

UNITED STATES PATENT OFFICE

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METHOD OF PREPARING GROUND WOOD PULP

No Drawing.

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This invention relates to paper pulp and particularly to an improved method of preparing pulp for the manufacture of newsprint and other papers.

Groundwood pulp is the common basis of newsprint papers. It is prepared by grinding wood on a stone to produce a short fibred pulp which is not subjected to chemical treatment and therefore includes the lignin constituents of the wood as well as the cellulose.

In grinding wood, a certain proportion of slivers is produced. It is the practice to separate these slivers from the pulp and to discard them as waste. To avoid excessive waste the proportion of slivers must be reduced to the minimum, generally not more than 5% by weight, by employing a fine surfaced stone. The grinding is therefore relatively slow, a large amount of power is used and the cost of the pulp is correspondingly increased. For example, about 1200 k. w. h. per ton of pulp is consumed in the usual practice.

The short fibres produced by grinding do not produce a satisfactory paper if used alone, and it is necessary to mix 70 to 80 per cent of the groundwood pulp with from 30 to 20 per cent of long fibred pulp produced by the sulphite process. Because of the losses incident to the preparation of sulphite pulp and the cost of the treatment, the addition thereof to the groundwood pulp materially increases the cost of the paper produced therefrom.

Various attempts have been made heretofore to avoid the use of sulphite pulp in the paper, for example, by steaming wood under pressure before grinding. This produces a strong long fibred mechanical pulp, but unfortunately the high temperature and pressure to which the wood is subjected causes discoloration of the pulp, which makes it unsuitable for paper. The discoloration cannot be removed without subjecting the pulp to chemical treatment to remove the ligneous portion of the wood. It has not been practicable, therefore, to produce satisfactory paper from groundwood pulp without the addition of long fibred sulphite pulp.

It is the object of the present invention to provide a method of preparing groundwood pulp in an efficient and economical manner with a sufficient proportion of long fibred material to permit the manufacture of strong and otherwise satisfactory paper therefrom without the addition of expensive sulphite or similar pulp.

We have discovered that the slivers obtained in grinding wood to produce pulp can be converted, by a simple and effective treatment with suitable chemicals at relatively low temperature, into a long fibred pulp without dissolving any substantial portion of the ligneous portion of the wood. The pulp thus prepared is free from discoloration. It can be mixed in any desired proportion with the groundwood pulp from which the slivers were separated to act as a binder therein and thus to produce a strong and satisfactory paper.

Since the slivers are utilized in accordance with our invention, it is no longer necessary to limit the proportion of slivers produced in preparing the groundwood pulp. We can, therefore, grind the pulp by any suitable means, for example, on relatively coarse grindstones or other mechanical devices adapted to convert the wood into pulp. We may, for example, produce pulp with 10 to 40 per cent or more of slivers which are separated by screening or otherwise from the short fibres, subjected to treatment to soften the fibres, and then mixed with the short fibres to produce the finished pulp.

In addition to the saving effected by avoiding the use of sulphite pulp, there is a marked advantage in coarse grinding or other treatment of the wood to produce a large proportion of slivers. The coarse grindstone cuts rapidly so that the time required to disintegrate the wood is materially reduced. The amount of power consumed is also reduced, for example, to about 700 k. w. h. per ton of pulp. Since the softening treatment to which the slivers are subjected is relatively inexpensive, the cost of pulp produced in accordance with the invention is much lower than that of any groundwood pulp heretofore available.

In carrying out the invention we select a suitable wood, usually spruce or fir, and disintegrate it, for example by grinding on a coarse stone, producing thereby short fibre
5 groundwood pulp with upward to 30% or even more of slivers. The pulp is screened in the usual way to separate the slivers, the short fibre being conveyed then to the chest as a basis for the finished pulp.

10 The softening and defibring may be carried out in any apparatus in which circulation can be maintained while the material is heated to relatively low temperature with the softening agent. The circulation results in repeated
15 flexing of the slivers and the consequent defibring thereof. For softening, we prefer to employ a solution of a sulphite or bisulphite of an alkali metal. We may use other softening agents such as alkalis or bisulphites of
20 the alkaline earth metals. Sufficient solution is added to the slivers to permit circulation of the mixture. Preferably the fibre content may be 10% or more by weight. Only a
25 limited amount of the chemical is required since it is not necessary to dissolve any substantial part of the ligneous portion of the wood. Approximately 100 pounds of sodium sulphite per ton of slivers is sufficient for the purpose.

30 The mass is heated by the introduction of steam, for example, but the temperature should not substantially exceed 180° F. The circulation is continued until by reason of the softening action and the continued flexing of the slivers, a pulp suitable for use
35 is produced. This may require two or more hours. The time will vary depending upon the chemicals employed, the concentration of the softening agent, and the temperature
40 maintained.

When the treatment is completed the pulp is removed and again thoroughly screened to remove slivers which have not been sufficiently softened. The balance of the material is a satisfactory long fibred pulp which
45 may be mixed with the short fibred stock. The slivers which are screened from the softened and defibred pulp are returned with additional material for further softening treatment so that substantially none of the original wood substance is lost in the operation.

In the practice of the invention, we prefer to employ apparatus similar to the high density bleachers which are used to bleach paper pulp. Such apparatus of standard design and construction is available. Either
55 vertical or horizontal types may be used. Because of its compactness we prefer to use vertical units comprising a shell of concrete or like material with a lining of tile and a centrally disposed elevator comprising a casing and a worm which lifts the pulp and discharges it at the top of the apparatus into the space between the shell and the elevator.
60 Rakes or ploughs at the bottom of the eleva-

tor connected to the worm shaft draw the pulp into the elevator. Apparatus of different construction may, however, be used to economically handle the material.

The saving of steam and power amounting to approximately 500 k. w. h. per ton of pulp materially reduces the cost of the product. Because the paper is made of material having a uniform composition, that is, lignified fibres of varying lengths, it is possible to produce sheets of greater opacity and more even texture than those secured when groundwood pulp is mixed with sulphite pulp.

Various changes may be made in the details of procedure and apparatus employed without departing from the invention or sacrificing any of the advantages thereof.

We claim:

1. The method of preparing paper pulp which comprises grinding wood to produce short fibred groundwood pulp and slivers, separating the slivers from the pulp, subjecting the slivers to a softening and defibring treatment with a solution of a chemical softening agent and mixing the resulting pulp with the short fibred pulp produced by grinding.

2. The method of preparing paper pulp which comprises grinding wood to produce short fibred groundwood pulp and slivers, separating the slivers from the pulp, subjecting the slivers to a softening and defibring treatment with a solution of a chemical softening agent, separating the resulting long fibred pulp from slivers which are not sufficiently softened, returning the slivers for further softening and defibring treatment and mixing the long fibred pulp with the short fibred pulp produced by grinding.

3. The method of preparing paper pulp which comprises grinding wood to produce short fibred groundwood pulp and slivers, separating the slivers from the pulp, heating the slivers with a solution of a chemical softening and defibring agent and mixing the resulting pulp with the short fibred pulp produced by grinding.

4. The method of preparing paper pulp which comprises grinding wood to produce short fibred groundwood pulp and more than 10% of slivers, separating the slivers from the pulp, subjecting the slivers to a softening and defibring treatment with a solution of a chemical softening agent and mixing the resulting pulp with the short fibred pulp produced by grinding.

5. The method of preparing paper pulp which comprises grinding wood to produce short fibred groundwood pulp and slivers, separating the slivers from the pulp, mixing the slivers with a solution of a chemical softening agent, heating and circulating the mixture until the slivers are converted into long fibred pulp and mixing the long fibred

pulp with the short fibred pulp produced by grinding.

6. The method of preparing paper pulp which comprises grinding wood to produce
5 short fibred groundwood pulp and slivers, separating the slivers from the pulp, mixing the slivers with a solution of a chemical softening agent, heating and circulating the mixture until the slivers are converted into
10 long fibred pulp, separating the softened slivers therefrom, returning the slivers for further softening treatment and mixing the long fibred pulp with the short fibred pulp produced by grinding.

15 7. As an article of manufacture, paper pulp comprising a mixture of groundwood short fibres with long fibres produced by treating the slivers resulting from the grinding with a solution of a chemical softening
20 agent.

In testimony whereof we affix our signatures.

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