July 13, 1954 B. T. BRIGGS ET AL 2,683,710

PREPARATION OF ALKALI CELLULOSE

Filed April 4, 1950

FIG. 1

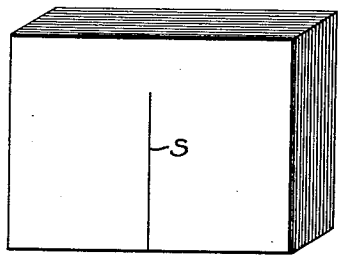


FIG. 2

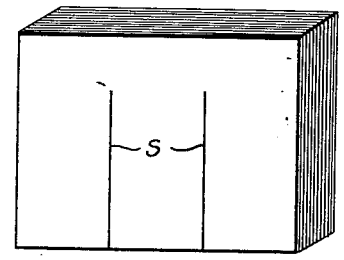


FIG. 3

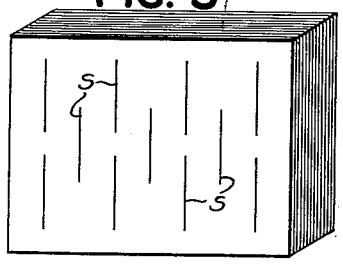


FIG. 4

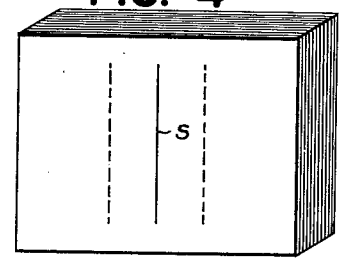


FIG. 5

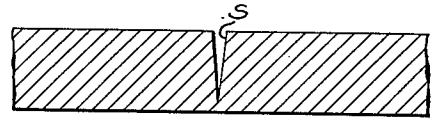


FIG. 6

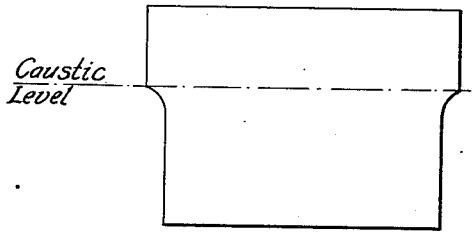
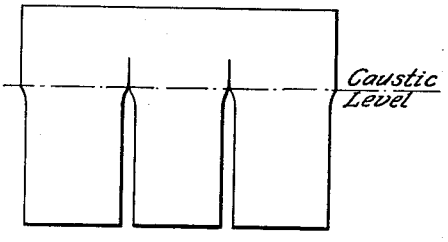


FIG. 7



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UNITED STATES PATENT OFFICE

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PREPARATION OF ALKALI CELLULOSE

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4 Claims. (Cl. 260—233)

1

This invention relates to the preparation of alkali cellulose, and particularly to the use of cellulose sheets in such a process which are cut to give better contact or distribution of the reacting chemicals. For example, in the viscose process, the sheets of the invention wet out more uniformly and completely during steeping in caustic soda and this thorough and more uniform wetting is reflected in better filterability of the resulting viscose solution.

Pulp sheets of the size required by the rayon industry are treated with the reacting chemicals while in books of 10 to 20 sheets varying in size from about 15 x 20 to about 30 x 20 inches, it being not economical to handle an equivalent amount of pulp in smaller sheets. The sheets tend to writhe and buckle when wet with caustic soda in the steeping operation of the viscose process, thus preventing the caustic from complete penetration. We have discovered that, by slitting the sheets while retaining their size, the caustic soda penetration is complete and the filterability of the resulting viscose solution is greatly improved. We may slit the sheet in any suitable manner without severing parts of the sheet or subdividing it into smaller sheets which are uneconomical to handle. For example, the sheets may be cut part way through their width or length or part way through their thickness any desired number of times. While there may be other causes for the unexpected results achieved, it is our present belief that the cut or scored sheets buckle less when wet with steeping caustic because tensions have been relieved.

The invention will be better understood after considering the following discussion taken in conjunction with the accompanying drawings, in which:

Figs. 1 to 4 are views of books of sheets for use in the preparation of alkali cellulose which are slit in accordance with the invention,

Fig. 5 is a sectional fragmentary view of a sheet in which the slit extends only part way through the thickness, and

Figs. 6 and 7 are plan views of slit and un-slit sheets, the lower portions of which have been wet with caustic solution.

As illustrated in the drawings, the sheets varying in width, say, from 15 to 30 inches, are slit any desired number of times and in any desired location. The slits may be in such direction that they will be vertical, horizontal, or diagonal in the steeping press. The slits may be staggered so that they do not occur in the same locations in successive sheets, as indicated in Fig. 4.

2

The slits may be cut to the edges as in Figs. 1 or 2 to form flaps, or they may be cut within the edges as in Figs. 3 and 4.

Instead of making cuts entirely through the thickness of the sheet and only partially across its width, we may make cuts or scores of such depth that the sheets are almost but not quite completely cut through, the depth to be regulated so that in places of stress the sheet would break or tend to pull apart in steeping. This type of cut or score is illustrated in Fig. 5.

Instead of making the slits by cutting or scoring in the finishing operation, they may be made by using suitable devices on the pulp drying machine. The slits may also be formed by the use of high pressure jets, discs, or narrow shoes located at the wet end of the machine. High pressure jets may be used under suitable control to give narrow scoring slits which almost sever the sheet.

In general, pulp sheets shrink in length and breadth and swell in thickness on being wet with caustic soda of steeping strength (18% to 19% NaOH). Shrinkage in the horizontal dimension as caustic rises in the steeping press buckles the dry portions of the pulp sheets and this buckling, together with the swelling which reduces the cross-sectional area of the passages, impedes uniform flow of caustic to the inner parts of the books of sheets. It is not uncommon for certain areas to become wetted by caustic solution which, through working its way into the region at least partially by diffusion and wicking rather than by stream flow, has lost a high proportion of its caustic soda content.

Pulp fibers from these areas which are identifiable as "brown spots" resist solution in the viscose process and impart poor filtration characteristics to the viscose solutions.

The buckling effect resulting principally from horizontal shrinkage is a more or less direct function of uninterrupted sheet width. Also, the volume of caustic which must flow in from the ends of the book during the press filling period is directly proportional to the horizontal length of the book of sheets provided height is constant.

It appears that in large part the improvement in steeping and therefore in filtration arises from the reduced tendency of the cut or scored sheets in the books to warp, buckle, and bind. The forces which cause the distortion of the sheets result mainly from horizontal shrinkage as the sheet becomes wet with caustic. As is diagrammatically represented in Figs. 6 and 7, the hori-

zontal shrinkage at any given level is directly proportional to the uninterrupted sheet width at that level. The decreased buckling obtainable by cutting or scoring is readily apparent during steeping.

Sheets slit according to the invention show a marked decrease in the number of "brown spots" in the steeped sheets after the excess caustic soda has been squeezed out. Better filterability of the viscose solution formed from the sheets is illustrated by the following viscose plugging values measured in total grams of viscose solution passing through one square centimeter of filter area in infinite time. Column A represents viscose made from sheets of the invention and column B non-slit control sheets:

Pulp Sample No.	Column A	Column B
1	545	177
2	1,740	425
3	905	425
4	1,355	470
5	830	200
6	1,045	200
7	1,950	210

In accord with the marked decrease in number of "brown spots" previously noted, the foregoing tests show that cutting or scoring the sheets effects a marked decrease in viscose plugging values in the conventional viscose process. Such an increase in filterability permits less frequent filter changes, thus effecting significant savings in the commercial viscose processes.

The advantage of improved steeping and improved alkali cellulose uniformity likewise applies to any other process where alkali cellulose is made by steeping books of pulp sheets. In general, the advantages gained by the use of cut or scored pulp sheets apply wherever it is desired to improve uniformity of wetting of books of pulp sheets in solutions which cause pulp sheets to shrink or swell. While the slits, cuts or scores preferred in our process do not involve removal of any portion of the cellulose sheet—i. e. the slit, cut or score in the dry sheet has no appreciable width—similar effects could be obtained by slots or "cut-outs" of finite width, these to be located as previously specified for the slits, cuts, or scores of our invention.

We claim:

1. The improvement in the preparation of alkali cellulose which comprises subjecting a book of disconnected cellulose pulp sheets, each of which has at least one slit, to steeping in a caustic steeping solution, whereby on shrinkage of the sheets a passageway forms at the slit, resulting in a better flow of the steeping solution into the sheets.

2. The improvement in the preparation of alkali cellulose as defined in claim 1 in which each sheet has a plurality of slits each extending from one edge almost to the opposite edge, thereby forming a plurality of flaps on each sheet.

3. The improvement in the preparation of alkali cellulose as defined in claim 1 in which the slit of one sheet is staggered with respect to the slit of an adjacent sheet so that the slits do not occur in the same locations in successive sheets.

4. The improvement in the preparation of alkali cellulose as defined in claim 1 in which each sheet has a plurality of slits each of which extends from one flat surface at least half way but not entirely through the thickness of the sheet.

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