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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **Mechanical pulp hydrosulfite bleaching.**

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US-A-3 313 678
US-A-4 030 969
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The file contains technical information submitted after the application was filed and not included in this specification

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Description

The invention relates to a method of treating a mechanical pulp with hydrosulfite bleaching chemical which (b) is added to the mechanical pulp, substantially free of entrained air, whereupon (c) the pulp is retained at predetermined pH and temperature conditions for a predetermined period of time to effect bleaching thereof.

With shortages in raw materials for manufacture of paper pulps, mechanical pulping processes have become of more interest. Mechanical pulping processes generally have higher yields than chemical pulping processes. However, since in mechanical pulping processes (including refiner mechanical pulping (RMP), chemimechanical pulping (CMP), thermomechanical pulping (TMP), and chemithermomechanical pulping (CTMP)), most of the lignin and polysaccharides are left in the pulp, rather than being dissolved and modified as in chemical pulping, bleaching must be accomplished by decoloration, instead of by solubilization, as in chemical pulping.

One major process for bleaching of mechanical pulps is a reductive bleaching process utilizing hydrosulfite, such as sodium hydrosulfite or zinc hydrosulfite. While hydrosulfite bleaching can achieve the desired decoloration of the mechanical pulp, there are a number of drawbacks associated with its use. Hydrosulfite is oxidized extremely rapidly by air, therefore the entrainment of air in the pulp can negate the bleaching effects of the hydrosulfite. This makes hydrosulfite impractical for use with mechanical pulps having a consistency of much greater than 4% since as the consistency rises the pulp tends to entrain air. However, it is desirable to effect bleaching at the same consistency as for other processing of the pulp (e.g. 5-25%, preferably 8-15%), although successive diluting and thickening stages are to be avoided because of the equipment costs and energy expense associated therewith.

A method of bleaching mechanically-disintegrated wood pulp in accordance with the prior art portion of claim 1 is disclosed by US-A-2 707 146 comprising continuously feeding a water-soluble polyphosphate, in aqueous solution substantially free of entrained air, into a continuously moving stream of mechanically-disintegrated wood pulp, substantially free of entrained air. The polyphosphate is fed to the pulp at a point not substantially later than that at which the hydrosulfite is fed to the pulp. The mixture of pulp and bleaching chemicals is subjected to vigorous agitation and propulsion, thereby forcing the mixture along a confined, airtight path, including a vertical fluid way, as a streamline, plug flow, until the desired bleaching takes place. Although in that U.S. specification it is mentioned that the consistency of the pulp to be treated may range up to the point where satisfactory mixing is not feasible, e.g. up to 10% or even 15%, by weight, the actual range of consistency for which good results easily can be achieved is between about 2% and 5%.

It is the primary object of the present invention to provide an efficient method of treating a higher-consistency mechanical pulp, and this problem is solved in such a way that in the method of the prior art portion of claim 1 (a) the mechanical pulp at a consistency of about 8-15% is simultaneously pumped and essentially completely degassed, and immediately thereafter, (b) the about 8-15% consistency mechanical pulp is mixed, without substantial air introduction, with an effective charge of hydrosulfite bleaching chemical, followed by step (c), the consistency of 8-15% being maintained throughout the entire treating operation.

By the present invention, a method of treating mechanical pulp is provided that allows reductive bleaching of the pulp in an effective manner at pulp consistencies of about 5-25%, and preferably 8-15%, during the entire treating procedure. Simultaneous pumping and degassing of the mechanical pulp is preferably accomplished utilizing a fluidizing centrifugal pump. Mixing of the mechanical pulp with an effective charge of hydrosulfite bleaching chemical preferably is accomplished in a fluidizing mixer, with the hydrosulfite bleaching chemical including sequestering, chelating, and buffering agents. A typical charge is 0,5-1,5% hydrosulfite.

By practicing the invention oxidation of the reductive bleaching agent is avoided, a minimal amount of equipment is utilized, and the processing can be done at the desired consistency range of 8-15%.

Alternatively, the mixer may be eliminated, and the hydrosulfite added directly to the fluidizing pump. For instance, the chemical may be added to the discharge, or the suction, of the pump.

These and other objects of the invention will become clear from the following detailed description with reference to the drawings in which:

Figure 1 is a schematic view illustrating exemplary apparatus utilized in practicing the method according to the present invention;

Figure 2 is a schematic detail cross-sectional view of the exemplary fluidizing centrifugal pump illustrated in Figure 1; and

Figures 3 and 4 are schematic views of two different alternative embodiments of apparatus for practicing the method of the invention.

The method according to the present invention is applicable to mechanical pulps. That term, as commonly used in the industry and as used in the instant specification and claims, encompasses refiner mechanical pulps (RMP), chemimechanical pulps (CMP), thermomechanical pulps (TMP), chemithermomechanical pulps (CTMP), and stone groundwood pulps.

Typically, the mechanical pulp is produced utilizing any desired conventional technique, and then is fed by line 11 to a storage tower 12 or the like. According to the present invention it is preferable to mount a fluidizing centrifugal pump 13 at the bottom of the storage tower 12, to draw the mechanical pump downwardly therefrom. The pulp typically has a consistency of about 5-25 percent, and a consistency of 8-15 percent is preferred.

The fluidizing centrifugal pump 13, and an apparatus and method for controlling the head therefrom, are illustrated and described in Applicant's FR-A-2479 870. The pump 13, as illustrated in Figure 2, may comprise an inlet channel 14, a rotor 15 including a plurality of axially extending blades 16 having an interior opening 17 therebetween, and impeller blades 18. The blades 18 rotate in a spiral housing section 19, and gas can pass through openings 21, 22 from the housing section 19 to a gas chamber 20, the gas chamber 20 being connected up to a gas discharge line 23.

Pulp passes from the pump 13 into the discharge line 25, with a throttling valve 26 disposed therein. The head of the pump 13 is controlled, by adjusting the throttling valve 26 in a manner explained in the aforementioned FR-A-2479 870 so that a variety of heads within a wide range may be achieved. The valve 26 preferably is controlled, according to the present invention, so that the pump head is maximized, to thereby maximize the degassing action of the pump (i.e. maximizing the amount of air withdrawn through conduit 23).

After simultaneous pumping and degassing of the mechanical pulp in the pump 13, the pulp is immediately passed to a mixer 28. The pulp must be passed to the mixer 28 so that substantially no air introduction occurs, and the mixer 28 must effect mixing without air introduction. At the mixer, hydrosulfite bleaching chemical is added from line 29 to the mixer, and is thoroughly mixed with the pulp. For the practice of the present invention, the mixer 28 preferably comprises a fluidizing mixer such as shown in U.S. Patents 4,093,506 and 4,339,206.

The amount of hydrosulfite bleaching chemical added to provide an effective charge will vary depending upon the properties of the mechanical pulp, the amount of bleaching desired, etc. Typically, however, the sodium hydrosulfite or zinc hydrosulfite would be added so that the total charge was about 0.5-1.5 percent. Buffering, sequestering, and/or chelating agents, such as sodium tripolyphophate and sodium diethylenetriaminepetaacetate, are also preferably added with the hydrosulfite.

After mixing of the hydrosulfite bleaching chemical into the pulp using mixer 28, the pulp, still at the same consistency (i.e. 5-25 percent), is retained at predetermined pH and temperature conditions for a predetermined period of time to effect the desired bleaching. This retention may be merely in conduits passing the pulp onto a further processing station, or may be in a vessel particularly designed for that purpose, such as a conventional up-flow bleaching tower 31. Typical, although not limiting, conditions are: pH, about 4.5-6.5; temperature, about 35-80°C; retention time, about 0.25-2 hours.

Since the pulp is essentially completely degassed before mixing with the hydrosulfite bleaching chemical, the bleaching action can be effectively controlled, and the desired amount of bleaching chemical can be added to effect the desired bleaching. The degassing action is accomplished, according to the present invention, in a simple and effective manner, and with a minimum amount of equipment. The pulp, at a consistency of between 5-25 percent, and preferably 8-15 percent, is withdrawn from storage tower 12, simultaneously pumped and degassed by fluidizing centrifugal pump 13, the head of which is controlled by valve 26 to maximize degassing action, immediately passed to fluidizing mixer 28 at which the hydrosulfite bleaching chemical is added via line 29, and subsequently passed to a conventional retention tower 31, or the like, where it is retained at predetermined pH and temperature conditions for a predetermined period of time to effect desired bleaching.

In the exemplary embodiments of the present invention illustrated schematically in FIGURES 3 and 4, the mixer 28 is eliminated, and instead the hydrosulfite is added directly to the pulp within the pump 13. In the FIGURES 3 and 4 embodiments, the control mechanisms for the pump 13 have not been shown, for clarity of illustration.

In the FIGURE 3 embodiment, the hydrosulfite bleaching chemical is added through line 33 directly to the discharge of the pump 13. At the discharge of the pump 13, the pulp has been effectively degassed, and when the bleaching chemical is added through a nozzle, or like other introduction structure, due to the turbulence of the pulp at that point, it will become intermixed with the pulp, and effective bleaching will occur.

In the embodiment illustrated in FIGURE 4, the pump 13 is shown with the axis of rotation of the rotor thereof horizontal. This merely illustrates that the present invention may be practiced irrespective of the orientation (e.g., horizontal or vertical) of the pump rotor.

In the FIGURE 4 embodiment, the hydrosulfite bleaching chemical is added via line 35 at the suction of the pump 13. Again, introduction can be accomplished utilizing a suitable nozzle, or the like. While the pulp is not completely degassed at this position, adding the bleaching chemical at the suction provides for complete intermixing of the bleaching chemical with the pulp as it is pumped by the pump 13, and the time from chemical addition at the suction side of the pump, to effective degassing by the pump, is short enough that under most circumstances entrained air will not significantly negate the bleaching effects of the hydrosulfite. However, if entrained air does negate such effects for a particular pulp, then the embodiments of FIGURES 1 and 3 will be utilized instead of the embodiment of FIGURE 4.

Claims

1. Method of treating a mechanical pulp with hydrosulfite bleaching chemical which (b) is added to the mechanical pulp, substantially free of entrained air, whereupon (c) the pulp is retained at predetermined pH and temperature conditions for a predetermined period of time to effect bleaching thereof, characterized by (a) simultaneously pumping and essentially com-

pletely degassing the mechanical pulp at a consistency of about 8-15%, and immediately thereafter, (b) mixing, without substantial air introduction, the about 8-15% consistency mechanical pulp with an effective charge of hydrosulfite bleaching chemical, followed by step (c), the consistency of 8-15% being maintained throughout the entire treating operation.

2. A method as claimed in claim 1, characterized in that the hydrosulfite bleaching chemical added in step (b) includes buffering, chelating, and sequestering agents, and step (b) is practiced by adding sufficient hydrosulfite bleaching chemical charge so that the hydrosulfite bleaching chemical comprises about 0,5-1,5 %.

3. A method as claimed in claim 1 or 2, characterized in that step (c) is practiced by maintaining the pH at about 4,5-6,5, and maintaining the temperature at about 35-80°C, wherein the predetermined time period is about 0,25-2 hours.

4. A method as claimed in any one of claims 1 to 3, characterized in that step (a) is practiced utilizing a fluidizing pump, and by controlling the head of the pump by throttling the pulp output from the pump.

5. A method as claimed in any one of claims 1 to 4, characterized in that step (b) is practiced immediately after step (a), step (a) is practiced utilizing a fluidizing pump, and step (b) is practiced utilizing a fluidizing mixer separate and distinct from the pump.

6. A method as claimed in claim 5, characterized in that step (c) is practiced by feeding the pulp to an up-flow bleaching tower after it passes through the fluidizing mixer.

7. A method as claimed in any one of claims 1 to 4, characterized in that steps (a) and (b) are practiced utilizing a fluidizing pump, and the chemical is added to the discharge of the pump.

8. A method as claimed in any one of claims 1 to 7, characterized in that the mechanical pulp is CTMP, TMP, CMP, and/or stone groundwood.

Patentansprüche

1. Verfahren zum Behandeln einer mechanischen Pulpe mit Hydrosulfit-Bleichchemikalien, die (b) der im wesentlichen von mitgeführter Luft freien mechanischen Pulpe zugesetzt werden, wonach (c) die Pulpe zum Bewirken des Bleichens derselben während einer vorbestimmten Zeitspanne unter vorbestimmten Bedingungen von pH-Wert und Temperatur gehalten wird, gekennzeichnet durch (a) gleichzeitiges Pumpen und im wesentlichen vollständiges Entgasen der mechanischen Pulpe bei einer Konsistenz von etwa 8-15% und (b) unmittelbar anschließendes Vermischen der eine Konsistenz von etwa 8-15% aufweisenden mechanischen Pulpe ohne wesentliches Einführen von Luft mit einer wirksamen Menge von Hydrosulfit-Bleichchemikalien, gefolgt von Schritt (c), wobei die Konsistenz von 8-15% während des gesamten Behandlungsvorganges aufrechterhalten wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die im Schritt (b) zugesetzten Hydrosulfit-Bleichchemikalien Puffersubstanzen, Chelatbildner und Sequestrierungsmittel enthalten und daß der Schritt (b) durch Zusetzen einer hinreichenden Menge von Hydrosulfit-Bleichchemikalien ausgeführt wird, so daß die Hydrosulfit-Bleichchemikalien etwa 0,5-1,5% ausmachen.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Schritt (c) durch Aufrechterhalten eines pH-Wertes von etwa 4,5-6,5 und einer Temperatur von etwa 35-80°C ausgeführt wird, wobei die vorbestimmte Zeitspanne etwa 0,25-2 h beträgt.

4. Verfahren nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß der Schritt (a) unter Verwendung einer Fluidisierungspumpe und Regelung des Förderdruckes der Pumpe durch Drosseln des Pulpenausstoßes der Pumpe ausgeführt wird.

5. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß der Schritt (b) unmittelbar anschließend an den Schritt (a) ausgeführt wird und daß der Schritt (a) unter Verwendung einer Fluidisierungspumpe und der Schritt (b) unter Verwendung eines gesonderten und von der Pumpe unterschiedlichen Fluidisierungsmischers ausgeführt werden.

6. Verfahren nach Anspruch 5, dadurch gekennzeichnet, daß der Schritt (c) durch Zuführen der Pulpe nach deren Durchgang durch den Fluidisierungsmischer an eine Steigstrom-Bleichkolonne ausgeführt wird.

7. Verfahren nach einem der Ansprüche 1 bis 4, dadurch gekennzeichnet, daß die Schritte (a) und (b) unter Verwendung einer Fluidisierungspumpe ausgeführt werden, wobei die Chemikalien am Auslaß der Pumpe zugesetzt werden.

8. Verfahren nach einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß die mechanische Pulpe CTMP, TMP, CMP und/oder Holzschliff ist.

Revendications

1. Méthode de traitement de pâte mécanique par un agent chimique de blanchiment à base d'hydrosulfite qui (b) est ajouté à la pâte mécanique, pratiquement exempte d'air entraîné, après quoi (c) la pâte est maintenue dans des conditions de température et de pH prédéterminées pendant une durée prédéterminée pour effectuer son blanchiment, caractérisée par (a) le fait que l'on effectue simultanément un pompage et un dégazage pratiquement total de la pâte mécanique jusqu'à une consistance d'environ 8-15%, et immédiatement après, (b) un mélange, sans introduction substantielle d'air, de la pâte mécanique jusqu'à une consistance d'environ 8-15% avec une charge efficace d'agent chimique de blanchiment à base d'hydrosulfite, suivi de l'étape (c), la consistance de 8-15% étant maintenue durant toute l'opération de traitement.

2. Méthode selon la revendication 1, caractérisée en ce que l'agent chimique de blanchiment à base d'hydrosulfite ajouté dans l'étape (b) com-

prend des agents tampon, complexants et séquestrants, et que l'étape (b) est effectuée par addition d'une charge suffisante d'agent chimique de blanchiment à base d'hydrosulfite de telle sorte que l'agent chimique de blanchiment à base d'hydrosulfite représente environ 0,5-1,5%.

3. Méthode selon l'une des revendications 1 et 2, caractérisée en ce que l'étape (c) est effectuée en maintenant le pH à environ 4,5-6,5, et en maintenant la température à environ 35-80°C, la durée prédéterminée étant d'environ 0,25-2 heures.

4. Méthode selon l'une quelconque des revendications 1 à 3, caractérisée en ce que l'on effectue l'étape (a) en utilisant une pompe de fluidisation, et en ajustant la pression de la pompe en ralentissant la quantité de la pâte sortant de la pompe.

5. Méthode selon l'une quelconque des revendications 1 à 4, caractérisée en ce que l'on effectue l'étape (b) immédiatement après l'étape (a), que l'on effectue l'étape (a) en utilisant une pompe de fluidisation, et que l'on effectue l'étape (b) en utilisant un mélangeur de fluidisation séparé et distinct de la pompe.

6. Méthode selon la revendication 5, caractérisée en ce que l'on effectue l'étape (c) en alimentant la pâte dans une tour de blanchiment à courant ascendant après l'avoir fait passer par le mélangeur de fluidisation.

7. Méthode selon l'une quelconque des revendications 1 à 4, caractérisée en ce que l'on effectue les étapes (a) et (b) en utilisant une pompe de fluidisation, et que l'on ajoute l'agent chimique au refoulement de la pompe.

8. Méthode selon l'une quelconque des revendications 1 à 7, caractérisée en ce que la pâte mécanique est de la pâte mi-chimique thermique, de la pâte thermomécanique, de la pâte michimique et/ou de la pâte Chemigrounwood.

Fig. 1

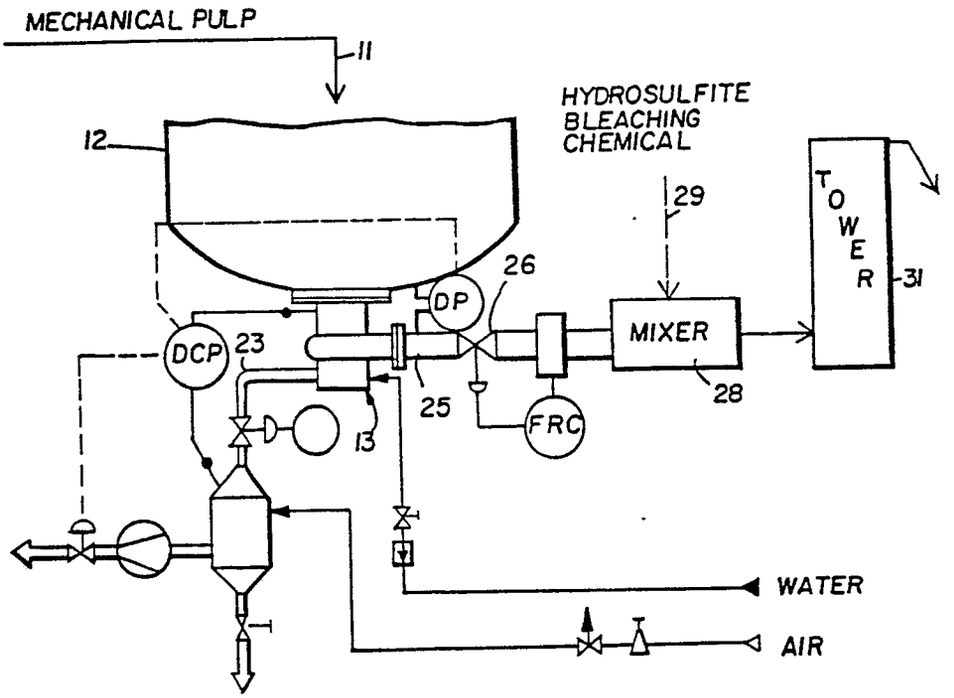
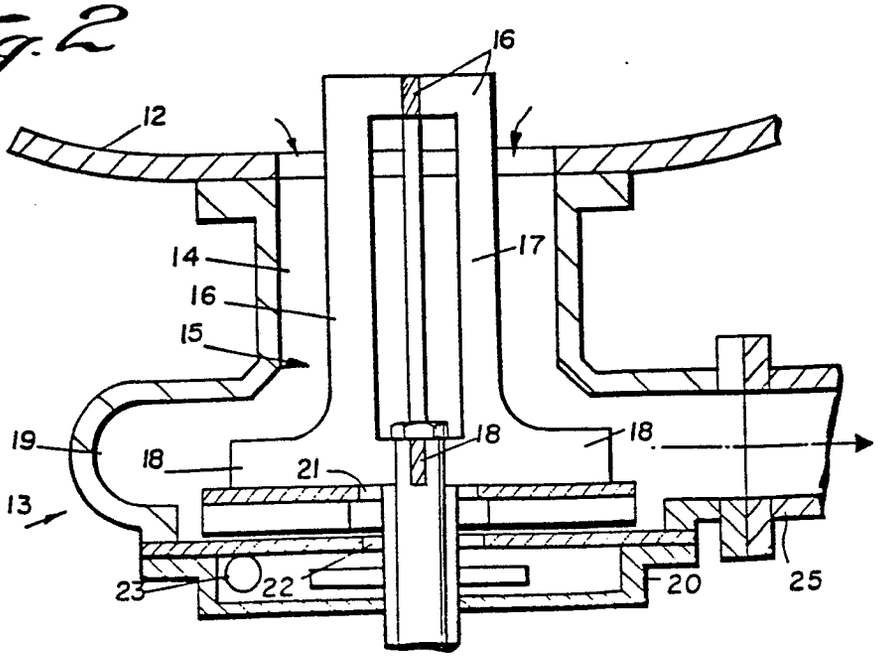

MECHANICAL PULP
11
12
HYDROSULFITE
BLEACHING
CHEMICAL
29
TOWER
31
26
DP
DCP
23
MIXER
28
25
FRC
13
WATER
AIR

Fig. 2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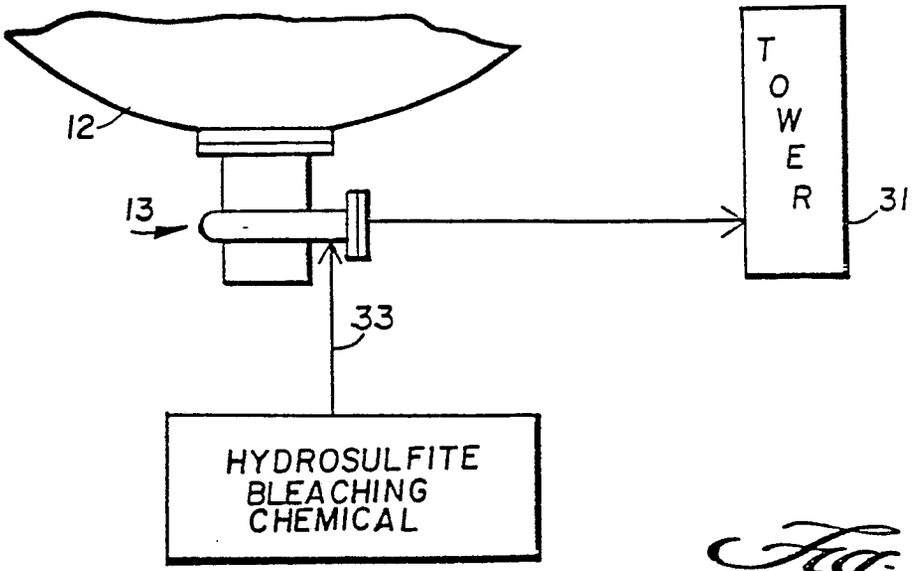
12
13
TOWER
31
33
HYDROSULFITE BLEACHING CHEMICAL

Fig. 3

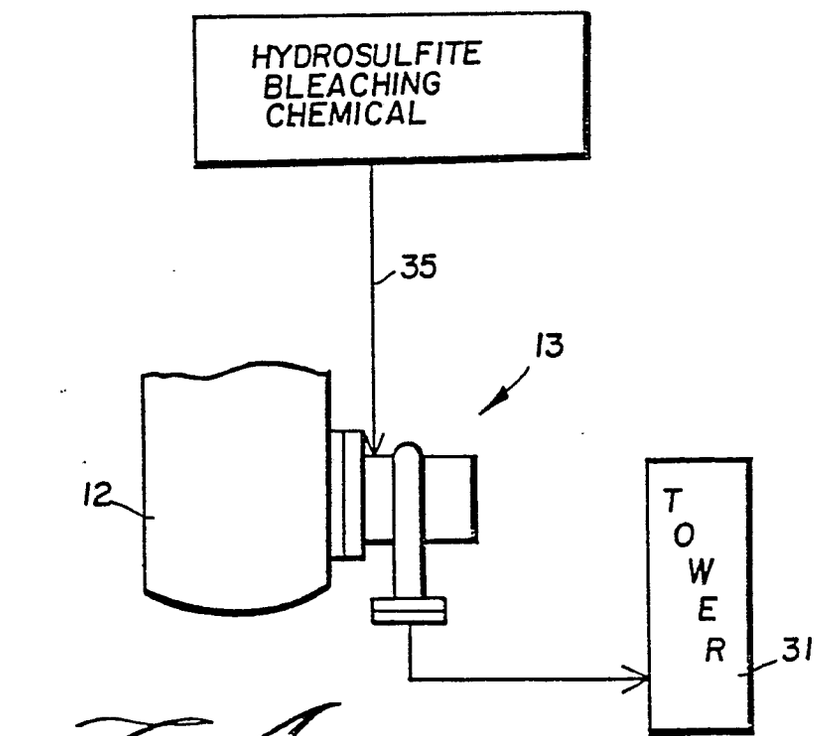
HYDROSULFITE BLEACHING CHEMICAL
35
13
12
TOWER
31

Fig. 4