United States Patent
Engstrom

[15] 3,693,380
[45] Sept. 26, 1972

[54] APPARATUS FOR REMOVAL OF ENTRAINED AIR FROM CELLULOSE PULP BEFORE BLEACHING OF THE PULP

[72] Inventor: Hans-Erik Rye Engstrom, Kristinavagen 4, Sundsvall, Sweden

[22] Filed: Dec. 17, 1970

[21] Appl. No.: 99,309

Related U.S. Application Data

[62] Division of Ser. No. 771,593, Oct. 29, 1968, abandoned.

[30] Foreign Application Priority Data

Nov. 10, 1967 Sweden 15463/1967

[52] U.S. Cl.....68/5 C, 68/181, 68/183, 68/207

[51] Int. Cl.....D21c 9/10

[58] Field of Search.....68/5 R, 5 C, 5 D, 5 E, 181, 68/183, 207

[56] References Cited

UNITED STATES PATENTS

2,706,390 4/1955 Johansen .....68/181 R

2,990,710 7/1961 Burling .....68/181 R

FOREIGN PATENTS OR APPLICATIONS

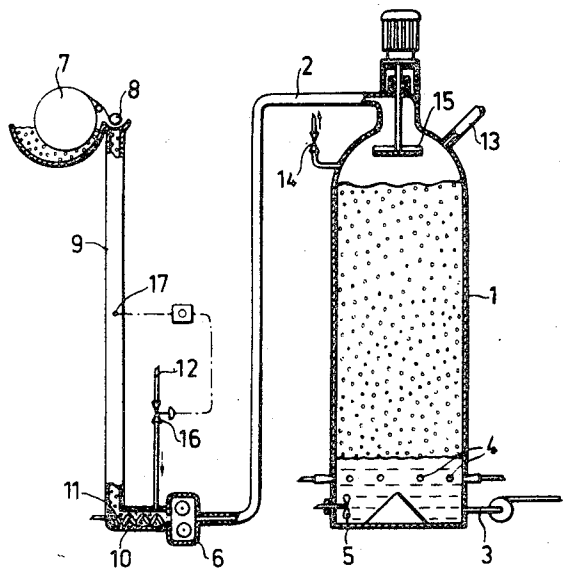
166,221 2/1959 Sweden.....68/181 R

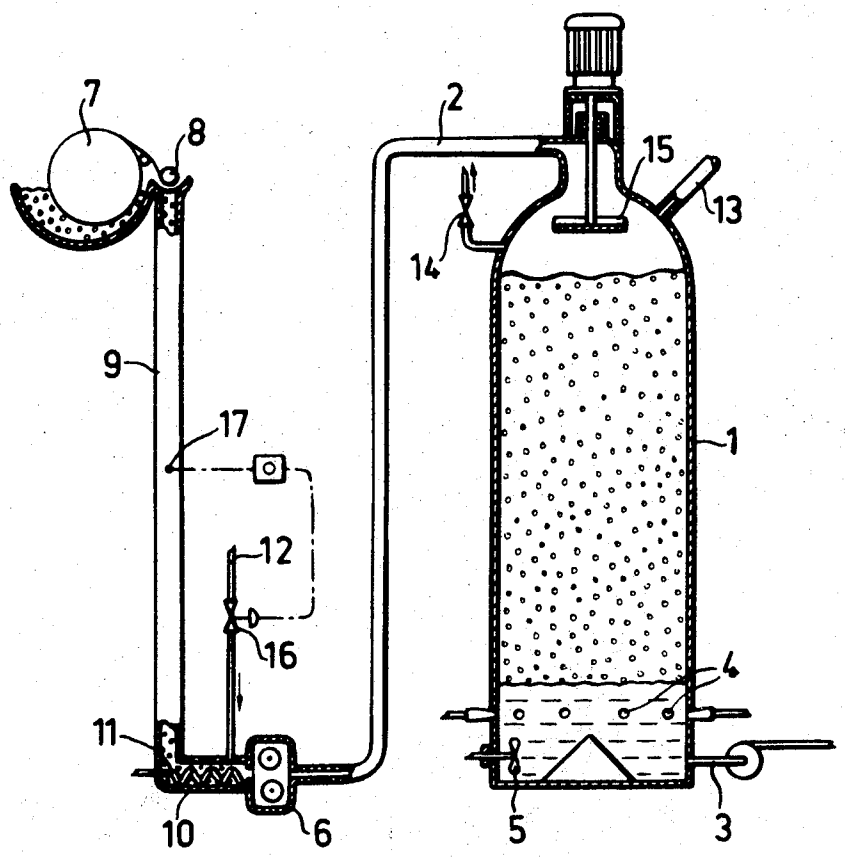
Primary Examiner—William I. Price
Attorney—Pierce, Scheffler & Parker

[57] ABSTRACT

A down-flow bleaching tower having a space under pressure at the top thereof is provided for bleaching cellulose pulp with a gaseous bleaching agent. An inlet is provided at the top of the tower for introducing the gaseous agent in the space. A first conduit, having an inlet for pulp containing entrained air, is connected to the inlet of a pump. A second conduit, having an inlet connected to the outlet of the pump, introduces the pulp to the top of the tower against the pressure of the gaseous bleaching agent. Pressure admitting means is connected to the outlet of the first conduit to force steam, oxygen, or a gaseous bleaching agent countercurrent to the pulp to expel and replace at least a portion of the entrained air in the pulp.

3 Claims, 1 Drawing Figure




7
8
2
15
13
14
9
17
1
12
16
4
11
10
6
5
3

APPARATUS FOR REMOVAL OF ENTRAINED AIR FROM CELLULOSE PULP BEFORE BLEACHING OF THE PULP

This application is a divisional application of my earlier filed parent application Ser. No. 771,593, filed Oct. 29, 1968.

According to the co-pending United States Patent Application now abandoned in favor of continuation application Ser. No. 130,504, filed Apr. 1, 1971. Ser. No. 771,071, filed Oct. 28, 1968 by Rudi William Schleinkofer now abandoned in favor of continuation application Ser. No. 143,648 filed May 14, 1971. cellulose pulp is bleached with a gaseous bleaching agent, for example, oxygen, the bleaching agent being supplied to a downward-flow bleaching vessel, preferably a bleaching tower, into a space at the top of the tower above the column of pulp present in the vessel and the pulp falling down from the inlet opening of the tower being, within said space, subjected to a mechanical working, which has for its object partly to finely break up or disintegrate the pulp, partly to create a circulation of gas within said space, in order that the reaction between the pulp and the gaseous bleaching agent should be facilitated.

When using a gaseous bleaching agent the bleaching process should be carried out at a high pulp consistency, for example, at 20 percent consistency. Pulp of such a high consistency must, however, be transported to the inlet opening at the upper part of the bleaching tower and, the pressure in the tower at the pulp inlet opening preferentially being 8–10 kiloponds/cm^2, it is suitable to transport the pulp through a conduit to the inlet opening in question. The most suitable means for effecting such pulp transportation is a so-called thick stock pump. In connection with pulp transportation of the kind mentioned a great deal of air will accompany the pulp and, together with the latter, be introduced into the gas space at the top of the tower. In bleaching towers, intended for bleaching by means of oxygen, the oxygen in the air supplied with the pulp will react with the pulp during the bleaching process, the nitrogen gas, however, being separated. The consequence is that nitrogen gas will accumulate within the tower, which may involve considerable drawbacks, because gas not taking part in the bleaching process is difficult to remove.

The present invention has for its object, by means of a special method and an apparatus for carrying out said method, to eliminate the above described drawbacks, at the same time providing for considerable advantages.

The new method in connection with the bleaching of cellulose pulp by means of a gaseous bleaching agent, for example, and preferably, by means of oxygen, in a downward-flow bleaching tower consists, fundamentally, therein that prior to feeding the pulp into a conveying means, for example, a thick stock pump, serving for transferring the pulp to the bleaching tower, a gaseous bleaching agent is supplied to the pulp in such a manner that air, contained in the pulp is wholly or partly, displaced and replaced by a gaseous bleaching agent, and that for carrying out the bleaching process an additional amount of gaseous bleaching agent, which may be required, is added to the pulp at some other place. This can preferably be done in a space at the top of the bleaching tower above the column of pulp in the tower.

An apparatus suitable for carrying out the method is characterized, fundamentally, by at least one conveying means for feeding cellulose pulp of, preferably, high consistency to a bleaching tower, to which the conveying means may be connected by means of at least one conduit, furthermore at least one conduit, for supplying pulp to said conveying means and at least one conduit for supplying a gaseous bleaching agent to the pulp near the conveying means. Then the supplying of the gaseous bleaching agent is meant to take place in such a manner that air, contained in the pulp, is gradually displaced and is, wholly or partly, replaced by the gaseous bleaching agent, which preferably is added in such an amount that part of it will leave together with the air displaced from the pulp. Preferably there is also at least one conduit for supplying bleaching agent at some other place.

In accordance with the invention it is suitable to add the gaseous bleaching agent to the pulp immediately before the pulp enters the conveying means and then to adapt the amount of bleaching agent and the pressure in such a manner that the gaseous bleaching agent will, at least to a little extent, be caused to flow counter the direction of feed of the pulp. Preferably such large an amount of bleaching agent is added that part thereof will flow on through the conduit towards the place where the pulp is being supplied, possibly all the way up to said place and, alternatively, out of the opening of said conduit. Furthermore, the amount of gaseous bleaching agent, added before the conveying means, may be controlled automatically. The gaseous bleaching agent may be added partly before the means for conveying the pulp to the bleaching tower, partly at the upper end of the tower and, furthermore, the gaseous bleaching agent may be added at an essentially lower pressure before the conveying means for the pulp than in the bleaching tower itself.

Instead of, or together with, oxygen there may be used, for the displacement of the air in the pulp, some other gaseous bleaching agent and/or vapor, preferably steam. If, for example, steam is used then heating of the pulp is obtained at the same time.

The following is a description of a preferred embodiment of a plant for carrying out the new method, reference being had to the accompanying diagrammatic drawing, which shows a vertical elevation of the plant, partly in section.

Numeral 1 indicates a bleaching tower, which may be a conventional downward-flow tower, provided with a supply conduit 2 for cellulose pulp, connected to the tower at the top thereof, and with an outlet conduit 3 for treated pulp, located at the bottom of the tower. At the bottom part of the tower there are, in a manner known per se, provided dilution nozzles 4 and propeller stirring means 5 for the purpose of providing a uniform decrease of the consistency of the pulp. The pulp is supplied to the tower by a conveying means, which, in the embodiment shown, is presumed to consist of a so-called thick stock pump 6, to which the pulp is led from a filter 7, via a screw conveyor 8, a conduit 9 and a conduit 10 connected to the thick stock pump. The conduits 9 and 10 may be replaced by one single conduit, which then preferably extends more straight to the thick stock pump 6. In the embodiment shown the conduit 10 has a larger diameter than the conduit 9, which is, in the first place, due to the fact that the conduit 10

encloses a screw conveyor **11**. To that portion of the conduit **10**, which is located next to the thick stock pump **6**, which portion also may be characterized as a screw trough, there is connected a conduit **12** for a gaseous bleaching agent, for example, oxygen and/or vapor, preferably steam. The adding of a gaseous bleaching agent to the bleaching tower **1** also takes place through a conduit **13**. The bleaching tower usually being under a high pressure there is provided, on the upper portion of the tower, a conduit with a safety-valve **14**. Numeral **15** indicates a movable, preferably rotatable, member adapted to work the pulp upon its entering the tower. The means in question forms the object of the aforementioned co-pending U.S. Pat. application Ser. No. 771,071, filed Oct. 28, 1968 by Rudi William Schleinkofer, now abandoned in favor of continuation application Ser. No. 143,648 filed May 14, 1971. For controlling the supply of gas- and/or vapor (steam) to the conduit **12**, which is connected to the conduit **10** just before the thick stock pump **6**, there is provided a control valve **16**, which preferably is adapted to be controlled by a feeler **17** for feeling the concentration of the gaseous bleaching agent and/or vapor (steam) which may ascend within the conduit **9**. The feeler **17** preferably is located at a larger distance from the thick stock pump **6** than is the place of connection of the supply conduit **12** in the neighborhood of said pump.

When using, for example, oxygen as a bleaching and air-displacing agent the plant operates in the following manner.

Dewatered cellulose pulp, having a consistency of say about 20 percent, leaves the filter **7** in order to be moved sideways by the screw conveyor **8** to the substantially vertical, long conduit (tube) **9** to the nearest portion of the conduit (screw trough) **10**, where the pulp is caught by the screw conveyor **11** and is fed on into the thick stock pump **6** in order to be moved on to the bleaching tower **1**. The pulp which is to be fed into the thick stock pump **6** by means of the screw conveyor **11** contains a great deal of air, which, wholly or partly, is displaced or replaced by oxygen arriving from the conduit **12**. In that case some oxygen may ascend within the conduit **9** and the feeler **17** then gives an impulse for controlling this quantity of gas to a predetermined value. In order to gurantee a good displacement of the air within the pulp prior to its entering the thick stock pump a certain excess of oxygen may be allowed without any mentionable amount of oxygen leaving at the upper opening of the conduit **9**. As a matter of fact the oxygen is absorbed, at least partially, by the falling pulp.

A plant according to the invention is not restricted to the embodiment as shown and described, but several modifications may be devised within the scope of the invention. For example, the supply conduit **12** for the gaseous medium need not be connected to the pulp supply conduit near the pulp conveying means **11** but it may, instead, have its connection located further away from the conveying means.

What is claimed is:

1. Apparatus for bleaching cellulose pulp with a gaseous bleaching agent comprising a down-flow bleaching tower having a space under pressure at the top thereof and a column of pulp beneath said space, means for introducing a gaseous bleaching agent into the tower, a first conveying conduit having an inlet for pulp containing entrained air and an outlet end, a pump means, a second conveying conduit for introducing pulp to the top of the tower against the pressure of the gaseous bleaching agent therein, said pump means interconnecting said conveying conduits, means adjacent the outlet end of said first conveying conduit and adjacent said pump for introducing a fluid under such pressure that fluid is forced to flow counter-current to the pulp passing through said first conveying conduit, said fluid being selected from the group consisting of steam, oxygen and a gaseous bleaching agent, the fluid, which flows counter-current to the pulp expelling and replacing at least a portion of the entrained air in the pulp.

2. Apparatus as claimed in claim **1** and further comprising means disposed upstream from said fluid introducing means for detecting the amount of fluid flowing counter-current to the pulp and means responsive to said detecting means for controlling the introduction of the fluid.

3. Apparatus as claimed in claim **1** wherein the means for introducing the gaseous bleaching agent is disposed at the top of said tower so as to introduce the agent into the space above the column of pulp.

* * * * *

PO-1050
(5/69)

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,693,380 Dated September 26, 1972

Inventor(s) HANS-ERIK RYE ENGSTROM

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

Please correct the heading of the patent to include the following :

(73) "Assignee: Sunds Aktiebolag,Sundsvall,Sweden"

Signed and sealed this 10th day of April 1973.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents