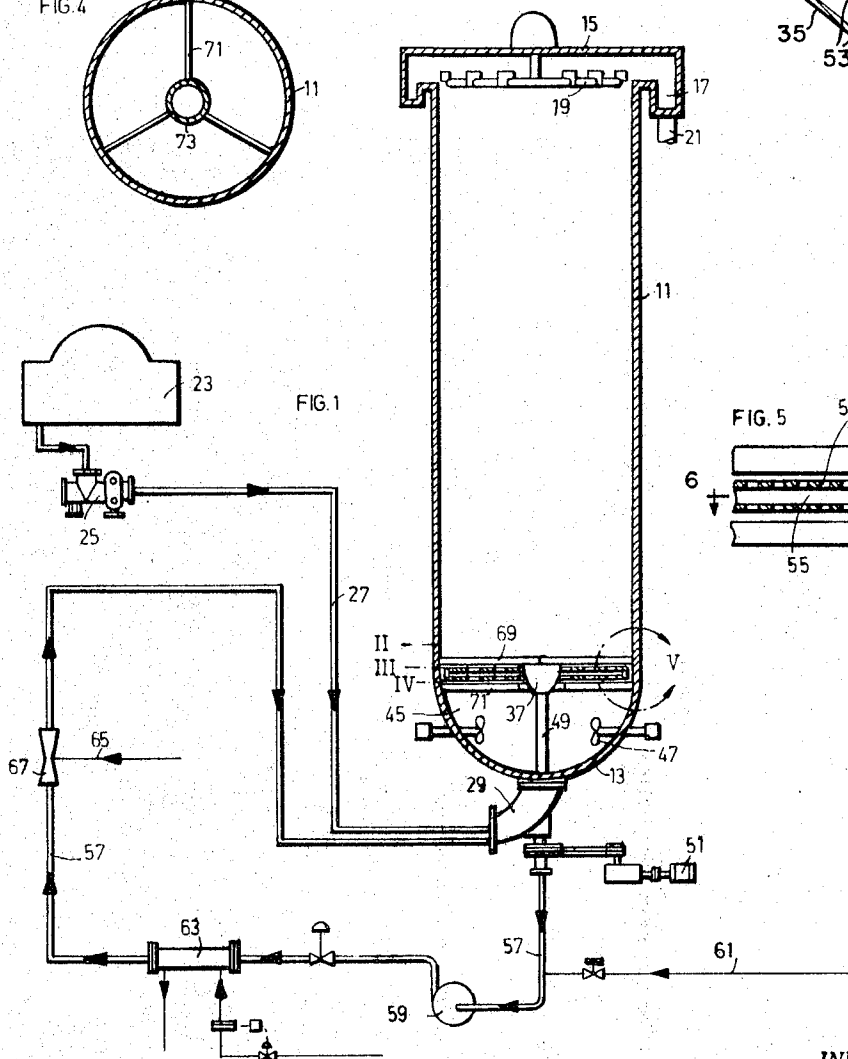
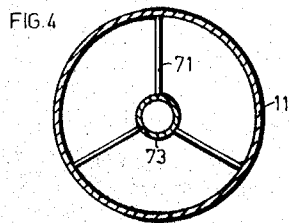
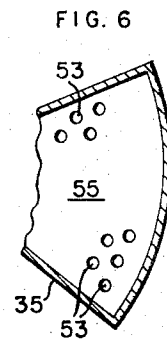
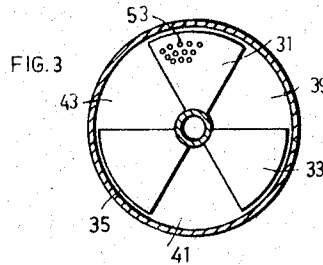
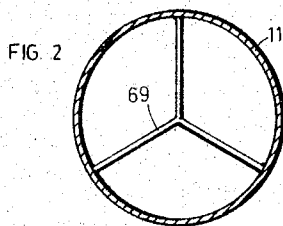


Jan. 17, 1967

O. A. LAAKSO
METHOD AND APPARATUS FOR THE CONTINUOUS BLEACHING
OF CELLULOSIC PULP
Filed March 17, 1964

3,298,900



INVENTOR.
Oliver Armas Laakso
BY
Lushman, Parby & Lushman
attorneys

1

3,298,900

METHOD AND APPARATUS FOR THE CONTINUOUS BLEACHING OF CELLULOSIC PULP

Oliver A. Laakso, Glens Falls, N.Y., assignor to Aktiebolaget Kamyr, Karlstad, Sweden

Filed Mar. 17, 1964, Ser. No. 352,606

Claims priority, application Sweden, Mar. 22, 1963, 3,124/63

7 Claims. (Cl. 162—17)

The invention relates to apparatus for the bleaching of cellulosic pulp in which the bleaching reaction can be performed at a high consistency of the pulp, while the mixing of the bleaching agent into the pulp takes place at a low consistency thereof.

Throughout this specification the term "low consistency" is intended to denote mixtures in which the cellulosic material is combined with a relatively large amount of liquid, which in the general case is largely composed of water. "High consistency" is intended to denote mixtures having a relatively small amount of liquid combined with the cellulosic material.

The apparatus and method of the present invention allow use of conventional cellulosic bleaching agents. "The principal agents used for bleaching wood pulps for paper and dissolving cellulose applications include those agents used for bleaching low lignin content pulps (chlorine, calcium and sodium hypochlorite, and chlorine dioxide) and those used for high lignin content pulps (sodium and hydrogen peroxide and zinc and sodium hydrosulfite)." ["Bleaching Agents, Pulp Bleaching," Kirk-Othmer, Encyclopedia of Chemical Technology, second edition vol. 3, p. 563, John Wiley and Sons, Inc., N.Y. (1964)].

A principal feature of the invention is the provision of apparatus of the type described including a hollow generally cylindrical, vertically oriented container wherein the bottom portion of the container forms a mixing chamber provided with agitating means, and in which chamber the pulp can be mixed with the bleaching agent at a low consistency; the chamber being separated from the rest of the container by a screen body having passages for the pulp and being rotatable about the axis of the container and extending to the vicinity of its shell, so that substantially the entire cross-sectional area of the container is swept over by said screen body, the same being adapted for thickening the pulp during its passage past said body by drawing off and discharging a part of the liquid contents of the pulp.

The foregoing and further features of the invention will be evident from the following description, in which an embodiment of the bleaching container is more fully described with reference to the accompanying drawing.

FIGURE 1 shows diagrammatically a vertical cross-sectional view of the bleaching container as well as schematically showing auxiliary means connected to its charging end;

FIGURE 2 is a cross-sectional view of the container taken along the line II—II, in FIGURE 1;

FIGURE 3 is a cross-sectional view of the container taken along the line III—III of FIGURE 1;

FIGURE 4 is a cross-sectional view of the container taken along the line IV—IV of FIGURE 1;

FIGURE 5 shows on an enlarged scale the portion of FIGURE 1 indicated by the circle V; and

FIGURE 6 is a cross-sectional view of one screen plate taken substantially along line 6—6 of FIGURE 5.

The container illustrated is shaped generally as a vertical standing cylinder and is adapted for the performance of a bleaching operation on cellulosic pulp while the pulp is moved continuously upwardly through the container. The cylindrical shell 11 of the container, which may consist of sheet iron, reinforced concrete or similar material,

2

merges at its lower end into a bottom section 13 which is shown spherically curved but which may alternatively be conical or any other shape which fits to the cylindrical shell 11 and forms a suitable lower end of the container without any sharp edges or corners. At its upper end the container is closed by a cover 15 having an upwardly directed channel 17 extending circumferentially around the cylindrical shell 11 radially outwardly thereof. The pulp rising vertically up through the container is continuously fed by means of a rotary scraper 19 attached to the cover 15 into said channel, from where it is discharged through a conduit 21.

The pulp to be bleached in the container preferably emanates from a rotary wash filler shown schematically at 23, from where it is pumped by means of a pump 25 through a conduit 27 into the container at an inlet 29 arranged centrally in the bottom section 13. The consistency of the pulp supplied to the container may be comparatively high.

In the lower part of the container, preferably at the level where the cross-section of the container begins to decrease in area and merge into the bottom section 13 or somewhat above said level, there is arranged a rotary screen body consisting of substantially horizontal hollow screen plates 31, 33 and 35 attached to a central hub 37. As seen from above in FIGURE 3, said screen plates have the general configuration of axially elongated circular sectors and thus are defined by two approximately parallel radially extending generally planar portions, an axially extending arcuate edge joining the outer extent of each planar portion and two axially and radially extending generally rectangular portions bordering the sides of the sectors. As best shown in FIGURES 3 and 5, the screen plates 31, 33 and 35 are configured so that the axially extending arcuate edge of each is located close to the shell 11. The screen plates 31, 33 and 35 are double-walled and their upper as well as their lower planar faces are pervious being provided with holes 53 or slits, through which the liquid contents of the pulp, but not the fibers therein, can enter the cavity 55 of the screen plates. Between the plates 31, 33 and 35 are defined open sector-shaped areas 39, 41 and 43 through which the pulp can rise up past the screen body. The screen body forms the upper delimitation of a mixing chamber 45 within the bottom 13 of the container close to the inlet 29. In said chamber 45, a thorough mixing of the introduced cellulosic material, liquid and bleach is effected by agitating means 47 comprising rotary screw blades, pump wheels, or similar suitable means.

The hub 37 of the screen body is secured to a shaft 49 arranged co-axially in the container and extending through the bottom thereof, the lower end of said shaft being rotatably connected via a gear to a motor 51.

The shaft 49 is preferably hollow, having a through-bore, the upper end of which communicates with the cavities 55 of the screen plates and the lower end of which is connected to an exterior stationary circulation conduit 57. Interposed in said conduit is a pump 59 which draws liquid from the screen body and injects it through the other end of the conduit which is connected to the inlet 29, so that the liquid is maintained in circulation. Water from the conduit 61 may be fed into the circulation conduit according to requirements and in order to maintain the consistency of the diluted pulp in the mixing chamber 45 at a desired value. By means of a heat exchanger 63 associated with the conduit 57, heat may be supplied to the circulation liquid to a sufficient degree to maintain a desired reaction temperature in the bleaching container.

In a preferred method of employing the apparatus of the invention the bleaching agent is supplied through a conduit 65 and is introduced into the circulation con-

duit, e.g. by means of a steam injector 67. In the mixing chamber 45 the bleaching agent is thoroughly mixed into the pulp, and the mixing operation is facilitated by the dilution of the pulp to a low consistency. When the pulp is fed upwards through the open areas of the screen body, it will be subjected to a sucking action by the screen body, said action being evenly distributed over the entire cross-sectional area of the container by the rotation of the screen body, whereby the liquid contents of the pulp are partly sucked off and discharged through the bore of the shaft 49. Accordingly, as pulp, liquid and bleach continues to be supplied through the inlet 29 and liquid removed after the mixing process at 45, the thickened pulp slowly moves up through the container without further agitation, the bleaching reaction thus being performed in the container at the desired high consistency.

In order to prevent pulp from being carried with the screen body in its rotary motion there are provided at a level immediately above the screen body a series of vanes 69 which are attached to the shell 11, extend radially in the container and are mutually connected at the center thereof as illustrated in FIGURES 1 and 2. A similar series of radially extending vanes 71 attached to the shell 11 are located in a plane immediately below the screen body and have their inner ends connected to ring 73 surrounding the shaft 59 as shown in FIGURES 1 and 4.

The above described embodiment has been set forth merely to illustrate the principles of the invention and may be modified in various respects without departing from the scope of the invention. Thus, for instance, the bleaching agent may be added to the pulp at an earlier stage, and the pulp may be of a low consistency already before entering the container. It is for this reason that the discussion hereinabove should be taken in an illustrative sense rather than a limiting one and the invention understood to encompass all modifications within the spirit and scope of the appended claims.

I claim:

1. A method for continuously bleaching cellulosic pulp comprising continuously introducing cellulosic pulp, bleach and a relatively large amount of dilution liquid to the bottom portion of a vertically elongated container so that said pulp is of lower consistency in said bottom portion than prior to the introduction therein; agitating said pulp, bleach and liquid to form a relatively homogeneous mixture therefrom; rotating a liquid collector through said mixture at a point spaced upwardly from said bottom portion; removing a major portion of said liquid and said bleach from said mixture through said liquid collector, the remaining bleach in the thickened mixture bleaching the pulp therein as the mixture moves upwardly in the container, wherein the pulp moving upwardly in the container past said liquid collector is of higher consistency than the pulp in said bottom portion; and removing the bleached pulp from the upper portion of the container.

2. A method as set forth in claim 1 additionally including returning the liquid removed from the container by the rotating liquid collector to the bottom portion of the container.

3. Apparatus for bleaching cellulosic pulp at a high consistency during continuous vertically rising movement of the pulp, comprising: an upright cylindrical container;

a screen body located in said container intermediate the upper and lower ends thereof; said screen body being rotatable about the longitudinal axis of the container and extending from the vicinity of said longitudinal axis to the vicinity of the container sidewall so that substantially the entire cross-sectional area of the container is swept over by said screen body during rotation thereof, said cross-sectional area thereby defining a first chamber in said container below said screen body and a second chamber in said container above said screen body; said screen body and said container sidewall defining open areas through said screen body configured and arranged to pass vertically rising pulp from said first chamber to said second chamber; agitating means mounted in said first chamber; means for introducing bleaching agent and pulp to said first chamber for mixing therein by said agitating means; conduit means communicating with said screen body, said conduit means communicating with the exterior of the container and having inlets communicated with said first chamber, said conduit means being constructed and arranged to withdraw liquid including a part of said bleaching agent from pulp in said first chamber and discharge the liquid from the container thereby thickening the pulp as the pulp passes into said second chamber, and to recycle said liquid to said first chamber; and means for withdrawing pulp from the second chamber near the upper end of the container.

4. Bleaching apparatus as claimed in claim 3, wherein the screen body comprises sector-shaped hollow plates connected to a central hub mounted on a tubular shaft, said plates being separated by sector shaped open areas, said plates being pervious through their upper as well as on their lower surfaces to provide communication from both said first and said second chambers to cavities defined within said plates, said cavities communicating with the bore in said shaft carrying the screen body and hub, said shaft extending through the bottom of the container.

5. Bleaching apparatus as claimed in claim 3 including radially directed stationary vanes attached to the sidewall of the container within the container closely adjacent to the screen body to prevent the pulp from rotating with the screen body.

6. Bleaching apparatus as claimed in claim 3 wherein said conduit means includes, interposed in said conduit means, a pump and a heating device constructed and arrayed to heat the contents of said conduit means.

7. Bleaching apparatus as claimed in claim 3 wherein said means for introducing bleaching agent and pulp comprises separate means for introducing pulp, and, as separate means for introducing bleaching agent, a bleaching agent inlet conduit communicated to said conduit means intermediate the ends of said conduit means.

References Cited by the Examiner

UNITED STATES PATENTS

2,706,390	4/1955	Johansen	162—237
2,712,488	7/1955	Brax et al.	8—156
2,878,116	3/1959	Carlsmith et al.	162—237
3,078,703	2/1963	Richter et al.	68—181
3,088,306	5/1963	Richter	68—181
3,237,773	3/1966	Laakso	68—27 X

DONALL H. SYLVESTER, *Primary Examiner*.

S. LEON BASHORE, *Examiner*.