Aug. 6, 1968 K. C. LOGAN ETAL 3,396,069

WOOD CHIP

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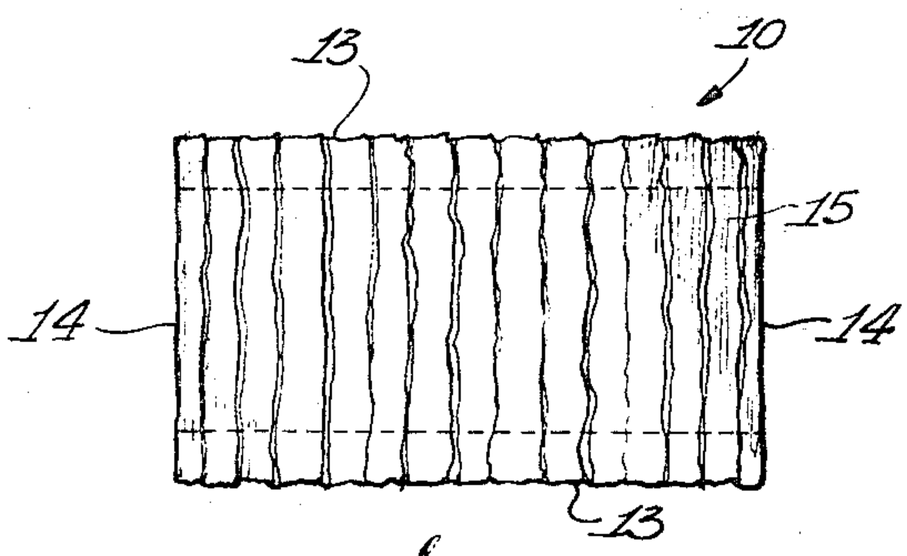


Fig. 1.

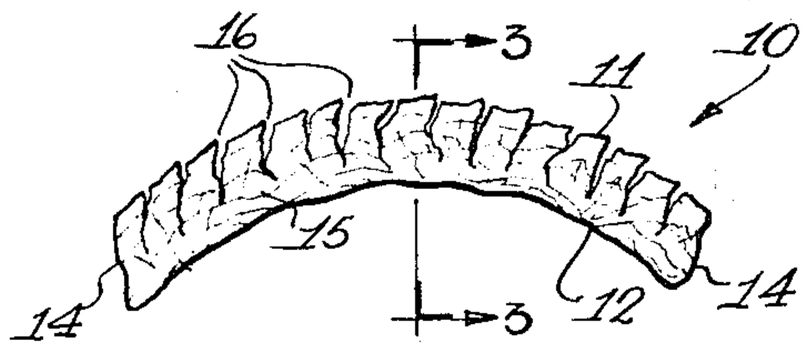


Fig. 2.

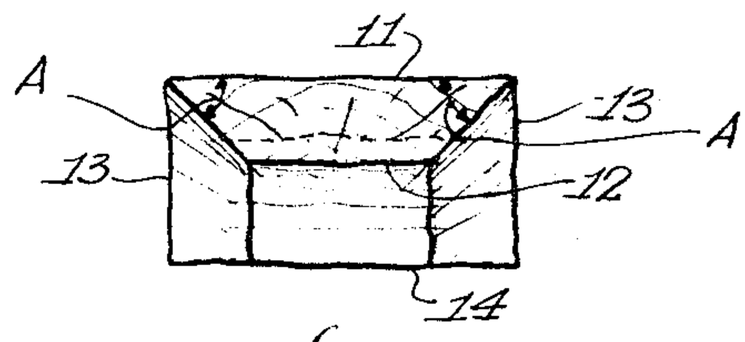


Fig. 3.

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# WOOD CHIP

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Continuation-in-part of abandoned application Ser. No. 258,697, Feb. 15, 1963. This application Nov. 20, 1964, Ser. No. 412,795

6 Claims. (Cl. 161—117)

## ABSTRACT OF THE DISCLOSURE

Wood chips for paper making pulp each being of curved contour whereby one major surface is convexly curved and the other major surface is concavely curved, there being a plurality of cracks in the convexly curved surface extending in the grainwise direction of the wood. Each chip has a thickness of about 0.1 to about 0.3 inch and a maximum dimension from end to end and from side to side of six inches.

This invention relates to wood chips for use in the production of pulp for paper making. This application is a continuation-in-part of patent application Ser. No. 258,697, filed Feb. 15, 1963, now abandoned.

It has long been recognized that the characteristics of chips as produced for pulping have a very substantial effect upon the quality of the resulting pulp. One of the most important of these characteristics is the fiber condition of the chips employed. If the fibers in the chips are in damaged condition, the resulting pulp will be of lower quality depending upon the extent of fiber damage in the chips.

Another factor that has a substantial bearing upon pulp quality is the dimensional characteristic of the chip. The most important dimension is that of thickness. If the chip is excessively thin it will be overcooked. If it is too thick, it will not be cooked in the center and pulp screen rejects will be high.

It is also highly desirable, for uniform pulp quality, that the chips employed conform to certain uniform characteristics including size.

It is an object of this invention to provide a wood chip for pulping which possesses desirable shape, size and other characteristics whereby there is achieved better uniformity in pulp production with consequent greater yield of good quality pulp and less reject material.

Another object of the invention is to provide a wood chip for pulping the fibers of which have minimal damage as compared with the natural state thereof whereby pulp produced therefrom is of higher grade.

The invention resides in a wood chip for pulping which comprises a body having two major side surfaces in opposed relation to each other and substantially uniformly spaced from each other, two side edge surfaces, and two end edge surfaces, each of the side edge surfaces being approximately at right angles to the grain of the wood in the body whereby the grain extends substantially transversely of the major side surfaces. The space between the major side surfaces is about 0.065 to 0.500 inch. The chip is curled somewhat, one of the major side surfaces being convexly curved and the other being concavely curved. The convexly curved surface has therein a plurality of cracks extending from one to the other of the side edge surfaces. Each of the side edge surfaces is disposed at a specified angle of 85° to 5° to one of the major side surfaces.

Further, in accordance with the invention, the fibers in the chip body are compressed in the grainwise direction thereof less than 0.060 inch per inch as compared with the natural condition of the fibers.



The invention will be described with reference to the accompanying drawing, in which

FIGURE 1 is a plan view of a chip in accordance with the invention,

FIGURE 2 is a side elevation, and

FIGURE 3 is an end elevation.

Referring to the drawing, the chip **10** has two major side surfaces **11** and **12**, surface **11** being convexly curved and surface **12** being concavely curved. The chip also has two side edge surfaces **13** and two end edge surfaces **14**. The grain or fiber direction of the chip, as indicated at **15**, extends transversely of the major side surfaces **11** and **12**, that is; substantially right angularly with respect to side edge surfaces **13**.

The thickness of the chip, that is; the distance between the major side surfaces **11** and **12**, is substantially uniform throughout and about 0.1 to 0.3 inch.

It has been found that the selection of chips of the specified thickness is necessary for most effective pulp production. As previously indicated, chips of a thickness above about 0.3 inch are unsuitable because pulp screen rejects are unduly high. Use of chips having a thickness below about 0.1 inch is undesirable because the bulk density is reduced and, furthermore, the production capacity of batch pulping equipment is reduced.

The chip dimension in the grainwise direction thereof, that is, the distance between side edge surfaces **13** may range from about ½ to 6 inches.

The chip dimension in the crossgrain direction thereof, that is, the distance between end edge surfaces **14**, may range from about one to six inches.

The chip employed in accordance with the invention is somewhat curled as shown in the drawing, that is, the surface **11** is convexly curved and the surface **12** is concavely curved. Such a curled chip has a plurality of transverse cracks **16** in the surface **11** thereof, each such crack extending substantially from one to the other of edge surfaces **13**. These cracks occur at a spacing of not substantially more than one-quarter inch. Moreover, since the thickness of the chip will not substantially exceed 0.3 inch, the depth of each crack is substantially greater than one-half of such thickness.

The presence of the grainwise splitting or cracking condition of the chip is of significant importance since it results in the presentation of a greatly enlarged chip surface area for penetration of pulping chemicals with consequent more uniform reaction conditions.

Each side edge surface **13** is disposed at an angle of 85° to 5° to the major side surface **12**. It has been found that when the chip has been formed by cutting at such an angle (indicated at A in FIGURE 3) to produce such side edge surfaces, fiber damage is reduced.

The invention further resides in selecting a chip having not only the aforementioned characteristics but one in which there is granwise compression less than 0.060 inch per inch as compared with the natural conditions of the fibers in the chip. By "natural condition" as employed in this specification and claims is meant the condition of the particular fibers in the log before the chip was cut therefrom.

It has been found that, if the fibers of the chip are not more greatly compressed than 0.060 inch per inch of wood, the fiber damage is not of great consequence and pulp produced therefrom will be of uniformly high quality.

Sulphite pulp prepared from chips produced in accordance with the invention has much superior qualities as compared with sulphite pulp prepared from chips produced by presently available commercial chippers. The following tables give the results of comparison tests, column numbered (1) being values relating to regular pulp prepared from chips produced in conventional commer-

cial manner and column numbered (2) being values relating to pulp prepared from chips produced in accordance with the invention.

| A. BLEACHED SULPHITE PULPS | | |
|---|---|---|
| Beater Evaluation—Properties at 300 C.S. Freeness: | (1) | (2) |
| Burst Factor | 51 | 67 |
| Tear Factor | .67 | .72 |
| Breaking Length (meters) | 8,400 | 10,200 |
| Dynamic Breaking Stress (cm./kg.) | 1.6 | 2.0 |
| Static Breaking Stress (kg.) | 7.7 | 8.8 |
| Stretch (mm.) | 2.9 | 3.4 |
| Bulk (cc./g.) | 1.29 | 1.28 |
| Beating Time (min.) | 54 | 40 |
| Fiber Length Classification Percent: | | |
| Retained on 14 mesh | 4.5 | 11.2 |
| Retained on 30 mesh | 31.6 | 40.3 |
| Retained on 100 mesh | 29.9 | 24.8 |
| Percent Fines (pass 100 mesh) | 34.0 | 23.7 |
| Ball Mill Evalutation—Properties at 300 C.S. Freeness: | | |
| Burst Factor | 48 | 58 |
| Breaking Length (meters) | 7,600 | 9,000 |
| Fold (M.I.T.) | 240 | 1,000 |
| Beating Time (min.) | 144 | 144 |
| Fiber Length Classification Percent: | | |
| Retained on 14 mesh | 21.1 | 34.3 |
| Percent Fines (pass 100 mesh) | 22.6 | 6.5 |
| **B. UNBLEACHED SULPHITE PULPS** | | |
| Properties at 300 C.S. Freeness—Heater Pulp Test: | | |
| Burst Factor | 60–65 | 76–80 |
| Tensile, Breaking Length | 10,550–11,000 | 12,000–12,500 |
| Impact Tensile | 9,700 | 10,800 |
| Porosity (relative) | 1.0 | 0.5 |
| Double folds | 200 | 600 |
| Percent long fibers (retained on No. 14 mesh) | 5–26 | 24–41 |
| Resistance to Mechanical Damage: | | |
| Percent long fibers (retained on No. 14 mesh) in untreated pulp | 26 | 41 |
| Percent long fibers (retained on No. 14 mesh) in pulp treated Waring Blendor | 11 | 29 |
| Resistance to Acid Hydrolysis: | | |
| Percent long fiber (retained on No. 14 mesh) after hydrolysis in 0.25 N. sulphuric at 100° C | 19 | 33 |
| Same as above after treatment in Waring Blendor | 2 | 4 |
| Percent long fibers retanied in No. 30 mesh in above pulp after treatment in Waring Blendor | 39 | 48 |

We claim:

**1.** A wood chip for production of papermaking pulp which comprises a body having two major side surfaces



in opposed relation to each other and substantially uniformly spaced from each other, two side edge surfaces, and two end edge surfaces, each of said side edge surfaces being approximately at right angles to the grain of the wood in said body whereby said grain extends substantially transversely of said major side surfaces, said major side surfaces being spaced from each other about 0.1 to 0.3 inch, the distance between said side edge surfaces and between said end edge surfaces being not substantially greater than six inches, one of said major side surfaces being convexly curved and the other of said major side surfaces being concavely curved, said convexly curved surface having therein a plurality of cracks extending from one to the other of said side edge surfaces, each of said side edge surfaces being disposed at a specified angle of 85° to 5° to one of said major side surfaces.

**2.** A wood chip for pulping as defined in claim **1**, each said crack being spaced from an adjacent crack less than about one-quarter inch.

**3.** A wood chip for pulping as defined in claim **2**, each said crack having a depth at least half the distance between said major side surfaces.

**4.** A wood chip for pulping as defined in claim **1**, the fibers in said body being compressed in the grainwise direction thereof less than 0.060 inch per inch as compared with the natural condition of said fibers.

**5.** A wood chip for pulping as defined in claim **1**, said angle being 45° to 15°.

**6.** A wood chip for pulping as defined in claim **1**, the distance between said side edge surfaces being one-half to six inches, the distance between said end edge surfaces being one to six inches.


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