COPPER PENTACHLOROPHENATE SOLUTION

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No Drawing. Application April 28, 1958
Serial No. 731,122

4 Claims. (Cl. 167—42)

This application is a continuation-in-part of my appli-
cation Serial No. 533,496, filed September 7, 1955, now
abandoned.

This invention relates to a method for the preserva-
tion of wood and particularly relates to a novel wood preser-
vative containing copper pentachlorophenate.

Copper pentachlorophenate has heretofore been used
as a preservative of wood, but it has previously been
necessary to incorporate copper pentachlorophenate into
the wood by means of a complicated technique. Thus,
it is first necessary to form a cuprammonium salt of cop-
er and add this to pentachlorophenol in the presence of
a dilute, water soluble solvent to produce an ammoniacal
solution of copper pentachlorophenate. This solution
must then be used at an elevated temperature and pres-
sure, so the treatment is complicated and expensive. Fur-
ther, since the compound is used with a solvent which
vaporizes, the copper pentachlorophenate is deposited
in solid form and loses its ability to migrate, and thus
does not protect against fresh cuts or holes which may
develop in the wood.

It is therefore one object of the present invention to
provide a stable, non-volatile solution of copper penta-
chlorophenate which readily penetrates wood and which
may be used with or without pressure.

Another object of the invention is to provide a solvent
for copper pentachlorophenate which does not require
the use of ammonia.

Still another object of this invention is to provide a for-
matulation of copper pentachlorophenate which gives
protection to treated wood for an extended period of
time and particularly gives protection against fresh in-
juries to the wood.

A further object of this invention is to provide a penta-
chlorophenate which is easy to store and ship and which
can be diluted before use with relatively inexpensive sol-
vents.

In general, the objects of the present invention are ac-
complished by utilizing a solvent sold commercially as
Lebcol T—40. Lebcol T—40 is a mixture of the methyl
esters of the fatty acids of tallow and is capable of dis-
solving copper pentachlorophenate; copper pentachloro-
phenate may be dissolved in Lebcol T—40 directly, or the
process can be speeded up by employing a bridging sol-
vent, such as ethanol or hexylene glycol.

It is possible to incorporate the copper pentachloro-
phenate into the Lebcol T—40 directly. In general, about
5% copper pentachlorophenate may be incorporated in the
Lebcol solution in this manner. However, a preferred
solution contains only about 3% copper pentachloro-
phenate for when efforts are made to incorporate greater
quantities somewhat unstable solutions are formed. A
temperature of 130—140° C. for a period of about half an
hour is preferably employed as a means of aiding the sol-
bilization of the copper pentachlorophenate in the
Lebcol T—40. The purpose of heating to such a tempera-
ture is to remove water whereby to produce a stable solu-
tion.

Improved results are obtained by mixing the copper
pentachlorophenate with Lebcol T—40 in the presence of
a bridging solvent such as ethanol or hexylene glycol.
Where ethanol is used, a temperature in the neighborhood
of 130—140° C. for one-half hour is necessary, as above,
to drive off the water present in the alcohol. Where hex-
ylene glycol replaces the alcohol, substantially lower tem-
peratures are possible, such as set forth in Example 6
below.

Where only Lebcol T—40 and hexylene glycol are pre-
sent, it is possible to place as much as 40% of the copper
pentachlorophenate in solution. This, however, is not or-
dinarily a stable solution and it is preferred that no more
than about 25% copper pentachlorophenate, as set forth
in the examples, is incorporated in the solution contain-
ing the hexylene glycol and Lebcol. Where only Lebcol
and ethanol are present, the 5% maximum mentioned
above applies with 3% being the preferred concentration
of the copper pentachlorophenate in solution.

The preferred method, however, for the preparation
of the copper pentachlorophenate solution is by the in situ
preparation of the copper pentachlorophenate in the sol-
vent. The copper pentachlorophenate as produced by the
method set forth in my copending patent application, Se-
rial No. 521,629, filed July 12, 1955, is suitable for prac-
ticing the present invention. In that application, a meth-
od is shown of making copper pentachlorophenate by re-
acting pentachlorophenol with copper hydroxide in a
solution of ethyl alcohol. This results in the production
of copper pentachlorophenate dissolved in from one to
two parts of alcohol per part of copper pentachloro-
phenate. The copper pentachlorophenate alcohol solu-
tion can then be added to the Lebcol T—40 to produce a
solution containing as much as about 5% copper penta-
chlorophenate.

Better results are secured where hexylene glycol is used
in place of ethyl alcohol, as set forth in Example 6 be-
low. Far lower temperatures are possible since there is
no necessity for driving off water and, as indicated above,
much larger quantities of the copper pentachlorophenate
may be dissolved. The percentages are as set forth above,
a 40% absolute maximum with 25% being a preferred
maximum in solution.

By heating a mixture of Lebcol T—40 and copper penta-
chlorophenate together at a temperature of from 130—
140° C. for about one-half hour, the two form a solu-
tion either with or without the use of a bridging solvent.
Further, the heating prevents the subsequent formation
of a residue which sometimes happens where bridging
solvent is used without heating.

Where more water is present than can be handled readi-
ly by the coupling agent, the residue formation seems to
take place more readily. Hence, the advantage of heat-
ing to drive off water.

The use of ethylene glycol in combination with Lebcol
T—40 presents an additional advantage. When this mix-
ture is used, it is possible to use substantial quantities of
inexpensive solvents such as the aromatics, paint thinners,
and others (but excluding kerosene and the like). The
less volatile extenders are preferred, such as Aromatic
Solvent 42, since the wood penetration of copper penta-
chlorophenate is greater if the carrier is present for a
longer period of time. Where Lebcol T—40 alone or a
combination of Lebcol T—40 and ethanol are present
without the ethylene glycol, it is found that there is an
insufficiently strong coupling agent present to hold cop-
ner pentachlorophenate in solution should quantities of
paint thinner or stoving oil be added. Hence, it is preferred
to use substantial quantities of extenders only where the
ethylene glycol is used.
The following examples illustrate how solutions may be formed:

**Example 1.**—About 3.5 grams of pentachlorophenol in 50 ml. ethanol is added with agitation to 0.45 gram of copper hydroxide. When solution is complete, 50 ml. of Lebcol T-40 is added and the mixture is heated to 130° C. for one-half hour. The mixture is then cooled and more Lebcol T-40 is added to make a total of 100 grams. The solution contains 3% copper pentachlorophenate and a slight excess of pentachlorophenol. This is more concentrated than is necessary for use and can be diluted to 0.5% solution either with more Lebcol T-40 or with a solvent such as Aromatic Petroleum Solvent 42.

**Example 2.**—A mixture containing 0.45 gram copper hydroxide, 3.5 grams of pentachlorophenol and 50 ml. of Lebcol T-40 was agitated until all of the pentachlorophenol had gone into solution. The mixture was then gradually heated to 130° C. and held at this temperature for one-half hour. The solution was then diluted with additional Lebcol T-40 to make 100 grams and remained stable.

The following examples illustrate the formation of concentrated solutions of copper pentachlorophenate. In Examples 3–5, the copper pentachlorophenate is made in situ by first mixing the hexylene glycol and Lebcol T-40. The pentachlorophenol and copper hydroxide are then slowly added with continuous stirring. The solution is warmed slightly (30° C.) and is stirred for 20 to 30 minutes. A stable solution of copper pentachlorophenate is thus produced which can be employed directly in wood preserving, or which can be diluted to the desired concentration with additional Lebcol T-40 or with less expensive solvents such as Aromatic Petroleum Solvent 42, paint thinner, or the like.

**Example 3.**—To make 10% (by weight) concentration of copper pentachlorophenate:

**Formula**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>45 lbs. hexylene glycol</td>
<td></td>
</tr>
<tr>
<td>45 lbs. Lebcol T-40</td>
<td></td>
</tr>
<tr>
<td>9 lbs. pentachlorophenol</td>
<td></td>
</tr>
<tr>
<td>1.5 lbs. copper hydroxide</td>
<td></td>
</tr>
</tbody>
</table>

**Example 4.**—To make 20% concentration of copper pentachlorophenate:

**Formula**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 lbs. hexylene glycol</td>
<td></td>
</tr>
<tr>
<td>40 lbs. Lebcol T-40</td>
<td></td>
</tr>
<tr>
<td>18 lbs. pentachlorophenol</td>
<td></td>
</tr>
<tr>
<td>3 lbs. copper hydroxide</td>
<td></td>
</tr>
</tbody>
</table>

**Example 5.**—To make 25% concentration of copper pentachlorophenate:

**Formula**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>37½ lbs. hexylene glycol</td>
<td></td>
</tr>
<tr>
<td>37½ lbs. Lebcol T-40</td>
<td></td>
</tr>
<tr>
<td>22½ lbs. pentachlorophenol</td>
<td></td>
</tr>
<tr>
<td>3½ lbs. copper hydroxide</td>
<td></td>
</tr>
</tbody>
</table>

In the above examples, the copper pentachlorophenate was formed in situ in the presence of the Lebcol T-40. However, it is also possible to form the copper pentachlorophenate in hexylene glycol and then add the Lebcol T-40, as is shown in the following example.

**Example 6.**—About 45 pounds of hexylene glycol, 9 pounds of pentachlorophenol and 1.5 pounds of copper hydroxide were stirred together at 30° C. for 20 minutes. This solution of copper pentachlorophenate in hexylene glycol was then added to 45 pounds of Lebcol T-40 and stirred to produce a solution having the same characteristics as that of Example 3.

In the following example, the copper pentachlorophenate was not made in situ, but the solution was prepared from previously made copper pentachlorophenate:

**Example 7.**—To 20 pounds of copper pentachlorophenate there were added with stirring 40 pounds of hexylene glycol and 40 pounds of Lebcol T-40. This produced a solution having the characteristics of Example 4.

The solutions prepared as above may then be used to treat lumber in any desired manner. Although pressure treatment is entirely feasible with the solution, it has generally been found that pressure treatment does not offer any particular advantage since the composition of the present invention readily penetrates the wood upon contact. Further, since the composition is not volatile, it is retained by the wood for an indefinite length of time. When the composition of the present invention is used, it remains a liquid and continued protection is offered as holes or cuts develop in the wood. The wood may be preserved by merely dipping it into the solution, or the solution may be painted onto the surface of the wood. One attractive alternative is the employment of hot and cold dipping.

One indication of the penetrating powers of the solution of the present invention is shown by the fact that 1.4 ml. of a solution prepared as in Example 1 was applied drop-wise to the surface of a ¾” fir board. In a period of twenty-four hours, the solution traveled completely through the board and could be observed on the opposite side.

I claim:

1. As a new composition of matter a mixture of copper pentachlorophenate and the methyl esters of tallow fatty acids.

2. The composition of claim 1 wherein the copper pentachlorophenate constitutes about 3% of the mixture.

3. The composition of claim 1 wherein ethyl alcohol is present.

4. The composition of claim 1 wherein hexylene glycol is present.

References Cited in the file of this patent

UNITED STATES PATENTS

993,827 Ellis ------------------ May 30, 1911
2,209,970 Hay ------------------ Aug. 6, 1940
UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 2,901,395
August 25, 1959

Charles Parkes Matzinger

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, lines 56, 67, and 72, for "ethylene", each occurrence, read — hexylene —.

Signed and sealed this 12th day of April 1960.

(SEAL)
Attest:

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Commissioner of Patents