This invention relates to the manufacture of glassine and greaseproof paper, etc. and includes an improved method of manufacture and the paper resulting therefrom.

According to the present invention bleached semi-chemical pulps from broad-leaf, short-fibered woods, which pulps contain a large part of the normal hemi-cellulose contents of such woods, are subjected to beating or refining under controlled pH conditions to retain a high proportion of hemi-cellulose in the resulting paper.

The manufacture of glassine and greaseproof papers, etc. is commonly effected by using long-fiber sulfite pulp, such as Mitscherlich pulp, and subjecting it to prolonged refining and beating to effect so-called hydration and with accompanying conversion of the long fibers into shorter fibers to a greater or less extent during the refining and hydrating operation.

The present invention is based upon the discovery that improved greaseproof and glassine papers can be produced from bleached semi-chemical pulp from broad-leaf, short-fibered woods substantially free from lignin and retaining a large proportion of the normal hemi-cellulose content of such woods by subjecting such pulps to refining or beating and hydration with control of the hydrogen ion concentration between about pH 6.0 and pH 9.0 and advantageously between the range of about pH 7.4 and pH 7.8. By such regulation of the pH during the refining and hydrating treatment of the pulp important advantages are obtained both in the refining and hydrating operation and in the resulting greaseproof and glassine papers, etc.

The bleached semi-chemical pulp used in the present process is produced from the wood of broad-leaf trees by subjecting such woods to semi-chemical pulping, e.g., with a neutral or nearly neutral sulfite liquor to soften and dissolve the lignins in the wood chips to permit separation of the fibers by simple attrition. The pulp thus manufactured contains approximately all or most of the hemi-cellulose which is available in the broad-leaf wood. The semi-chemical pulp thus produced by cooking under approximately neutral conditions is distinguished from the pulps produced by the acid and alkali cooking liquors commonly used by its retention of a large proportion of hemi-cellulose which would be largely removed by the acid and alkali cooks.

The semi-chemical pulp contains, in addition to its high hemi-cellulose content, a considerable amount of residual lignin. This is removed from the pulp by a regulated bleaching carried out under approximately neutral conditions, e.g., by multi-stage bleaching with alkali hypochlorite with strict control of pH conditions, temperatures and pressures so that the high hemi-cellulose content is retained in the bleached pulp while the residual lignin is removed.

The resulting bleached pulp will be substantially free from lignin but will contain in addition to the normal cellulosics of the wood a large amount of the original hemi-cellulose present in the wood. Advantageously the bleached pulp will contain at least three-quarters of the original hemi-celluloses present in the short-fiber wood from broad-leaf trees. A high hemi-cellulose content results from the semi-chemical pulping and bleaching operations in which strongly acid and alkali liquors are avoided.

The semi-chemical pulping process and also the bleaching are advantageously carried out so that the pulp, both after the pulping process and after the bleaching, remains slightly on the alkaline side, e.g., around a pH of 7.4.

In making the new glassine and greaseproof papers it is important to subject the semi-chemical bleached pulp of high hemi-cellulose content to treatment within a fairly narrow range of conditions and advantageously at a hydrogen ion concentration which does not deviate to any considerable extent from around pH 7.4. Thus the refining of this stock for the making of glassine, greaseproof or similar papers is advantageously controlled so that the hydrogen ion concentration is within the field of about pH 6.0 to pH 9.0. This range is advantageously further restricted between the narrow field of about 7.4 and 7.8 for optimum physical qualities.

According to one embodiment of the invention the bleached, semi-chemical pulp having a pH of about 7.4 is subjected to beating or refining without the addition of any chemicals so that the pulp does not deviate materially from that pH during the beating or refining operation. By maintaining such conditions during beating or refining the desired hydration is obtained with less power consumption than that normally required in making glassine or greaseproof paper from long-fiber sulfite pulp and hydration can be attained with very excellent fibrillation and without any objectionable or excessive cutting of the fibers to attain desired freeness relation.

The present process can also advantageously be carried out with the addition of metallic compounds and particularly aluminum compounds to the pulp but when such compounds are used care should be taken to control the pH of the
of the present invention are characterized by increased physical strength properties so that, for instance, the bursting test is from 90 to over 100% on the basis weight; total tear by Elmendorf test, totalizing the machine and cross-direction, is 15 to 25 or, the width on the basis; the stretch of the sheet, particularly when plasticized with simple sugars, and/or glycerin is 10 to 15%; and the folding endurance on the Schopper folding tester is more than double that of No. 1 glassine available on the market and substantially to test. What has been previously known of the present invention is supercalendered, as in the making of glassine, the sheet is more transparent than the equivalent grade made from other chemical pulp such as long-fiber sulfite.

The greaseproof and glassine papers of the present invention are characterized by a smooth surface and well adapted for printing or writing with a pen even though the sheet is not sized. The greaseproofness of the sheet is equal or better than similar sheets made from other common materials.

Another advantage of the new paper shown by laboratory tests is that the paper is not influenced by variations in humidity conditions as much as similar papers made from other pulps.

The advantages of the new paper appear to special advantage when the paper is waxed. The waxed sheets retain the desirable qualities of the waxed sulfite sheet without losing the typical glassine qualities. Thus normal waxed glassine paper when crumpled in the hands readily cracks and paper in innumerable points of creasing; while the waxed glassine paper of the present invention does not readily rupture under the same treatment.

Another valuable quality of the paper of the present invention as it comes off the paper machine, the supercalender stack, the waxer, coater, or other converting operation, is a low coefficient of expansion, lower than is normally encountered in similar papers. This is particularly significant considering the slowness of the stock.

The improved properties of the finished paper, whether greaseproof paper or glassine, etc., appear to be due to the high hemi-cellulose content and to its intimate association with the other celluloses of the bleached, semi-chemical pulp. Sheets may thus be readily made which more closely resemble cellophane than greaseproof or glassine paper made by other processes.

It is another advantage of the present invention that it makes possible the production of glassine sheets of lighter weight than can readily be produced from ordinary sulfite pulp but sheets...
which are nevertheless characterized by desirable strength and other properties. Sheets may thus be made of e.g., 15-pound weight, this being the weight of 500 sheets 24" by 36".

The paper above described is made entirely from the bleached semi-chemical pulp by subjecting it to the process of the present invention, and such sheets have important advantages, such as those above mentioned.

Composite papers can, however, be made to advantage by combining the refined and hydrated pulp produced by the present process with hydrated and refined pulps produced by other processes. Thus Mitscherlich pulp, after hydrating and refining and with the use of alum during the process, may be washed to remove the alum and to give an approximately neutral pulp and this refined and hydrated pulp then admixed with the hydrated and refined bleached semi-chemical pulp produced by the present process using, e.g., 40 parts of the sulfite pulp and 60 parts of the semi-chemical pulp. These pulps should be hydrated and refined separately and the final mixture of the pulps which is made after the refining should for maximum strength and greaseproofness be kept within the range of pH 6 to 9 and advantageously around pH 7.4.

The incorporation of the improved hydrated and refined pulp of the present invention with ordinary sulfite pulp gives a composite sheet of improved physical strength properties.

We claim:

1. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and of high hemi-cellulose content to mechanical refining and hydration with regulation of the pH about 7.4 to 7.8 and forming the paper from the resulting refined and hydrated pulp.

2. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and of high hemi-cellulose content to mechanical refining and hydration with regulation of the pH at about 7.4 to 7.8.

3. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and containing upwards of 10% of hemi-cellulose to mechanical refining and hydration with regulation of the pH between about 6 and 9, and forming the paper from the resulting refined and hydrated pulp.

4. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and containing upwards of 10% of hemi-cellulose to mechanical refining and hydration with regulation of the pH about 7.4 to 7.8 and forming the paper from the resulting refined and hydrated pulp.

5. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and of high hemi-cellulose content to mechanical refining and hydration with regulation of the pH between about 6 and 9, and forming the paper from the resulting refined and hydrated pulp.

6. The method of producing greaseproof and glassine papers, which comprises subjecting bleached, neutral-sulfite semi-chemical pulp from broad-leaf, short-fiber woods substantially free from lignin and containing upwards of 10% of hemi-cellulose to mechanical refining and hydration with regulation of the pH about 7.4 to 7.8 and forming the paper from the resulting refined and hydrated pulp.

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