

UNITED STATES PATENT OFFICE

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CHEMICAL PULPING PROCESS

No Drawing.

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This invention relates generally to the preparation by chemical processes of pulp or fiber such as is used in the manufacture of paper.

It is well known that, in the preparation of fiber, such as wood pulp, by mechanical processes, the product is contaminated with lignin and resinous materials which turn brown on exposure to light. Because of this and also because the mechanically prepared fibers are short and do not mat well, pulp of this character is restricted for use only in the manufacture of cheap paper such as newspaper.

The chemical processes differ from the mechanical processes in the important particular that they function to dissolve the lignin and resinous and fatty materials so that they can be drawn off from the product leaving the fiber or pulp in an uncontaminated condition. Pulp of this character is used in the manufacture of the better grades of paper.

In addition to cellulose, which forms from 40 to 45 per cent of fibrous materials such as spruce wood and which represents the most useful portion of the material, other carbo-hydrates, such as hexoses, hexosans, pentoses and pentosans, are present in proportions ranging from 23 to 28 per cent, the remaining 25 to 35 per cent representing the undesirable lignin, fats, and resinous materials referred to. The other carbo-hydrates, the hexoses, hexosans, pentoses and pentosans, can be usefully employed if retained with the cellulose but they are not so resistant as cellulose to the cooking action of the digesters and some of these carbo-hydrates are broken down into soluble products along with the lignin and resinous material. The result has been that carbo-hydrates have been dissolved and removed from the pulp with the lignin and resinous substances. The removal of carbo-hydrate material is, of course, wasteful and a general object of the present invention is to provide for the removal of the undesirable lignin and resinous content of the material without a corresponding removal of carbo-hydrate substances.

In order to protect the less stable carbo-hydrates against the hydrolyzing effect of the cooking solutions and the resulting breaking

down of the carbo-hydrates into soluble products, attempts have been made to obtain the desired results by employing lower temperatures and a longer cooking period. An increase in yield of pulp has been obtained by this method but the increase has been relatively small and the total gain in efficiency very slight when the increased cost of processing produced by the longer cooking period is taken into account.

My invention contemplates a more effective and more economical method of protecting the carbo-hydrates from being dissolved during the cooking operation than that practised in prior operations. I have found that by adding a solution of carbo-hydrates to the cooking liquor, the solid carbo-hydrates contained in the wood pulp are protected from the dissolving action of the liquor. By thus preventing the dissolving of the carbo-hydrates contained in the wood, I have found that without increase of the time period of cooking a much higher yield of fiber is obtained than is possible by present or heretofore known methods of operation.

I have also found that a convenient and efficient way of supplying the soluble carbo-hydrates required in the cooking liquor is to add to the fresh cooking liquor an appropriate proportion of waste cooking liquor from a previous cooking operation and from which the soluble lignin compounds have been removed. The removal of the lignin compounds either completely or in part is essential to the effectiveness of the operation because in this way a cooking liquor is provided which contains a content or excess of soluble carbo-hydrates which prevents the taking up of further carbo-hydrate material in the solution. I understand that it has heretofore been suggested to add a portion of waste cooking liquor to a fresh batch of liquor for a cooking operation without however first removing the lignin content of the waste liquor therefrom. The partial or complete removal of the lignin content of the waste liquor before re-use is essential to the effectiveness of the operation.

As an example of a method of operation, such as has been outlined, I have had satis-

factory results by the addition to a batch of fresh cooking liquor of an equal volume of waste cooking liquor which has been treated for the removal of the lignin content or a large proportion of the lignin content therefrom. An effective method of treatment of the waste liquor for the removal of its lignin content consists in the addition to the waste liquor of a one per cent proportion of calcium oxide which reacts with the lignin to form a precipitate readily separable from the liquid. Upon the removal of the precipitated lignin the waste liquor is added to the fresh cooking liquor for the carrying out of the operation as described. I do not confine myself to the use of calcium oxide for precipitation of the lignin preparatory to its removal from the liquor, it being apparent that other methods for treating the liquor for precipitating the lignin may be employed.

The method herein described is intended merely to illustrate and not to limit my invention which consists broadly in adding to an acid or neutral cooking liquor carbo-hydrates for the purpose of protecting the carbo-hydrates contained in the wood fiber from being dissolved during the cooking operation, it being evident that the retention of the solid carbo-hydrates in the fiber results in an increase in the yield of pulp produced in the cooking operation.

The terms and expressions which I have employed are used as terms of description and not of limitation, and I have no intention, in the use of such terms and expressions of excluding any equivalents of the features described, or portions thereof, but recognize that various modifications are possible within the scope of the invention claimed.

What I claim is:

1. The process of cooking vegetable fibrous material with a cooking liquor to which has been added a solution of waste cooking liquor containing carbo-hydrates, from which the lignin compounds have been wholly or partly removed.

2. The method of preparing a cooking liquor containing carbo-hydrates which consists in treating waste cooking liquor with a base in sufficient quantity to remove a large proportion of the lignin contained therein but retaining in the solution a large part of its content of carbo-hydrates, separating the solid precipitate from the waste liquor so treated, and adding the resulting waste liquor to fresh cooking liquor.

3. The process of making pulp from fibrous material which comprises cooking the fibrous material in a solution formed of fresh liquor and waste liquor containing dissolved carbo-hydrates and substantially free from lignin compounds.

4. The process of making pulp from fibrous material which comprises cooking the

fibrous material in a solution formed of substantially equal volumes of fresh liquor and waste liquor from which lignin compounds have been removed.

5. The process of making pulp from fibrous material which comprises cooking the fibrous material in a solution formed of substantially equal volumes of fresh liquor and waste liquor containing carbo-hydrates and from which lignin compounds have been removed.

6. The process of making pulp from fibrous material which comprises treating waste liquor containing carbo-hydrates with calcium oxide to precipitate lignin compounds, in removing the precipitated matter, in adding the liquor thus treated to an equal volume of fresh cooking liquor, and in cooking the fibrous material in the liquor thus produced.

7. The process of cooking vegetable fibrous material with an acid or neutral cooking liquor, to which carbo-hydrates substantially free from lignin have been added.

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