Nov. 21, 1972 R. W. SCHLEINOFER 3,703,435

METHOD FOR FINELY DISINTEGRATING PULP, PREFERENTIALLY CELLULOSE PULP, IN CONNECTION WITH THE BLEACHING THEREOF WITH GASEOUS BLEACHING AGENT

Original Filed Oct. 28, 1968

FIG.1

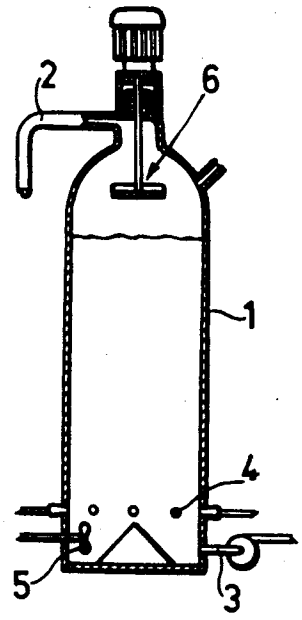


FIG.2

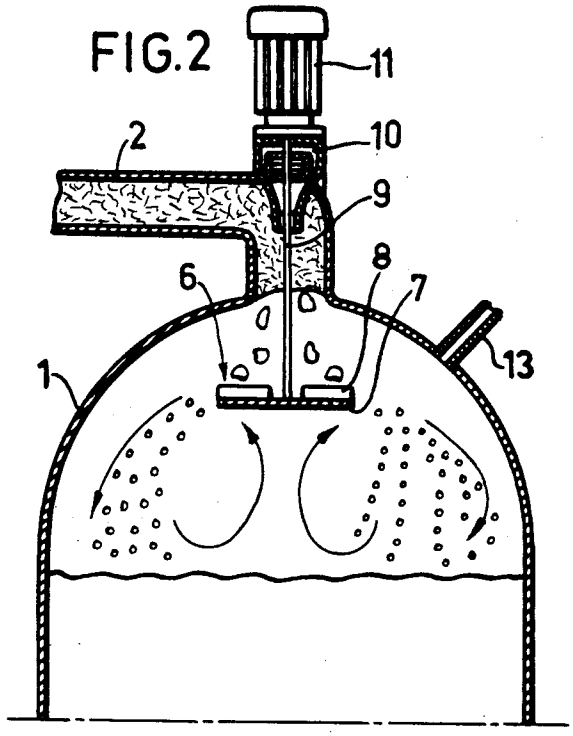


FIG.3

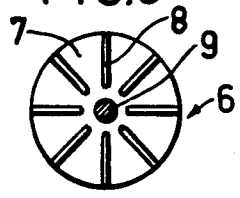


FIG.4

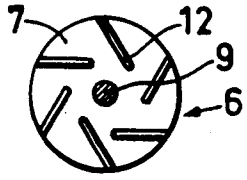


FIG.5

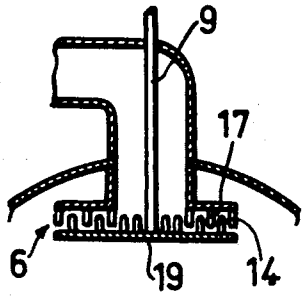
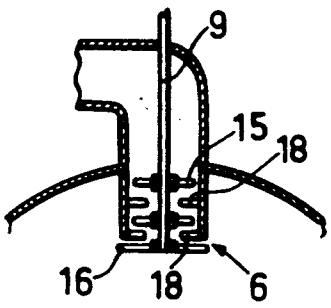


FIG.6



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METHOD FOR FINELY DISINTEGRATING PULP, PREFERENTIALLY CELLULOSE PULP, IN CONNECTION WITH THE BLEACHING THEREOF WITH GASEOUS BLEACHING AGENT

Rudi William Schleinkofer, Nashua, N.H., assignor to Sunds Aktiebolag, Sundsvall, Sweden

Continuation of abandoned application Ser. No. 771,071, Oct. 28, 1968. This application May 14, 1971, Ser. No. 143,648
Claims priority, application Sweden, Nov. 9, 1967, 15,383/67
Int. Cl. D21c 3/26
U.S. Cl. 162—17 8 Claims

ABSTRACT OF THE DISCLOSURE

In the course of being delivered into a generally vertical bleaching vessel, containing a gaseous bleaching agent in a free space in the upper part of the vessel, a cellulose pulp is subjected to vigorous mechanical working in a direction transverse to the falling direction thereby being finely disintegrated and fluffed.

This application is a continuation of applicant's copending S.N. 771,071.

When bleaching cellulose pulp by means of gaseous bleaching agents, such as oxygen, the very bleaching process should be carried out at a high pulp consistency, 10–50%, preferably at 15–30% and preferentially at about 20%, and at a high pressure. The compressing of the pulp, required for obtaining the above mentioned consistencies, and the feeding of the pulp into the bleaching vessel counter the high pressure results in the pulp receiving a compact consistency which is undesirable for carrying out the bleaching process. In order that the bleaching process shall take place rapidly and uniformly it is required that the pulp is in a finely disintegrated and fluffy state with a considerable porosity and an exposed surface.

The present invention has for its object, in connection with the bleaching, to transform the pulp into a state of the kind just mentioned, so that a rapid and uniform bleaching is obtained. Fundamentally this is done in such a manner that the pulp is introduced into the upper part of an upright bleaching vessel, that a gas-filled space is maintained within said upper part and that, on its way through said gas-space from the mouth of the supply conduit and to the upper surface of the column of pulp, gradually forming within the bleaching vessel, the pulp is subjected to a centrifugal mechanical working in a direction extending substantially transversely of the (substantially vertical) falling direction of the pulp within the gas-filled space, so that the pulp is finely broken up or disintegrated and/or is spread within said space. The mechanical working of the pulp may be so strong that a considerable part of the pulp is caused to flow downwards and upwards several times within the gas-filled space before occupying its rest position on the upper surface of the column of pulp. In that case the pulp, when viewed in a horizontal plane, may first be caused to move helically, then substantially rectilinearly and, finally, to perform a whirling motion. The working of the pulp may be carried out while supplying, preferably continuously supplying, a gaseous bleaching agent.

Primarily the present method is intended to be used in bleaching vessels, the gas-spaces of which are under overpressure from about 5 up to about 20 kiloponds/cm.^{2}, preferably about 6 to about 15 kiloponds/cm.^{2} and preferentially about 8 to about 10 kiloponds/cm.^{2}, but it may also be used, advantageously, in bleaching vessels the gas-spaces of which are under atmospheric pressure or in which there prevails low pressure.

An apparatus for carrying out the method comprises, fundamentally, an upright (vertical or substantially vertical) bleaching vessel, at least one supply conduit for pulp and at least one supply conduit for supplying a gaseous bleaching agent at the upper portion of the bleaching vessel and at least one working member positioned in the way of the pulp arriving from the mouth of the supply conduit and falling down into the bleaching vessel, said working member being adapted to move rapidly substantially transversely of the free falling direction of the pulp and, being also adapted during its motion, to disintegrate and spread the falling pulp, for the purpose of creating favorable conditions of reaction between the gaseous bleaching agent and the pulp introduced into the bleaching vessel.

The invention will be described below in greater detail, reference being then had to the accompanying figures of the drawing. FIG. 1 shows a vertical sectional view of a closed, upright bleaching vessel, FIG. 2 showing, also in a vertical sectional view but on an enlarged scale, the upper part of such a bleaching vessel. FIGS. 3–6 illustrate various embodiments of details of the apparatus according to the invention.

The bleaching vessel **1** is here shown to be a conventional downward-flow tower having a pulp supply conduit **2**, connected to the top of the tower, and an outlet conduit **3** for treated pulp at the bottom of the tower. At the lower portion of the tower there are, in a manner known per se, mounted dilution nozzles **4** and propeller stirring means **5** for the purpose of providing for a uniform decrease of the consistency of the pulp. In the way of the pulp falling down from the conduit **2** there is provided a fine-disintegrating member **6**, preferably embodied as shown in FIGS. 2 and 3 as a rotatable disc **7** having a number of upwardly projecting fillets **8**. The fine-disintegrating member **6** is supported by a shaft **9** (see FIG. 2) journalled in a bracket **10** and adapted to be driven by a motor **11**. The outer diameter of the disc **7** and the fillets **8** may be 1 to 5 times, preferably 2 to 4 times, and preferentially about 3 times the diameter of the pulp inlet of the tower. The height of the fillets **8** usually is 2–3 cm. but heights of between 1–25 cm. may prove suitable under various conditions. Although not shown the fillets **8** may form an angle to the plane of the disc **7** deviating from 90°, so that upon rotation of the disc the upper edges of the fillets either move ahead of or after the lower edges, when seen in the direction of rotation. As appears from FIGS. 3 and 4 the fillets may extend either substantially radially (the fillets **8** of FIG. 3) or in a direction deviating from the radial direction (the fillets **12** of FIG. 4). In that case the fillets are located between two radial planes and the arrangement preferably is such that there is only one such group of fillets. It is possible also to dispense with the disc **7** and, instead, to secure the fillets **8** in a hub provided on the shaft **9**, said hub having a diameter which is smaller than the diameter of the disc **7**. In an embodiment of that kind two, three or more systems of fillets may, at suitable intervals, be provided in the vertical direction on the shaft **9**. Numeral **13** indicates a conduit for supplying gaseous bleaching agent. Also a plurality of such supply conduits may be provided.

In the embodiments according to FIGS. 5 and 6 the fillets have been replaced by rotatable pegs **14** and, respectively **15** and **16**. The pegs **14** (FIG. 5) are, when seen in the direction of movement of the falling pulp, arranged substantially axially of the shaft **9** and preferably adapted to co-operate with stationary pegs **17**, which are also arranged substantially axially to facilitate disintegration. The pegs **15** (FIG. 6) which extend substantially trans-

versely or radially of the rotary shaft **9** may be arranged substantially helically in the axial direction of the bleaching vessel at equal or varying pitch and the stationary pegs **18**, with which the pegs **15** co-operate, extend also substantially transversely or radially toward the rotary shaft **9**. In the embodiment according to FIG. 5 the pegs **14** are supported by a disc **19**.

The mode of operation of the apparatus is as follows:

Through the conduit **2** pulp is introduced into the upper part of the tower **1**. During its passage through the conduit **2** the pulp constitutes an efficient lock against the overpressure from inside the tower. The pulp then falls downwards and will then come into contact with the rotating fillets and/or pegs, the pulp being then disintegrated. During this operation the disintegrated pulp will be thrown out towards the periphery of the bleaching tower and the intended distribution of the pulp is obtained over the entire interior cross sectional area of the tower. During their rotation the fine-disintegration members also provide for a fan action generating a favorable gas circulation in the upper gas-filled space of the tower, in accordance with what is indicated by the arrows in FIG. 2. In order that the intended effect of fine disintegration shall be obtained the number of revolutions per minute of the shaft **9** should be from about 100 to 3000 r.p.m., possibly also higher. A suitable number of revolutions is about 1500 r.p.m. Normally, a number of revolutions of between 200 to 2000 r.p.m. will provide for the intended effect.

The invention is not limited to the embodiments shown and described. Thus, the intended technical effect can be obtained by using fine-disintegration members, adapted to work the pulp along its free falling direction within the tower. Also, said effect may be obtained by means of fine-disintegration members, arranged to work the pulp straight or obliquely to the same, and also through a combined working of the pulp along the free falling direction thereof and/or obliquely to said direction and/or transversely of said direction, in which case the combined working should include at least two of the aforementioned working directions. The upper and/or lower edges of the fillets may be toothed, undulated or embodied in some other, similar way.

I claim:

1. An improved method for finely disintegrating fibrous pulp for improving the bleaching thereof with a gaseous bleaching agent comprising continuously introducing the pulp into a space at the top of a substantially vertical, circular bleaching chamber, separately introducing a gaseous bleaching agent into said chamber, the pulp being fed to said chamber in a compacted state serving to prevent escape of the gaseous bleaching agent therethrough, the chamber containing a column of distintegrated pulp below the space at the top thereof, subjecting the pulp as it enters the space at the top of the chamber to the gaseous bleaching agent and to fine disintegration into a fluffy state and a rotary centrifugal distribution in an outward direction transversely of the axis of and bounded by the bleaching chamber to distribute the pulp in the space as it falls toward the top of the column of disintegrated pulp in said chamber whereby the pulp becomes easily available for the gaseous bleaching agent and removing the bleached distintegrated pulp from the bottom of the chamber.

2. An improved method as claimed in claim **1** wherein the pulp is subjected to the rotary, centrifugal distribution at such a force that at least a portion of the disintegrated pulp will follow a downward path within the confines of the space at the top of the chamber and will then move inwardly toward the center due to a decreased pressure prevailing at the center of the space and then upwardly therein to be entrained with fresh disintegrated pulp subjected to the rotary, centrifugal distribution, before finally coming to rest on the top of the column of disintegrated pulp in the chamber.

3. An improved method as claimed in claim **1** wherein the gaseous bleaching agent in the space at the top of the bleaching chamber is maintained at a pressure of from about 5 to about 20 kiloponds/cm.^{2}.

4. An improved method as claimed in claim **1** wherein the gaseous bleaching agent in the space at the top of the bleaching chamber is maintained at a pressure of from about 6 to about 15 kiloponds/cm.^{2}.

5. An improved method as claimed in claim **1** wherein the gaseous bleaching agent in the space at the top of the bleaching chamber is maintained at a pressure not higher than atmospheric pressure.

6. An improved method as claimed in claim **1** wherein the pulp is subjected to disintegration immediately adjacent the point of introduction of the stream of compacted, unbleached pulp.

7. An improved method as claimed in claim **1** wherein the pulp is subjected to fine disintegration just before it is introduced into the space at the top of the chamber whereby it enters the space at the top of the chamber with a whirling effect.

8. An improved method as claimed in claim **1** wherein the gaseous bleaching agent is oxygen.

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HOWARD R. CAINE, Primary Examiner

U.S. Cl. X.R.

8—111, 156; 162—52, 65; 259—8

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,703,435 Dated November 21, 1972

Inventor(s) R. W. Schleinkofer

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

The inventor's name is misspelled. It should be:

-- R. W. Schleinkofer --.

Signed and sealed this 15th day of May 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents

FORM PO-1050 (10-69)

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