming periods of 10 minutes to 2 hours may be employed. In other operations using wood of greater thickness, steaming time may be proportionally longer.

The following example serves to illustrate the process of my invention.

Wood strips, e. g. from poplar or pine having the dimensions $\frac{1}{4}$ inch $\times$ $\frac{1}{8}$ inch $\times$ 5 feet long were placed in a cylindrical rack with a grating near the bottom. The grating served to prevent any of the strips while in the autoclave from being immersed in a small amount of condensate which may collect at the bottom of the autoclave. When the strips were piled to a height of 4-6 inches, crystalline sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) was sprinkled over the strips in the amount of 1 pound per 100 strips. Another layer of strips of approximately the same height as the first layer was then piled on the first layer and sodium thiosulfate in the amount above noted again sprinkled thereon. This operation was then continued in this fashion with sodium thiosulfate sprinkled between the layers of wood strips until the rack was filled. A total of 12 pounds of sodium thiosulfate was used for approximately 1200 strips.

The rack was then placed in a horizontal autoclave about $5\frac{1}{2}$ feet long by 2 feet in diameter, the autoclave closed, and the steam turned on. The batch of wood strips was steamed for 30 minutes at 120 p. s. i. gauge steam pressure. The pressure was then released, the rack containing the strips removed from the autoclave, and the strips while still warm were bent into hoops for used in the manufacture of covers for bushel-size fruit baskets.

In the bending operation an average of 7 strips in 100 broke whereas average breakage of strips which had not been treated or impregnated with one of the above softening agents was 25 to 30 per 100 strips.

While I have described my process principally in connection with increasing the flexibility of wood strips to facilitate subsequent bending into hoops for use in the basket industry, my process is not to be limited to this application, but may be utilized for softening or increasing the flexibility of wood of any substantial or desirable dimensions. The term "layers" as used in the appended claim is intended to include relatively thin wood bodies such as strips or sheets.

I claim:

The process of rendering thin strips of wood flexible which comprises applying to the surface of successive layers of said strips piled one on the other, powdered $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in quantity of from 1 to 6 pounds per cubic foot of wood, and immersing said layers in a vaporous atmosphere of steam at superatmospheric pressure of the order of 120 p. s. i. gauge up to 150 p. s. i. gauge for a period of time ranging from 10 minutes up to 2 hours to thereby impart flexibility to said wood strips without charring.

WILLIAM A. KNAPP.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
84,733	Cowling	Dec. 8, 1868
1,398,065	Carpenter	Nov. 22, 1921
1,738,132	Wood	Dec. 3, 1929
2,154,433	Boller	Apr. 18, 1939

FOREIGN PATENTS

Number	Country	Date
411,182	Great Britain	June 7, 1934