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(54) **DISPLACEMENT HEATING IN CONTINUOUS DIGESTERS.**

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Description

TECHNICAL FIELD OF THE INVENTION

The present invention relates to improvements in apparatus and methods for the fiber liberating digestion of continuously fed comminuted cellulosic fiber material by cooking liquor and subsequent washing of the liberated fiber material. More particularly, the invention relates to an improved apparatus and process utilizing spent black liquor for heating the chips to effect savings in thermal energy, and for accomplishing high sulfidity cooking without changes to the overall sulfide balance of the system to accomplish a pulp having improved mechanical characteristics, to improve pulp yield, and to achieve extended delignification.

BACKGROUND OF THE INVENTION

In producing chemical wood pulps, it has become the practice to use cooking liquors containing various cooking chemicals for liberating the pulp fibers. The so-called kraft or sulphate pulp is produced by cooking the raw chipped wood in a liquor wherein materials such as sodium hydroxide and sodium sulfide serve as the essential fiber liberating chemicals. The so-called soda pulp derives its name from the caustic soda-containing cooking liquor which is produced, namely a liquor containing principally caustic soda as the active pulping chemical. There are modifications of these processes based on the use of liquors containing caustic soda and sodium sulphite or containing caustic soda, and sodium sulphide. All of these processes are, however, performed similarly with respect to the cooking being effected with an amount of liquor over a period of time requiring the addition of heat to maintain the process at the proper cooking temperature, approximately 170°C.

Two basic processes have been used for performing the chip cooking. The first is batch cooking in which the chips are placed in a digester, liquor is added, the temperature and pressure are raised and the "batch" is maintained at the elevated temperature and pressure to reach the desired stage of delignification. The digester is then emptied, and a subsequent fill is started for another batch. In continuous digesting, the second basic process, a chip column continuously moves through the digester with hot liquor circulating therethrough. Process conditions are controlled such that the desired stage of delignification has occurred when the chips flow out of the digester.

Various advances have been made in batch cooking processes utilizing spent liquor or black liquor in transferring heat to the chips, but effective heat conserving processes for continuous cooking have not been developed to an advanced stage for attaining maximum heat energy conservation.

In conventional continuous digesters, the spent liquor is allowed to flash and steam is generated. The steam is normally utilized to pre-steam the chips and to generate hot water. The heat and cooking chemicals could be utilized more efficiently if the spent liquors were used to preheat and precondition the chips and to preheat the cooking chemicals such as white liquor in kraft processes which enters the process.

SUMMARY OF THE INVENTION

It is accordingly an object of the present invention to provide a continuous digestion cooking process wherein an improved saving in thermal energy is effected.

A further object of the invention is to provide a continuous digestion process wherein the used black cooking liquors and the white liquors are utilized in a unique manner in the process so as to obtain a saving in thermal energy, and to effect an improvement in the resultant qualities of the pulp which is produced.

Yet another object of the present invention is to provide a process for achieving high sulfidity cooking without significant changes to the overall sulfide balance of the cooking system, and for achieving extended delignification in a continuous digesting system while improving pulp yield over existing continuous digesting systems.

A feature of the invention is the provision of a continuous digestion process wherein a plurality of containers are used in sequence, with the first container receiving preconditioned chips and the chips being preimpregnated and heated in the first container with a low temperature black liquor. Further heating of the chips is accomplished with higher temperature liquors in the second and subsequent containers, and after the chips are brought up to the desired elevated temperature, a white liquor is circulated through the chips at the digestion temperature and pressure. The chips are continuously fed from the last of the preimpregnation containers to the digester for cooking. The cooked delignified chips are removed as pulp from the bottom of the digester and circulated to final washing. The wash liquor from the washer is utilized in two or more stages to displace from the digester the free liquor and liquor within the chips.

In accordance with the principles of the present invention, the hot spent liquor is utilized to heat the incoming materials for the continuous digester. The spent liquor, having been extracted from the digester, is accumulated in pressure vessels substantially at digester temperature. Lower temperature liquors from final displacement stages are also accumulated. The incoming chips are first exposed to the lower temperature liquors and then the higher temperature liquors. The white liquor is preheated in a heat exchanger, utilizing a portion of hot spent liquor. The white liquor can be stored in a hot white liquor accumulator whereas

the hot spent liquor, after having given energy to the white liquor, goes to the low temperature accumulator.

Practically, the process can be accomplished wherein a first initial chamber or vessel is utilized, being fed by a screw conveyor feeder to press the chips downwardly. The vessel may be employed with an extraction screen at the top and with a recirculation screen further down the vessel, with the recycled liquor flowing through a central pipe ending at the screen level. Low temperature liquor is fed from a low temperature tank to a circulation pump, and the liquor is evenly spread over the vessel area. By extracting liquor from the top screen, a portion of the added liquor flows in a countercurrent path to the movement of the chips, thus transferring the heat and residual chemicals in the liquor to the chips. The duration of time that the chips are in that zone, and the liquor flow rate will determine the efficiency of the heat transfer. The amount of liquor extracted from the top screen is an amount that generally corresponds to the white liquor charge, wood moisture and the dilution factor. The extracted liquor goes to the evaporators. The remaining part of the liquor goes with the chips downwardly in the chamber.

The treatment with hot spent liquor takes place in a vessel at principally digester pressure. Preferably, this high pressure vessel is located underneath the first vessel, and the transfer of material takes place in utilizing a high pressure feeder. The arrangement for heat exchange is, in principal, essentially the same as in the first lower temperature vessel. The hot spent liquor is introduced in a recirculation circuit, and a portion of the liquor flows countercurrent to the chips, being extracted from a top screen. Thus, the low temperature liquor is being displaced and substituted by a hot spent liquor. The low temperature liquor which leaves the top screen is conveyed back to the low temperature tank.

A portion of the hot spent liquor is utilized to preheat the white liquor that is introduced in the bottom of the high pressure vessel. In the event a mechanical device is utilized to feed chips out of the high pressure vessel, white liquor should be added after that mechanical device to avoid pulp deterioration. This can be done by utilizing a vessel which forms part of the continuous digester and is integrated into the digester apparatus itself.

Other objects, advantages, and features will become more apparent with the teaching of the principles of the invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims, and drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic drawing of a process for operating in accordance with the principles of the present invention.

Figure 2 is a schematic drawing of a modification of the process shown in Figure 1, wherein the high pressure preimpregnation vessel forms a part of the continuous digester.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in Figure 1, wood chips are delivered to a first chamber or container 10 through a screw delivery mechanism 11. The chips may be preconditioned, such as by being heated by steam, in a supply container 12.

In the first container, which is a warm liquor preimpregnator, the preheating occurs by a supply of low temperature black liquor supplied from a low temperature black liquor tank 13 through a supply line 14. The black liquor is circulated through the chips through a recirculating mechanism including a recirculating line 15 and a recirculating pump 16.

Excess black liquor, after having spent its heat energy and residual chemicals, is removed near the top of the chamber 10 through a line 17 controlled by a valve 18 to flow to an evaporator 19 where the black liquor is reprocessed and reclaimed in the manner which will be recognized and understood by those versed in the art. Screens 10a and 10b are provided for the liquor outlets to the evaporator 19 and the recirculating line 15, respectively.

In the process depicted in Figure 1, preheated wood chips are forcibly conveyed downwardly to a second container 21, which is a hot liquor preimpregnator in which the wood chips are subjected to liquor for a predetermined time at a higher temperature and high pressure than in the first container. For delivering the wood chips to the second container 21, a mechanism such as a rotary delivery valve 20 is employed. Such valves are well-known to those skilled in the art and will not be described further herein.

To preheat the chips in the hot liquor preimpregnator to approach the digestion temperature, hot black liquor is delivered to the second container by line 23, which receives hot black liquor from a hot black liquor tank 22 delivered by a pressure pump 22a. The hot black liquor is recirculated through the moving chips by recirculation line 24, with the liquor being circulated by a pump 24a. A portion of the liquor is removed through a line 24b, controlled by a valve 24c, to be delivered back to the low temperature black liquor tank 13, preferably upstream of a delivery pump 13a which pumps the low temperature black liquor to the first container 10.

Arranged in the second container 21 are screens 21a, 21b, and 21c, which allow for the removal of the liquor, with the screen 21a facilitating the removal of the excess black liquor through the line 24b, and the screens 21b and 21c facilitating the recirculation of

the high temperature black liquor in two recirculation paths.

For the digestion process, white liquor is delivered to the second container 21 through a line 25. Alternatively, the white liquor can be supplied through a line 25a, shown by dotted line in Figure 1, as the chips leave the second container.

The white liquor is obtained from a high temperature white liquor tank 27, being delivered therefrom by a pump 27a. The white liquor is preheated before delivery to the second container 21 in a heat exchanger 28, with the white liquor being supplied to the heat exchanger from a supply source not shown and a supply line 29. The heat exchanger is heated by hot black liquor supplied through a line 30 leading from the high temperature black liquor tank 22, and, after passing through the heat exchanger, the black liquor flows through a line 31 to the low temperature black liquor tank 13.

The preimpregnated chips and cooking liquor exit the bottom of the second container 21 through a discharge line 32, which connects the bottom of the second container 21 to the upper end of the digester 33. Cooking liquor is recirculated at the top of the digester through a circuit 34 having a recirculation pump 34a and extraction screen 34b therein. Temperature adjustment of the cooking liquor may be achieved with a trim heat exchanger 34c heated by steam from a steam source 34d. A portion of the cooking liquor is removed from the digester through a line 38 by a pump 38a, and is delivered through a line 39 to the location where the chips exit the second container. This recirculated cooking liquor further dilutes the chips and liquor exiting the second container to facilitate transport of the chips to the digester.

In the digester 33, the chips move continuously downward, and are cooked to the desired level of delignification. Recirculation takes place through an extraction line 35, an extraction screen 35a, a recirculation line 36, and a pump 36a. A portion of the recirculated liquor is directed to the hot liquor tank 22, controlled by a valve 36b.

In the lower part of the digester, washer filtrate from a line 50 is recirculated through a circuit 52 by a pump 54, to eliminate temperature and spent liquor concentration gradients. The filtrate is added between an extraction screen 56 and the pump 54, so that the extracted liquor volume is less than the flow into the digester through circuit 52, causing an upward flow of filtrate in the bottom of the digester. A second recirculation circuit 60, including a pump 62, is provided to extract a portion of the upward flowing filtrate at an extraction screen 64, together with remaining hot spent black liquor. A portion of the extracted filtrate and liquor is directed to the low temperature tank 13, through line 66 controlled by a valve 68.

A blow line 80 is provided for removing pulp from the digester to a washer. The manner in which the pulp is moved from the digester, including any secondary dilution, is well-known in the art of continuous digesters and will not be described further herein.

In operation, preconditioned pulp is delivered via a screw conveyor 11 into a first chip preheating container 10 where it is heated by low temperature black liquor obtained from a low temperature black liquor tank 13. The preheated chips pass downwardly through a rotary delivery valve 20 to a second chamber 21, where the chips are further preheated by high temperature black liquor received from a high temperature black liquor tank 22.

The high temperature and low temperature black liquors are obtained from the pulp washer with the high temperature liquor also being utilized for heating the white liquor through the heat exchanger 28. White liquor delivered through the screen 21c from a white liquor supply line 25, is added to the chips before the chips enter digester 33.

In the digester, delignification takes place as the chip column and liquor move downwardly. The volume of filtrate added through supply line 50 should be sufficient to displace the free hot black liquor extracted through screen 35a and the warm liquor extracted through screen 64. The countercurrent flow of liquor in the area between screen 35a and screen 64, and between 64 and screen 56 creates a condition in which liquor held by the chips is displaced and removed, so that the chips leaving through blow line 80 are substantially free from cooking liquor.

The region of the countercurrent flow between screen 64 and screen 35a should be sufficiently long that the filtrate is heated by the chips substantially to cooking temperature, and the liquor and filtrate removed through line 35a are at or near cooking temperature.

It is known that the sulphide ions in cooking liquors that are absorbed by the chips prior to cooking are liberated from the wood chips later in the cooking process, so that approximately 90 percent of the sulphide is left in the spent liquors. It is critical to cooking selectivity to precondition chips with sulphide prior to bulk delignification. In the present invention, liquor leaving the top of the first chamber contains essentially the same amount of sulphide as conventional spent liquors going to evaporation. The sulphide concentration in the low temperature tank is even higher than that coming from the first chamber, and the sulphide concentration in the hot black liquor tank is even higher. These concentrations, in combination with the elevated temperatures, give an efficient preconditioning of the wood chips with sulphide prior to cooking.

It should be recognized that the various components of the present process can be rearranged to achieve the desired preimpregnation and preheating, with appropriate recirculation. Additional preimpregnation containers can be utilized, joined as shown in

Figure 1, or by other suitable means. The two container process described also can be alternatively arranged. For example, Figure 2 illustrates, in schematic format, a process in which the second chamber 21 is continguous with the digester. Corresponding parts of the process depicted in Figure 2 have been numbered similarly to Figure 1. Thus, the various extraction screens, recirculation circuits, pumps, and the like for both the high pressure preimpregnation process and the final digestion process are contained in the combined preimpregnation and digester vessel.

Thus, it will be seen that I have provided an improved method and apparatus for a continuous digestion process which meets the objectives and advantages above set forth.

Claims

1. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in a continuous process, comprising in combination:

a first chamber (10);

feed means (11) for delivering cellulosic wood chips to said first chamber (10);

a low temperature liquor tank (13) connected to the first chamber (10) for circulating low temperature black liquor through the chips in said first chamber (10) for the exchange of heat energy to increase the temperature of the chips and to convey residual chemicals to the chips;

a second chamber (21) connected to receive chips preheated by said low temperature liquor from the first chamber (10);

a feed mechanism (20) connected between said chambers (10,21) for delivering the chips to the second chamber (21);

a high temperature liquor tank (22) connected to said second chamber (21) for circulating high temperature black liquor through the chips for the exchange of heat energy to bring the temperature of the chips near digesting temperature and to convey residual chemicals to the chips;

an outlet means (32) leading from the second chamber (21) for a continuous delivery of preheated chips to a digester (33);

means (25,25a,27,27a) for supplying white liquor to the chips preheated in said second chamber furthering delignification of the chips in the digester;

a recirculation means (35,35a,36,36a) in the upper portion of the digester for recirculating hot liquor in the digester; and including diversion means (36b) for directing a portion of the recirculating hot liquor to the high temperature liquor tank (22);

a first recirculation means (52,54,56) in the lower portion of the digester for recirculating liquor in the lower portion, including means (50) for adding washer filtrate to recirculating liquor;

a second recirculation means (60,62,64) in the lower portion of the digester including extracting means (66,68) for directing liquor to the low temperature liquor tank (13); and

a connection (80) from the digester to a pulp washer for transfering the delignified pulp.

2. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in continuous process constructed in accordance with claim 1:

including a recirculation means (14,15,16) for the first chamber (10) for receiving low temperature liquor from said low temperature tank (13) and for recirculating the liquor through the chips in the first chamber (10) countercurrent to the continuous movement of chips through said first chamber (10).

3. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in a continuous process constructed in accordance with claim 1:

including a recirculating means (23,24,24a) for the second chamber (21) connected to receive liquor from the high temperature tank (22), for recirculation of the high temperature liquor through the second tank (21) countercurrent to the continuous movement of chips therethrough for raising the temperature of the chips therein.

4. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in a continuous process constructed in accordance with claim 1:

including a white liquor recirculation means (34,34a, 34b,38,38a,39) connected to the digester (33) for recirculating the white liquor countercurrent to the chip movement during the digesting process.

5. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in a continuous process constructed in accordance with claim 1:

including a heat exchanger (28) connected to the high temperature liquor tank (22) and connected to the white liquor container (27) for in-

creasing the temperature of the white liquor utilizing the thermal energy in the liquor in said high temperature liquor tank (22).

6. A digester apparatus for the liberation of cellulosic fibrous material for papermaking pulp using cooking liquor at a high pressure and a high temperature in a continuous process constructed in accordance with claim 1:

including a liquor removal line (17) connected to the first chamber (10) for the removal of low temperature liquor.

7. A continuous digestion process for treating chipped wood, comprising the steps:

delivering wood chips to a first chamber (10);

moving said chips continuously through said chamber (10);

circulating a black liquor therethrough at moderate temperatures in said first chamber (10) to heat the chips and recycle residual chemicals;

continuously feeding the preheated and chemically preconditioned chips and moderate temperature liquor to a second chamber (21) at a higher temperature and pressure;

displacing the moderate temperature black liquor with hot black liquor;

circulating the hot black liquor through the chips in the second chamber (21) to further increase the temperature of the chips and to further recycle residual chemicals;

delivering white liquor to the hot chips for displacing the hot black liquor;

transporting said chips in a continuous flow to a digester (33);

moving said chips through said digester (33) at a rate, temperature, and pressure for completing desired delignification while said chips are in said digester (33);

recirculating hot black liquor in the digester and diverting a portion therefrom for further use in said second chamber (21);

displacing liquor from the digested pulp using a lower temperature liquid and supplying said liquor to said first chamber (10);

separately collecting moderate temperature and hot temperature liquors displaced in the process as well as diverted during the liquor circulating steps; and

removing digested pulp from the digester (33) after being subjected to the effect of the white liquor for a predetermined time.

8. The method of treating cellulosic wood chips in a continuous, high pressure, high temperature, digestion process for the liberation of pulp, in accordance with the steps of claim 7:

including delivering the digested pulp to a washer and utilizing the wash liquor as said lower temperature liquid.

9. The method of treating cellulosic wood chips in a continuous, high pressure, high temperature, digestion process for the liberation of pulp, in accordance with the steps of claim 7:

including recirculating the black liquor in said first chamber (10) over a predetermined time to preheat and chemically precondition the chips.

10. The method of treating cellulosic wood chips in a continuous, high pressure, high temperature digestion process for the liberation of pulp, in accordance with the steps of claim 7:

including utilizing hot black liquor for preheating the white liquor.

11. The method of treating cellulosic wood chips in a continuous, high pressure, high temperature, digestion process for the liberation of pulp, in accordance with the steps of claim 7:

including removing black liquor from the first chamber (10) for reprocessing the liquor.

12. The method of treating cellulosic wood chips in a continuous, high pressure, high temperature, digestion process for the liberation of pulp, in accordance with the steps of claim 7:

including recirculating the hot black liquor in the second chamber (21).

Patentansprüche

1. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, beinhaltend in Kombination:

eine erste Kammer (10);

eine Fördereinrichtung (11) zum Fördern von Celluloseholzschnitzeln in die erste Kammer (10);

einen Niedertemperaturlaugentank (13), der mit der ersten Kammer (10) verbunden ist, zum Hindurchleiten von Niedertemperaturschwarzlauge durch die Schnitzel in der ersten Kammer (10) für den Austausch von Wärmeenergie zum Erhöhen der Temperatur der Schnitzel und zum Übertragen von restlichen Chemikalien auf die Schnitzel;

eine zweite Kammer (21), die so angeschlossen ist, daß sie durch die Niedertemperaturlauge vorgewärmte Schnitzel aus der ersten Kammer (10) empfängt;

eine Fördervorrichtung (20), die zwischen den Kammern (10, 21) angeschlossen ist, zum För-

dern der Schnitzel in die zweite Kammer (21);
einen Hochtemperaturlaugentank (22), der an die zweite Kammer (21) angeschlossen ist, zum Hindurchleiten von Hochtemperaturschwarzlauge durch die Schnitzel für den Austausch von Wärmeenergie, um die Temperatur der Schnitzel in die Nähe der Aufschließtemperatur zu bringen und restliche Chemikalien auf die Schnitzel zu übertragen;
eine Auslaßeinrichtung (32), die aus der zweiten Kammer (21) führt, zum kontinuierlichen Fördern von vorgewärmten Schnitzeln zu einem Aufschließer (33);
eine Einrichtung (25, 25a, 27, 27a) zum Fördern von Weißlauge zu den in der zweiten Kammer vorgewärmten Schnitzeln zur weiteren Entlignifizierung der Schnitzel in dem Aufschließer;
eine Rezirkulationseinrichtung (35, 35a, 36, 36a) in dem oberen Teil des Aufschließers zur Rezirkulation von heißer Lauge in dem Aufschließer; und mit einer Ableiteinrichtung (36b) zum Leiten eines Teils der rezirkulierenden heißen Lauge in den Hochtemperaturlaugentank (22);
eine erste Rezirkulationseinrichtung (52, 54, 56) in dem unteren Teil des Aufschließers zum Rezirkulieren von Lauge in dem unteren Teil, mit einer Einrichtung (50) zum Zusetzen von Wascherfiltrat zu der rezirkulierenden Lauge; und
eine zweite Rezirkulationseinrichtung (60, 62, 64) in dem unteren Teil des Aufschließers, die eine Extrahiereinrichtung (66, 68) aufweist zum Leiten von Lauge in den Niedertemperaturlaugentank; und eine Verbindung (80) von dem Aufschließer zu einem Zellstoffwascher zum Übertragen des entlignifizierten Zellstoffes.

2. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, der gemäß Anspruch 1 ausgebildet ist:
mit einer Rezirkulationseinrichtung (14, 15, 16) für die erste Kammer zum Empfangen von Niedertemperaturlauge aus dem Niedertemperaturtank (13) und zum Rezirkulieren der Lauge durch die Schnitzel in der ersten Kammer (10) im Gegenstrom zu der kontinuierlichen Bewegung der Schnitzel durch die erste Kammer (10).

3. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, der gemäß Anspruch 1 ausgebildet ist:
mit einer Rezirkulationseinrichtung (23, 24, 24a) für die zweite Kammer (21), die so angeschlossen ist, daß sie Lauge aus dem Hochtemperaturtank (22) empfängt, zur Rezirkulation der Hochtemperaturlauge durch den zweiten Tank (21) im Gegenstrom zu der kontinuierlichen Hindurchbewegung der Schnitzel, um die Temperatur der Schnitzel darin zu erhöhen.

4. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, der gemäß Anspruch 1 ausgebildet ist:
mit einer Weißlaugenrezirkulationseinrichtung (34, 34a, 34b, 38, 38a, 39), die mit dem Aufschließer (33) verbunden ist, zum Rezirkulieren der Weißlauge im Gegenstrom zu der Schnitzelbewegung während des Aufschließprozesses.

5. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, der gemäß Anspruch 1 ausgebildet ist:
mit einem Wärmetauscher (28), der mit dem Hochtemperaturlaugentank (22) und mit dem Weißlaugenbehälter (27) verbunden ist, um die Temperatur der Weißlauge unter Verwendung der thermischen Energie in der Lauge in dem Hochtemperaturlaugentank (22) zu erhöhen.

6. Aufschließvorrichtung für das Freisetzen von Cellulosefasermaterial für Papierzellstoff unter Verwendung von Kochlauge bei einem hohen Druck und einer hohen Temperatur in einem kontinuierlichen Prozeß, der gemäß Anspruch 1 ausgebildet ist:
mit einer Laugenabfuhrleitung (17), die mit der ersten Kammer (10) verbunden ist, zur Abfuhr der Niedertemperaturlauge.

7. Kontinuierlicher Aufschließprozeß zum Behandeln von zerschnitzeltem Holz, beinhaltend die Schritte:
Fördern von Holzschnitzeln in eine erste Kammer (10);
kontinuierliches Hindurchbewegen der Schnitzel durch diese Kammer (10);
Hindurchleiten einer Schwarzlauge mit mäßigen Temperaturen in der ersten Kammer (10), um die Schnitzel zu erwärmen und restliche Chemikalien zu recyceln;
kontinuierliches Fördern der vorgewärmten und chemisch vorkonditionierten Schnitzel und der Lauge mäßiger Temperatur in eine zweite Kammer (21) mit einer höheren Temperatur und höhe-

rem Druck;
Verdrängen der Schwarzlauge mäßiger Temperatur mit heißer Schwarzlauge;
Hindurchleiten der heißen Schwarzlauge durch die Schnitzel in der zweiten Kammer (21), um die Temperatur der Schnitzel weiterzusteigern und restliche Chemikalien weiter zu recyceln;
Fördern von Weißlauge zu den heißen Schnitzeln, um die heiße Schwarzlauge zu verdrängen;
Transportieren der Schnitzel in einem kontinuierlichen Strom zu einem Aufschließer (33);
Hindurchbewegen der Schnitzel durch den Aufschließer (33) mit einer Geschwindigkeit, einer Temperatur und einem Druck zum Erreichen der gewünschten Entlignifizierung, während die Schnitzel in dem Aufschließer (33) sind;
Rezirkulieren von heißer Schwarzlauge in dem Aufschließer und Ableiten eines Teils derselben zur weiteren Verwendung in der zweiten Kammer (21);
Verdrängen von Lauge aus dem aufgeschlossen Zellstoff unter Verwendung einer Lauge niedrigerer Temperatur und Fördern der Lauge in die erste Kammer (10);
separates Sammeln von Lauge mäßiger Temperatur und von Lauge hoher Temperatur, die in dem Prozeß verdrängt und während der Laugenumwälzschritte abgeleitet worden sind; und
Entfernen von aufgeschlossenem Zellstoff aus dem Aufschließer (33), nachdem er der Einwirkung der Weißlauge für eine vorbestimmte Zeit ausgesetzt gewesen ist.

8. Verfahren zum Behandeln von Celluloseholzschnitzeln in einem kontinuierlichen Aufschließprozeß bei hohem Druck und hoher Temperatur für die Freisetzung von Zellstoff gemäß den Schritten nach Anspruch 7:
beinhaltend das Fördern des aufgeschlossenen Zellstoffes in einen Wascher und Verwenden der Waschlauge als die Flüssigkeit niedriger Temperatur.

9. Verfahren zum Behandeln von Celluloseholzschnitzeln in einem kontinuierlichen Aufschließprozeß bei hohem Druck und hoher Temperatur für die Freisetzung von Zellstoff gemäß den Schritten nach Anspruch 7:
beinhaltend das Rezirkulieren der Schwarzlauge in der ersten Kammer (10) über einer vorbestimmten Zeit, um die Schnitzel vorzuwärmen und chemisch vorzukonditionieren.

10. Verfahren zum Behandeln von Celluloseholzschnitzeln in einem kontinuierlichen Aufschließprozeß bei hohem Druck und hoher Temperatur für die Freisetzung von Zellstoff gemäß den Schritten nach Anspruch 7:
beinhaltend das Verwenden der heißen Schwarzlauge zum Vorwärmen der Weißlauge.

11. Verfahren zum Behandeln von Celluloseholzschnitzeln in einem kontinuierlichen Aufschließprozeß bei hohem Druck und hoher Temperatur für die Freisetzung von Zellstoff gemäß den Schritten nach Anspruch 7:
beinhaltend das Entfernen der Schwarzlauge aus der ersten Kammer (10) zum Nachbearbeiten der Lauge.

12. Verfahren zum Behandeln von Celluloseholzschnitzeln in einem kontinuierlichen Aufschließprozeß bei hoem Druck und hoher Temperatur für die Freisetzung von Zellstoff gemäß den Schritten nach Anspruch 7:
beinhaltend das Umwälzen der heißen Schwarzlauge in der zweiten Kammer (21).

Revendications

1. Appareil de lessiveur pour la libération de matière fibreuse cellulosique pour de la pâte de fabrication du papier en utilisant de la liqueur de cuisson à une pression élevée et à une température élevée dans un procédé en continu, comprenant, en combinaison :
une première chambre (10);
un moyen d'alimentation (11) pour acheminer des copeaux de bois cellulosiques à ladite première chambre (10);
une cuve (13) pour la liqueur à basse température reliée à la première chambre (10) pour la mise en circulation de liqueur noire à basse température à travers les copeaux dans ladite première chambre (10) en vue d'un échange d'énergie thermique pour élever la température des copeaux et pour véhiculer des produits chimiques résiduels en direction des copeaux;
une seconde chambre (21) qui y est reliée pour recevoir des copeaux préchauffés par ladite liqueur à basse température provenant de la première chambre (10);
un mécanisme d'alimentation (20) relié entre lesdites chambres (10, 21) pour acheminer les copeaux à la seconde chambre (21);
une cuve (22) pour liqueur à température élevée reliée à ladite seconde chambre (21) pour la mise en circulation d'une liqueur noire à température élevée à travers les copeaux pour un échange d'énergie thermique dans le but d'amener la température des copeaux à proximité de la température de lessivage et pour véhiculer les produits chimiques résiduels en direction des copeaux;
un moyen de sortie (32) conduisant de la

seconde chambre (21) pour une alimentation continue de copeaux préchauffés à un lessiveur (33);

des moyens (25, 25a, 27, 27a) pour acheminer de la liqueur blanche aux copeaux préchauffés dans ladite seconde chambre pour poursuivre la délignification des copeaux dans le lessiveur;

un moyen de remise en circulation (35, 35a, 36, 36a) dans la portion supérieure du lessiveur pour la remise en circulation de liqueur chaude dans le lessiveur, et englobant un moyen de détournement (36b) pour diriger une portion de la liqueur chaude de remise en circulation vers la cuve (22) pour la liqueur à température élevée;

un premier moyen de remise en circulation (52, 54, 56) dans la portion inférieure du lessiveur pour la remise en circulation de la liqueur dans la portion inférieure, englobant un moyen (50) pour ajouter du filtrat de laveur à la liqueur de remise en circulation;

un second moyen de remise en circulation (60, 62, 64) dans la portion inférieure du lessiveur englobant un moyen d'extraction (66, 68) pour diriger la liqueur vers la cuve (13) pour la liqueur à basse température; et

une connexion (80) entre le lessiveur et le laveur de pâte pour transférer la pâte délignifiée.

2. Appareil de lessiveur pour la libération de matière fibreuse cellulosique pour la pâte de fabrication du papier en utilisant de la liqueur de cuisson sous une pression élevée et à une température élevée dans un procédé en continu, construit conformément à la revendication 1 :

englobant un moyen de remise en circulation (14, 15, 16) pour la première chambre (10) dans laquelle vient se loger la liqueur à basse température provenant de ladite cuve (13) à basse température et pour la remise en circulation de la liqueur à travers les copeaux dans la première chambre (10) à contre-courant au mouvement en continu des copeaux à travers ladite première chambre (10).

3. Appareil de lessiveur pour la libération de la matière fibreuse cellulosique pour la pâte de fabrication du papier en utilisant de la liqueur de cuisson sous une pression élevée et à une température élevée dans un procédé en continu, construit conformément à la revendication 1 :

englobant un moyen de remise en circulation (23, 24, 24a) pour la seconde chambre (21) qui y est reliée pour que vienne s'y loger la liqueur provenant de la cuve (22) à température élevée, pour la remise en circulation de la liqueur à température élevée à travers la seconde cuve (21) à contre-courant au mouvement continu des copeaux qui la traversent pour élever la température des copeaux qui y sont contenus.

4. Appareil de lessiveur pour la libération de la matière fibreuse cellulosique pour la pâte de fabrication du papier en utilisant de la liqueur de cuisson sous une pression élevée et à une température élevée dans un procédé en continu, construit conformément à la revendication 1 :

englobant un moyen de remise en circulation de liqueur blanche (34, 34a, 34b, 38, 38a, 39) relié au lessiveur (33) pour la remise en circulation de la liqueur blanche à contre-courant au mouvement des copeaux au cours du procédé de lessivage.

5. Appareil de lessiveur pour la libération de la matière fibreuse cellulosique pour la pâte de fabrication du papier en utilisant de la liqueur de cuisson sous une pression élevée et à une température élevée dans un procédé en continu, construit conformément à la revendication 1 :

englobant un échangeur de chaleur (28) relié à la cuve (22) pour la liqueur à température élevée et relié au récipient (27) pour la liqueur blanche afin d'élever la température de la liqueur blanche en utilisant l'énergie thermique dans la liqueur dans ladite cuve (22) pour la liqueur à température élevée.

6. Appareil de lessiveur pour la libération de la matière fibreuse cellulosique pour la pâte de fabrication du papier en utilisant de la liqueur de cuisson sous une pression élevée et à une température élevée dans un procédé en continu, construit conformément à la revendication 1 :

englobant un conduit d'élimination de liqueur (17) relié à la première chambre (10) pour éliminer la liqueur à basse température.

7. Procédé de lessivage en continu pour traiter du bois réduit en copeaux, comprenant les étapes consistant à :

acheminer les copeaux de bois à une première chambre (10);

déplacer lesdits copeaux en continu à travers ladite chambre (10);

mettre en circulation une liqueur noire à travers eux à des températures modérées dans ladite première chambre (10) pour chauffer les copeaux et remettre en circulation les produits chimiques résiduels;

alimenter en continu les copeaux préchauffés et chimiquement préconditionnés, et la liqueur à température modérée à une seconde chambre (21) à température et à pression plus élevées;

déplacer la liqueur noire à température

modérée avec la liqueur noire chaude;

mettre en circulation la liqueur noire chaude à travers les copeaux dans la seconde chambre (21) pour élever davantage la température des copeaux et pour remettre davantage en circulation les produits chimiques résiduels;

acheminer de la liqueur blanche aux copeaux chauds pour déplacer la liqueur noire chaude;

transporter lesdits copeaux dans un courant en continu à un lessiveur (33);

déplacer lesdits copeaux à travers ledit lessiveur (33) à un débit, à une température et à une pression pour compléter la délignification désirée, tandis que lesdits copeaux se trouvent dans ledit lessiveur (33);

remettre en circulation la liqueur noire chaude dans le lessiveur et dévier une portion de ce dernier pour l'utiliser ultérieurement dans ladite seconde chambre (21);

déplacer la liqueur de la pâte lessivée en utilisant un liquide à basse température et acheminer ladite liqueur à ladite première chambre (10);

récolter séparément les liqueurs à température modérée et à température élevée déplacées dans le procédé, de même que celles déviées au cours des étapes de mise en circulation de la liqueur; et

éliminer la pâte lessivée du lessiveur (33) après avoir été soumise à l'effet de la liqueur blanche pendant un temps prédéterminé.

8. Procédé de traitement de copeaux de bois cellulosiques dans un processus de lessivage en continu sous haute pression à température élevée pour la libération de pâte conformément aux étapes de la revendication 7 :

englobant le fait d'acheminer la pâte lessivée à un laveur et le fait d'utiliser la liqueur de lavage comme ledit liquide à basse température.

9. Procédé de traitement de copeaux de bois cellulosiques dans un processus de lessivage en continu sous haute pression à température élevée pour la libération de pâte conformément aux étapes de la revendication 7 :

englobant la remise en circulation de la liqueur noire dans ladite première chambre (10) pendant un laps de temps prédéterminé pour préchauffer et préconditionner chimiquement les copeaux.

10. Procédé de traitement de copeaux de bois cellulosiques dans un processus de lessivage en continu sous haute pression à température élevée pour la libération de pâte conformément aux étapes de la revendication 7 :

englobant le fait d'utiliser la liqueur noire chaude pour préchauffer la liqueur blanche.

11. Procédé de traitement de copeaux de bois cellulosiques dans un processus de lessivage en continu sous haute pression à température élevée pour la libération de pâte conformément aux étapes de la revendication 7 :

englobant le fait d'éliminer la liqueur noire de la première chambre (10) pour retraiter la liqueur.

12. Procédé de traitement de copeaux de bois cellulosiques dans un processus de lessivage en continu sous haute pression à température élevée pour la libération de pâte conformément aux étapes de la revendication 7 :

englobant la remise en circulation de la liqueur noire chaude dans la seconde chambre (21).

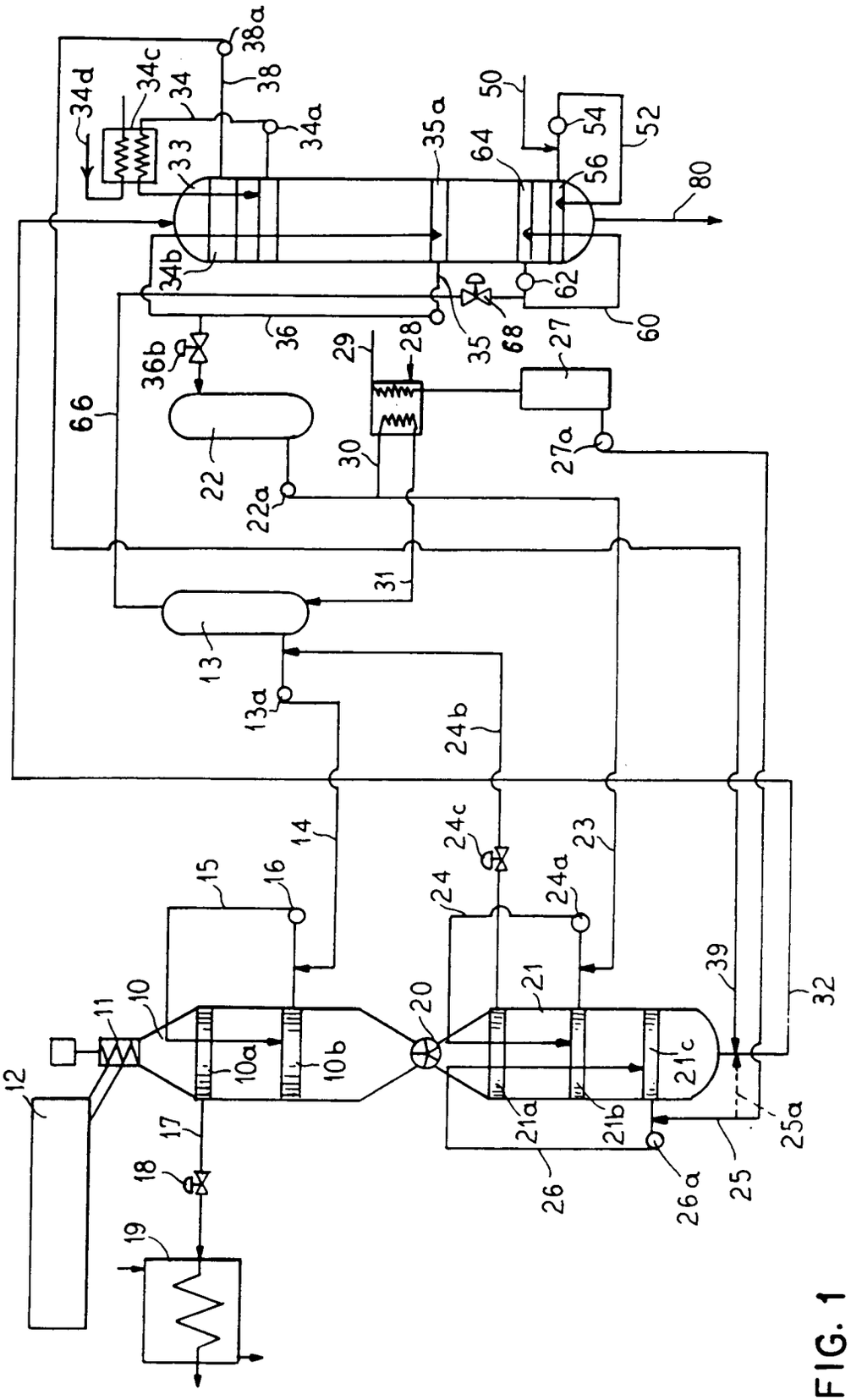
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FIG. 1

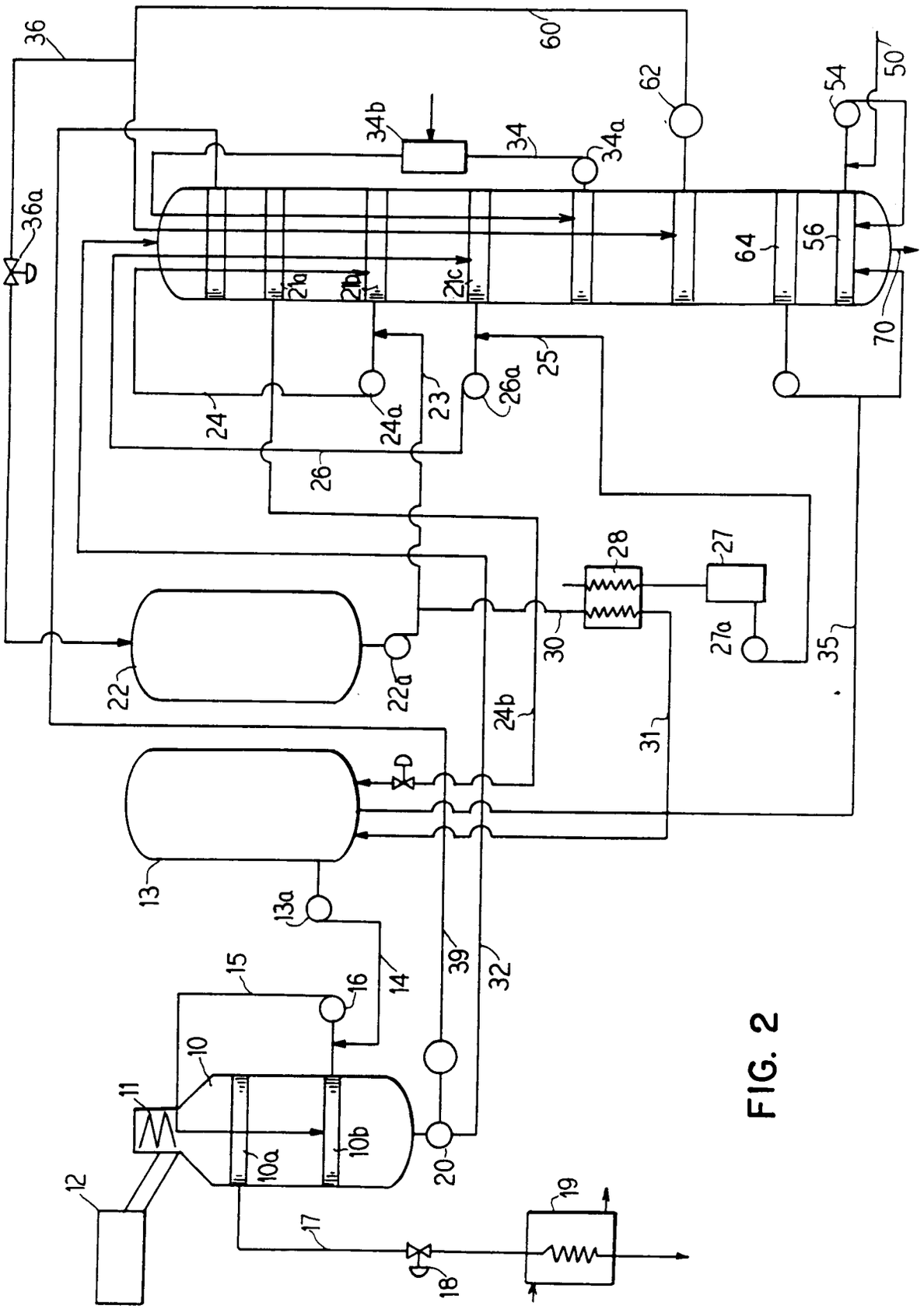
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FIG. 2