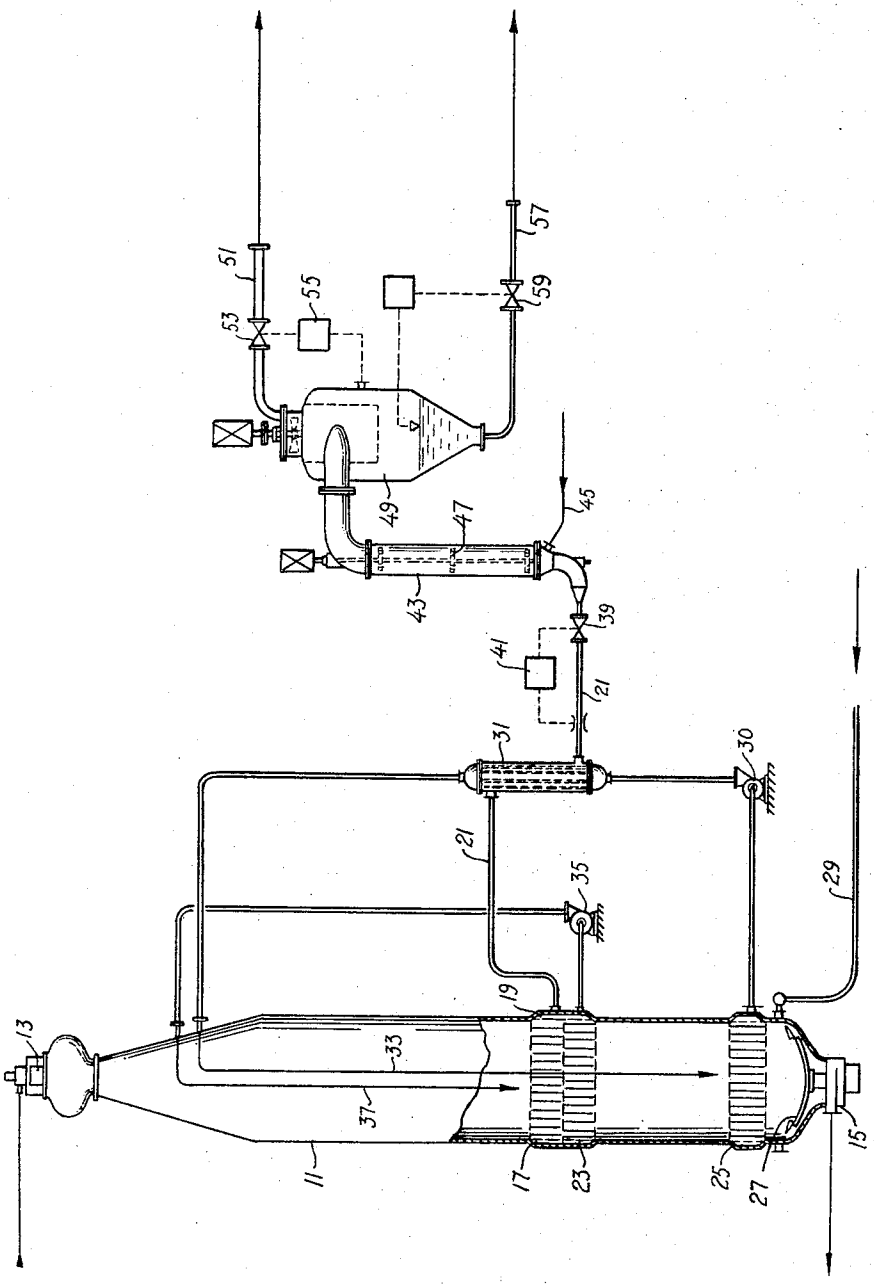
Jan. 9, 1968 E. ÅKE BACKLUND 3,362,868

METHOD AND APPARATUS FOR OXIDIZING SPENT DIGESTION LIQUORS

Filed Jan. 13, 1964



INVENTOR.
Ernst Åke Backlund
BY
Cushman, Darby & Cushman
Attorneys

United States Patent Office 3,362,868 Patented Jan. 9, 1968

3,362,868

METHOD AND APPARATUS FOR OXIDIZING SPENT DIGESTION LIQUORS

Ernst Åke Backlund, Karlstad, Sweden, assignor to Aktiebolaget Kamyr, Karlstad, Sweden, a company of Sweden

Filed Jan. 13, 1964, Ser. No. 337,429
Claims priority, application Sweden, Jan. 11, 1963, 289/63
4 Claims. (Cl. 162—30)

ABSTRACT OF THE DISCLOSURE

A method for treating spent liquor is provided wherein the liquor is oxidized in a separate vessel from a continuous cellulose digester while under overpressure and at a temperature above 100° C. The liquor is conveyed from the digester to the separate vessel by a difference in pressures between the digester and the separate vessel, and the separate vessel is maintained at a pressure which is sufficiently high to prevent the separation of volatile gases from the liquor before the liquor has been treated with air or oxygen. Apparatus is provided for the method wherein an oxidation vessel is interposed between a digester and a flash chamber.

Brief description of invention

The invention relates to a method for treating spent liquor which in connection with continuous cellulose digestion is separated from the digested fibrous cellulose material before the same is discharged out of the digester being held under a raised pressure, and which liquor is carried off in order to recover its contents of heat and/or chemicals.

As a preliminary measure to the recovery treatment of black liquor drained off a batchwise working cellulose digester, it is known to perform an oxidation of volatile sulphur compounds therein by means of air or oxygen. This is made in a separate pressure-resistant vessel in which an overpressure and a corresponding temperature above 100° C. are maintained and into which the liquor mixed with air is pumped after its heating.

The object of the invention is to perform a corresponding oxidation of the liquor in connection with continuous cellulose digestion and in a manner involving a considerable simplification as compared with the above-mentioned known method used in batchwise working digesters.

The essential characterizing feature of the invention consists in that the spent liquor is oxidized by air in a manner known per se while it still retains at least a portion of the overpressure prevailing in the digester. Thus the liquor may be transferred to the oxidation vessel without the use of pumps or similar, the digester pressure forcing out the liquor to the oxidation vessel held under lower pressure. The rate of flow may be controlled by means of choking valves or similar. Preferably, the oxidation is performed immediately after the liquor has left the cellulose digester, so that the liquor reaches the oxidation vessel with a temperature which may be lowered in comparison to the digestion temperature but still lies over 100° C. and is sufficiently high for the reaction desired to take place in the oxidation vessel. However, because the preferred oxidation temperature usually is considerably lower than the digesting temperature, it is possible to recover the heat contents of the liquor corresponding to the temperature drop mentioned, by inserting into the liquor conduit connecting the digester to the oxidation vessel a heat exchanger in which a different liquid is heated, preferably such washing liquid as is

supplied to the digester in the vicinity of its pulp outlet end.

The plant for performing the above-mentioned method comprises a digester, in the shell of which strainers are inserted for the extraction of spent liquor from the fibre material before the same is discharged out of the digester, and the inventive feature of said plant consists in that the space behind the strainers is connected to an oxidation vessel having a pressure air supply, by means of a conduit in which the pressure merely drops, said conduit thus containing no pump or similar.

The invention will be more closely described herein below with reference to the accompanying drawing, which diagrammatically shows a plant for continuous cellulose digestion completed with an arrangement for performing oxidation treatment of the spent liquor.

Detailed description of invention

In the drawing, **11** designates an upright digester which is cylindrical over the greater part of its length and to the upper end of which a mixture of a cellulosic material, such as wood chips, and a suitable digesting liquor, such as sulphate liquor, is supplied by means of a feeding apparatus **13**. Arranged at the lower end of the digester is a discharging apparatus **15** by means of which digested pulp is continuously discharged out of the digester. The digester content is heated in the upper part of the digester by the direct supply of steam or indirectly by heating the liquor in circulation conduits (not shown) having heat exchangers inserted therein. The digester content is heated to a temperature of approximately 170° C. and a hydraulic pressure of the order of 10 kgs./sq. cm. is maintained in the digester. During the slow and even drop of the chips down through the digester a reaction with the digestion liquor takes place so that the fibrous material is completely digested when it reaches the level of a first strainer girdle **17** inserted into the digester shell. Connected to the space **19** behind said strainer girdle is a conduit **21** through which the spent liquor is discharged. Inserted in the digester shell immediately below the strainer girdle **17** is a second strainer girdle **23**, and inserted in the digester shell somewhat above the lower end of the digester is a third strainer girdle **25**. Arranged between the latter and the discharging device **15** is a rotary scraping and stirring device **27**, by means of which diluting water supplied through a conduit **29** is mixed into the pulp in order to facilitate its discharge. A portion of the water supplied through the conduit **29** is forced upwards in counter-current to the pulp and serves for a preliminary wash of the same before it is discharged out of the digester. Said washing liquid mixed with liquor is let out through the strainer girdle **25** and by means of a pump **30** is pumped through a heat exchanger **31** and into a tube **33** extending along the axis of the digester and opening out centrally of the digester somewhat above the level of the strainer girdle **25**.

The other side of the heat exchanger **31** is connected into the conduit **21** carrying off the spent liquor still maintained at digesting temperature. By means of heat exchange between said liquor and the wash liquid the latter is heated so that the washing in the digester between the strainer girdles **25** and **23** takes place at a temperature considerably higher than the comparatively low discharging temperature of the pulp. The wash liquid with liquor mixed into the same is extracted through the strainer girdle **23** and by means of the pump **35** is carried back to the digester through a tube **37** extending along the axis of the digester and opening out at a level somewhat higher than that of the strainer girdle **17**. The wash liquid thus supplied displaces the undiluted spent liquor and forces the same towards and out through

the strainer girdle 17 from where the spent liquor, as already described, is carried off through the conduit 21. During the passage of the liquor through the heat exchanger 31 it heats the wash water and simultaneously it is itself cooled to a temperature of e.g. approximately 145° C.

By means of a choke valve 39 which may be controlled by a regulator 41 for adjusting a desired flow rate, the conduit 21 is connected to the lower end of the oxidation vessel 43 in which the volatile sulphur compounds of the spent liquor are oxidized. A pressure air conduit 45 is connected to the vesesl 43, and arranged therein is a motor-driven stirring device 47 for thorough mixing of air into the liquor.

The upper end of the vessel 43 is connected to a tangential inlet on a blow tank 49 in which a low overpressure, e.g. 1 atm., is maintained. On account of the drop of the pressure of the spent liquor and of its temperature in the blow tank, steam and gases are given off which are carried off through a conduit 51. Inserted in said conduit is a valve 53 controlled by a control device 55 for maintaining the desired pressure of the blow tank. Connected to the lower end of the blow tank is a conduit 57 leading to a plant (not shown) for recovery of the chemicals of the liquor. Inserted in said conduit is a valve 59 which is controlled in such a manner that a desired liquor level is maintained in the blow tank.

The outlet of the oxidation vessel is preferably choked and controlled in such a manner that a pressure of the order of 6 to 7 kgs./sq. cm. is maintained therein. During its flow from the digester to the blow tank the spent liquor is subjected to successive pressure drops, thus no pump being required in the connecting conduits. Nor are any heating means required in connection with the oxidation vessel, due to the liquor being taken directly from the operating digester.

I claim:

1. In a method of treating spent liquor which is separated from digested fiber material in a continuous cellulose digestion process, and which is subjected to an oxidizing treatment in a separate vessel in order to oxidize sulphurous compounds of the spent liquor, the steps comprising:

oxidizing the spent liquor with air before volatile gases have separated from the liquor by receiving said spent liquor into said separate vessel from a liquor outlet of a digester used with the continuous digestion process, said spent liquor being treated while at a temperature which is below the digesting temperature but above 100° C. and at a raised pressure which is maintained by passing the liquor into the separate vessel under an overpressure from the digester, said raised pressure being less than the digesting pressure in the digester but more than the pressure at which volatile gases are separated from the spent liquor, and

reducing the pressure of the spent liquor sufficiently to release gases therefrom only after said oxidizing step has taken place.

2. The method of claim 1 and including a step of cooling said spent liquor after it is discharged from said digester and before it is received into said separate vessel, said cooling being sufficient to prevent a premature release of volatile gases from the liquor because of any pressure drop which takes place in conveying the liquor to the separate vessel.

3. In apparatus for treating spent liquor in a plant for continuous cellulose digestion wherein said plant includes a digester having strainers for extracting spent liquor from cellulosic fiber material before the same is discharged out of the digester, the improvement comprising:

conduit means for conveying spent liquor under an overpressure and at a temperature over 100° C. to an oxidation vessel,

an oxidation vessel for treating the spent liquor with air, said oxidation vessel including means for suppling air to the vessel, and including means for maintaining the pressure within said oxidation vessel at a level which is higher than atmospheric but lower than the digesting pressure of the digester, and

a blow tank means downstream from said oxidation vessel for receiving said liquor only after it has been treated in the oxidation vessel, said blow tank means being at a pressure which is below the pressure of said oxidation vessel.

4. The improvement of claim 3 and including:

a heat exchanger interposed in the flow line between said digester and said oxidation vessel, said heat exchanger being connected to said conduit means for receiving and cooling spent liquor which is being conveyed to said oxidation vessel.

References Cited

UNITED STATES PATENTS

2,726,927	12/1955	Bergstrom et al.	23—48
2,876,098	3/1959	Schandroch	162—237
3,200,032	8/1965	Richter et al.	162—237

FOREIGN PATENTS

134,920	11/1949	Australia.

S. LEON BASHORE, *Primary Examiner.*

R. BAJEFSKY, *Assistant Examiner.*