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BLEACHING OF PULP

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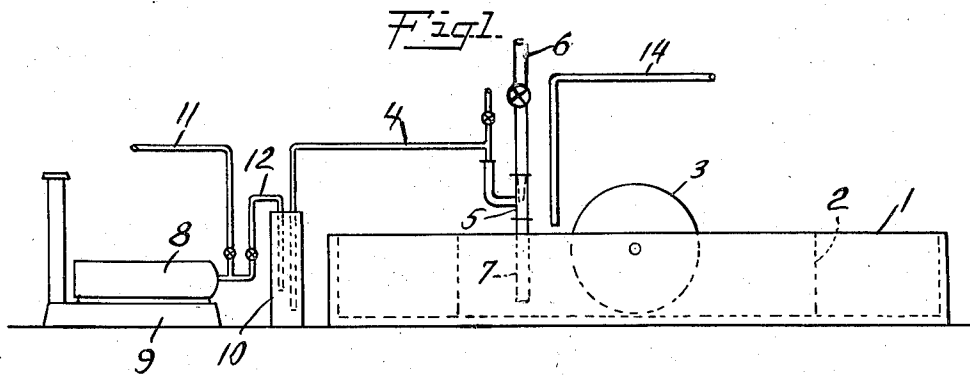
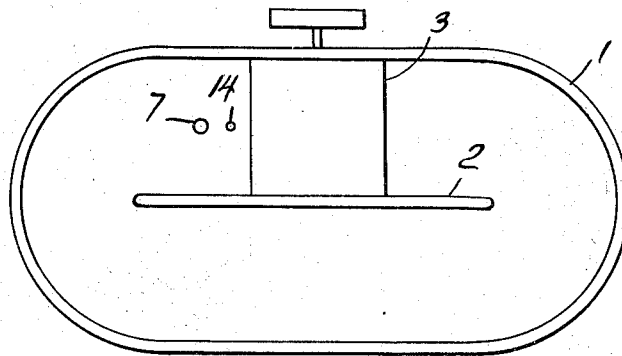


Fig. 2.



J. Alden Extrom
Hoke Martin

INVENTORS

Peniel Davis ^{BY} *Marvin Edmunds*
ATTORNEYS

UNITED STATES PATENT OFFICE

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BLEACHING OF PULP

John Alden Extrom, Tomahawk, Wis., and Hoke Martin, Chicago, Ill.; said Extrom assignor to Tomahawk Kraft Paper Company, Tomahawk, Wis., a corporation of Wisconsin and said Martin assignor to The Mathieson Alkali Works, Inc., New York, N. Y., a corporation of Virginia

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5 Claims. (Cl. 8-2)

This invention relates to improvements in the bleaching of pulp, and particularly of kraft pulp, with chlorine, with continuous neutralization of the pulp during bleaching.

It has been found that pulp absorbs chlorine very fast at first, but more slowly after about 2 to 5% of chlorine on the weight of the pulp has been absorbed. It has also been found that by neutralizing the acid products in the pulp suspension the pulp regained all or most of its avidity for chlorine absorption. These discoveries are taken advantage of in the present process by adding lime more or less continuously to maintain a fast rate of chlorine absorption by the pulp during the bleaching of the pulp by the addition of chlorine.

In the practice of the present process, lime is added continuously to the pulp while the chlorine is being added. Apparently the chlorine reacts first with the pulp, and the hydrochloric acid formed then reacts with the lime. The lime is added either in a continuous manner or with the addition of small amounts of lime intermittently and frequently so as to obtain in effect a continuous addition. We have found that when this is done the pulp obtained is of good quality, the chlorination and bleaching can be carried out rapidly, and degradation of the fiber can be prevented, or minimized.

In carrying out the present process, the pulp suspension is advantageously maintained at a pH between about 4 and 8; and, even though the pulp suspension may be alkaline, apparently the chlorine reacts first with the pulp and the acid by-products then react with the lime.

While the amount of lime used can be somewhat varied, we have found that, in the bleaching of kraft pulp, an amount of lime equal to about one pound of hydrated lime, $\text{Ca}(\text{OH})_2$, for each pound of chlorine used is suitable; and an amount of chlorine corresponding, e. g. to about 200 pounds of chlorine per ton of pulp.

The present process can be carried out with pulp at ordinary temperatures and without the application of heat or refrigeration. In the bleaching of pulp alone, the average temperature used may be, e. g., around 60° F., varying for example between about 32° and 85° with the season of the year.

The consistency of the pulp can be somewhat varied but we have found a pulp suspension of about 5% consistency well adapted for use in the practice of the process.

In the bleaching of the pulp, the chlorine is advantageously added in a continuous manner

and with suitable agitation of the pulp to insure rapid and effective distribution and dissemination of the chlorine in the pulp so that it can exert its rapid action on the pulp. The chlorine can thus be added, for example, by absorbing it in water and adding the resulting chlorine water, as by the use of a water ejector for absorbing and introducing it into the pulp.

The process can be carried out in different types of apparatus, for example in the ordinary beater. When a beater is used, the chlorine water is desirably introduced into the pulp ahead of the beater roll; and the lime is desirably introduced in the form of milk of lime between the point of chlorine introduction and the beater roll. The separate introduction of the chlorine and of the milk of lime appears to be advantageous in permitting rapid action of the chlorine on the constituents of the pulp, while the separate but approximate introduction of the lime results in rapid neutralization of acid and the maintenance of rapid chlorine action.

In the practice of the invention, different types of apparatus can be used such as are commonly used for the bleaching of pulp, with separate addition of the chlorine so that it will be distributed in the pulp and absorbed and diluted thereby and with separate addition of the lime so that it is distributed throughout the pulp after the pulp has been intimately admixed with the chlorine and after the chlorine has had an opportunity to act upon the pulp.

One suitable form of apparatus for the practice of the invention is the ordinary beater, together with the provision for the introduction of the chlorine and the lime; and the invention will be further described in connection therewith.

In the accompanying drawing, Fig. 1 is an elevation showing one form of apparatus, in a somewhat conventional and diagrammatic manner, and Fig. 2 is a plan view of the apparatus.

In the apparatus illustrated, the beater 1 has the usual midfeather 2 and the roll 3 for circulating and beating the pulp. Chlorine gas is introduced through the line 4 and ejector 5, having water supply pipe 6, and the chlorine water is discharged into the beater through the pipe 7 so that the chlorine water enters the pulp in the beater near the bottom and a short distance ahead of the beater roll.

The source of chlorine illustrated is a container 8 mounted on scales 9, so that the chlorine can be weighed, and a vaporizer 10 of suitable construction, which may be operated for exam-

ple with low pressure steam. The vaporized chlorine passes through the line 4 to the ejector 5 where the chlorine is mixed with water and from which the resulting mixture is discharged into the beater ahead of the beater roll. A further supply of liquid chlorine can be supplied to the container 3 through the line 11, e. g. from a tank car of liquid chlorine.

Provision is shown for adding milk of lime through the pipe 14 so that the milk of lime enters the body of pulp at or near its upper surface and between the beater roll and the place of introduction of the chlorine.

The arrangement shown is such that the chlorine water enters the circulating body of pulp near the bottom of the beater and is intimately mixed with and diluted by the pulp so that the chlorine can act rapidly thereon; the milk of lime is added separately between the chlorine supply and the beater and near the upper surface of the pulp so that it will in turn be diluted by the pulp and will then come into intermixture with the pulp which has previously been admixed with the chlorine. This arrangement is such that the lime can react with the hydrochloric acid formed shortly after its formation, thus preventing any large accumulation of acid in the pulp while insuring rapid and effective action of the chlorine on the pulp.

In the carrying out of the process, the amount of chlorine supplied may be e. g. 6 pounds of chlorine per minute fed through the ejector with around 70 gallons of water per minute. About 200 pounds of chlorine may, for example, be used per ton of pulp and approximately the same quantity of hydrated lime, supplied in the form of milk of lime. The liquid chlorine, previously supplied to the container 3, can be supplied in regulated amount to the ejector, and the amount of chlorine supplied can be measured by the scales supporting the container. A plurality of containers (not shown), separately supported on scales, can be provided, and the containers used alternately, to insure a continuous supply of chlorine, particularly where the process is carried out in a continuous manner. In a batch operation, a single container of liquid chlorine may be sufficient to supply the chlorine required for bleaching a batch of pulp.

The practice of the present process enables rapid chlorination and bleaching of the pulp to be obtained with a minimum of degradation of the fiber such as is obtained when kraft pulp is bleached with alkaline hypochlorites in the first step of the bleaching operation. The process also avoids the degradation of the pump which is obtained when the pulp remains acid too long. In the present process the pulp is maintained without any prolonged high acidity and without too great a departure from an approximately neutral

condition while still allowing the essential reaction of the chlorine on the pulp to take place in a particularly advantageous way. The action seems to be essentially one of chlorine upon the pulp and not of hypochlorite on the pulp. The process, moreover, is carried out with the continuous addition of chlorine and lime and in a simple manner.

The present process can advantageously be carried out as a two-stage process in which the first stage is a bleaching with the continuous addition of chlorine and lime, as already described, and with the second stage of the bleaching operation carried out with the use of hypochlorite. The second stage of the bleaching operation, in such case, can be carried out in the same beater, or as a subsequent treatment in a different apparatus.

We claim:

1. The method of bleaching pulp which comprises introducing separately and continuously into the pulp being bleached chlorine and hydrated lime with intimate distribution of the chlorine through the pulp to effect rapid action of the chlorine thereon, and with introduction of the lime in close proximity so that it is admixed with the pulp which has been previously admixed with the chlorine, and so that it neutralizes acids formed in the chlorine treatment.

2. The method of bleaching pulp which comprises circulating a body of pulp, continuously adding chlorine thereto and admixing the chlorine with the pulp, continuously adding lime to the pulp and admixing the lime with the pulp in close proximity to the place where the chlorine is added and admixed, and regulating the supply of chlorine and of lime to effect rapid and continuous neutralization of the acids formed during bleaching.

3. The method of bleaching pulp in a beater which comprises circulating the pulp with the beater, supplying chlorine continuously to the pulp ahead of the beater and intimately distributing the chlorine within the pulp shortly before it passes through the beater roll and separately and continuously supplying hydrated lime to the pulp between the point of addition of the chlorine and the beater roll whereby the chlorine and the lime are intimately admixed with the pulp.

4. The process according to claim 1 in which about one pound of hydrated lime is added to the pulp for each pound of chlorine added thereto.

5. The process according to claim 1 in which about 200 pounds of chlorine are added per ton of pulp and approximately the same quantity of hydrated lime per tone of pulp.

J. ALDEN EXTROM.
HOKE MARTIN.