

UNITED STATES PATENT OFFICE

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PREPARING REFINED BLEACHED PULP

No Drawing.

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This invention relates to an improvement in the refining and bleaching of fibrous materials, and concerns more particularly an improvement in the refining and bleaching of pulps preparatory to their use in the manufacture of paper and of fiber board.

In the manufacture of bleached pulp from raw fibrous materials, such as, for example, wood and the like, it is usually the practice to digest the raw material with a suitable chemical in such quantities and for such periods of time and at such elevated temperatures and pressures that practically complete solution in the interfibrous material is effected. Thereafter, only a comparatively mild mechanical treatment is necessary in order to effect separation of the fibers from each other; for example, discharging the digestion mass from the digester while under pressure, or passing the digestion mass, admixed with water, through a centrifugal pump, usually constitutes a sufficiently drastic mechanical action for the separation of the fibers, to the production of a crude "pulp".

The raw fibrous material used in the production of "chemical pulp" rarely is uniform in chemical and physical properties,—as a consequence, the interfibrous material in various parts of the raw material usually is dissolved at different rates.

According to the desired character of the pulp to be produced, the digestion treatment may be continued until even the more resistant portions of the raw material are thoroughly digested,—in which case the less resistant portions of the raw material suffer an excessive digestion with a consequent low yield, and reduction in strength of the pulp product,—or, the said treatment may be discontinued when all but the more resistant portions of the raw material have yielded to the solvent action of the digestion agent. In the latter case, the resulting pulp contains bundles of fibers which do not disintegrate into separate fibers under the subsequent mild mechanical treatment commonly given such pulps. In the subsequent bleaching operation, these fiber bundles are not readily and uniformly penetrated by the bleaching agent, with the result that an unsatisfactory un-

evenness of bleaching is obtained; if the major portion of the pulp is correctly bleached, the fiber bundles are insufficiently bleached, and appear in the white pulp as yellowish slivers, bundles or discolorations; or, if the bleaching treatment is made sufficiently drastic to remove the color from these fiber bundles, the major portion of the pulp will have been excessively bleached and the resulting product is of relatively low strength and low alpha-cellulose content. It is in view of the marked disadvantages of the latter described possible bleaching procedure that it heretofore has been the customary practice to carry out the bleaching treatment only so far as correctly to bleach the major portion of the pulp, accepting as inevitable a certain unevenness of whiteness in the final refined product.

The presence of fiber bundles in the bleached pulp affects the subsequent treatment of the pulp prior to its formation into a web of paper. To break up these bundles and to distribute the fibers thereof uniformly throughout the pulp mass, and, likewise, to develop in the pulp the degree of hydration essential to the particular grade of paper to be made, it is customary to subject the bleached pulp to a drastic refining treatment effected by means such as, for example, the heating engine, the Jordan engine, the Claffin refiner, or, more recently, the rod mill. If ordinary (non-stainless) iron, or steel, be used in the construction of those portions of the beating and refining means which come into direct and prolonged contact with the pulp, a sufficient portion of the iron may be and usually is transferred to the pulp to give the latter a more or less dark color, depending upon the area of iron so exposed. To replace the iron or steel with some non-staining material is costly and in the case of the rod mill is impossible from a practical standpoint. As a result, the whiteness of the bleached pulp usually is modified during the operations subsequent to bleaching in two respects, to wit: by discolorations from the beating and refining means, and by discoloration caused by the unbleached fibers of the

fiber bundles not opened up prior to bleaching.

An object of the present invention, therefore, is to provide a method of preparing in an economical manner a final bleached pulp product of uniform whiteness. Another object is to provide such a method in which an economy of bleaching agent may be effected over that heretofore considered necessary, and in which the digestion of the raw fibrous material may be carried out less drastically than has hitherto been considered necessary,—thus effecting an improvement in both yield and strength of the pulps so produced. Further, an object is to provide such a method in which the beating and refining operations may be effected by means of equipment which has not been made stainless to bleached pulp,—thus accomplishing an economy in the cost of equipment.

I have found that the above, and other, objects may be effected by first beating and/or refining the crude pulp and thereafter subjecting the so-treated pulp,—which, except for color, is essentially in the condition suitable for direct use in the web-forming operation of paper making,—to a bleaching treatment. My process, then, consists essentially in the following sequence of steps:

- (1) Digesting the fibrous material;
- (2) Refining and hydrating the resulting pulp substantially to the condition suitable,—save for color,—for direct application on the paper, or paper board, machine; and
- (3) Bleaching the refined and hydrated pulp.

The following procedure is illustrative of the manner in which my process may be carried out. Wood is prepared and digested in the manner common to any of the well known and customarily employed chemical pulping process. The digestion need not be carried to the point where substantially all of the fiber bundles are opened up, but may be terminated while the digestion product is still slightly "on the raw side". The digested product, after discharge from the digester, may then be passed through suitable equipment for the removal of knots, large incompletely digested or "undercooked" portions of wood, and dirt; this operation may, however, be non-essential for many purposes.

The pulp, either before or after removal of knots, incompletely digested raw material and the like, is subjected to the refining and beating operations necessary to prepare the pulp, except for color, essentially in the condition suitable for use directly on the paper, or paper board, machine. Preferably, I subject the pulp to mechanical beating and refining treatment and hydration first in a rod mill of known type, and thereafter completing the said treatment in a Jordan engine. Preferably, the aforesaid mechanical refining and beating operations are so carried out that

substantially all the fiber bundles of the pulp stock are reduced to ultimate fibers. The resulting thoroughly refined and hydrated pulp is then bleached by any of the procedures commonly used in the pulp-making art,—for example, by treatment with a solution or suspension of bleaching powder at raised, or normal room, temperatures in the presence or absence of an acid acting agent, with subsequent water-washing. The amount of bleach necessary to effect the desired degree of whiteness in the final refined and bleached pulp product has been found to be materially less than that heretofore considered necessary, due probably to the homogeneous and "open" condition of the refined and hydrated pulp.

By the foregoing procedure I avoid:

- (1) The low yield and reduction in strength of the pulp product obtaining where drastic digestion is resorted to, for the purpose of scrupulously eliminating fiber bundles; and
- (2) Diminution in the whiteness of the final bleached pulp product because of unbleached fibers from unopened fiber bundles and of discoloration resulting from the mechanical treatment of bleached pulp in contact with ordinary iron or steel; while at the same time effecting an economy of operation, an economy of bleach, and a superior, uniformly-white, bleached pulp product.

It is to be understood that the above improved procedure is applicable equally in the production of papers and of the so-called "paper board".

I claim:

1. Process of preparing a bleached pulp product of a uniform degree of whiteness suitable for use directly in a paper-web-forming operation which comprises digesting raw fibrous material, refining and hydrating the resulting pulp substantially to the condition suitable, except for color, for use directly in a paper web-forming operation, and thereafter bleaching the pulp.

2. Process of preparing a bleached pulp product of a uniform degree of whiteness suitable for use directly in a paper web-forming operation which comprises incompletely digesting raw fibrous material, separating the bulk of incompletely digested portions of fibrous material from the resulting pulp, refining and hydrating the pulp substantially to the condition suitable, except for color, for use directly in a paper web-forming operation, and thereafter bleaching the refined and hydrated pulp.

3. The method of treating fibrous material which consists in pulping the material, screening the pulped stock, subjecting the screened stock to a mechanical disintegration in a rod mill, and bleaching the disintegrated stock.

4. In a method of treating fibrous material the steps of pulping the material, screening the pulped stock, subjecting the screened stock to a mechanical disintegration to reduce the

material to its ultimate fibers, and bleaching the disintegrated stock.

5 5. In a method of treating fibrous material, the steps of pulping the material, subjecting the pulped material to a mechanical disintegration in a rod mill, and bleaching the disintegrated material.

In testimony whereof, I affix my signature.
HORATIO A. HELDER.

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