United States Patent [19]

Olson

[11] **3,898,124**

[45] **Aug. 5, 1975**

[54] **AUTOMATIC CONTROL OF A CONTINUOUS DIGESTER, INCLUDING LEVEL, CONCENTRATION, AND FLOW METERS**

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[22] Filed: **May 7, 1974**

[21] Appl. No.: **468,061**

Related U.S. Application Data

[63] Continuation of Ser. No. 301,743, Oct. 30, 1972, abandoned.

[30] **Foreign Application Priority Data**

Nov. 18, 1971 Sweden 14737/71

[52] **U.S. Cl.** **162/238**; 162/243; 162/263

[51] **Int. Cl.** **D21c 7/12**

[58] **Field of Search** 162/238, 237, 243, 263, 162/17

[56] **References Cited**

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Assistant Examiner—Richard V. Fisher

[57] **ABSTRACT**

In a continuous digester which has a boiler with a rotatable bottom scraper and a chip and lye inflow at the top as well as a wash inflow into and a pulp outflow from the boiler, the concentration at the pulp outflow is measured and is used to control the rotation of the scraper so as to maintain a constant concentration of the outgoing pulp. A flow meter at the pulp outflow controls a throttle valve to regulate the outflow. The liquid in the top of the digester is measured and is used to control the devices which feed chips to the digester. Measurement of the pressure in the digester is used to control the flow of black liquor at the chip and lye inflow. The chips are fed in by a chip screw which in turn is fed by a segmental wheel, and the speeds of the chip screw and segmental wheel are maintained proportional to each other.

4 Claims, 3 Drawing Figures

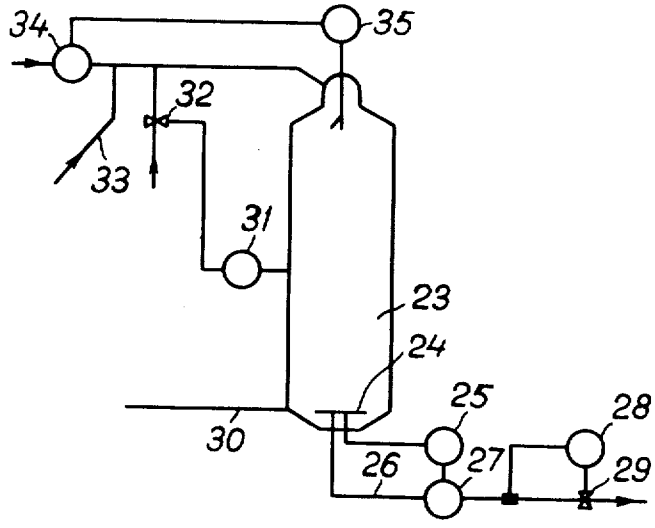


Fig.1
PRIOR ART

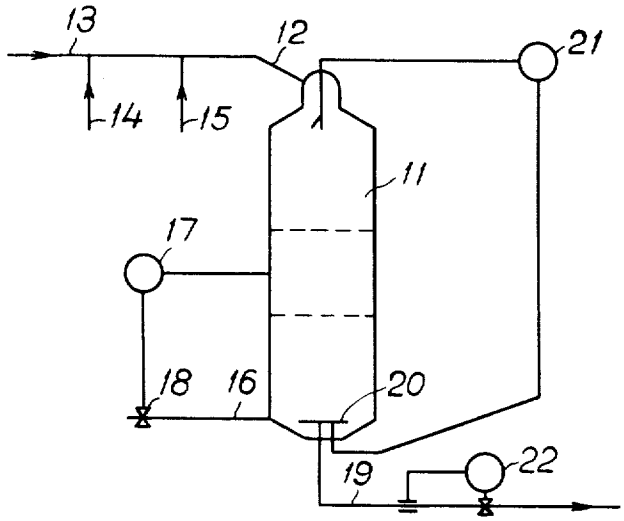


Fig.2

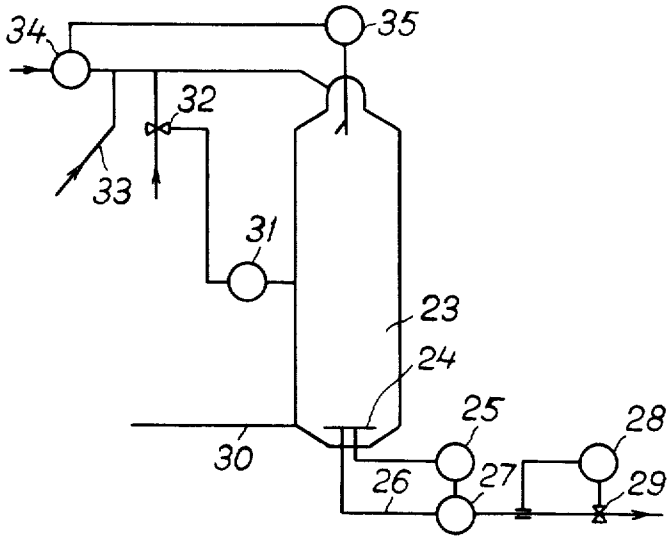
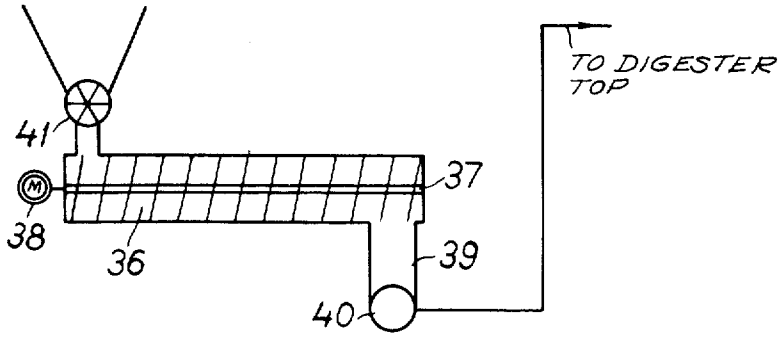


Fig.3



AUTOMATIC CONTROL OF A CONTINUOUS DIGESTER, INCLUDING LEVEL, CONCENTRATION, AND FLOW METERS

This is a continuation of application Ser. No. **301,743** filed Oct. **30, 1972,** now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an arrangement in a continuous digester, for example a continuous sulphate digester. Such an arrangement comprises a boiler with a rotatable bottom scraper or similar feeding-out-device at the bottom and with chip and lye inflow at the boiler and wash liquor inflow to and pulp outflow from said boiler at the bottom.

2. The Prior Art

In continuous digesters used heretofore such as sulphate digesters, chips mixed with white liquor and black liquor, that is, white liquor plus compounds released from pulp wood, have been led to a boiler from an inflow. During stationary operation it is difficult to measure the moisture content in the incoming chip flow. Chips are supplied in a constant flow along with white liquor and black liquor. Wash liquor is also supplied in variable amounts, controlled by a throttle valve which is regulated by the pressure in the digester.

The outgoing plug from the digester has a varying concentration which it is difficult to measure so that it is difficult to obtain a constant concentration in the output.

SUMMARY OF THE INVENTION

This invention is intended as a solution to these and other related problems and is characterised in that a concentration meter is arranged at the pulp outflow, the output signal of which is arranged to control the speed of the bottom scraper, in order to obtain a constant concentration for the outgoing pulp, and that a flow meter, known per se, is arranged at the pulp outflow, the output signal of which is transmitted over a regulator to a control device for a throttle valve at the pulp outflow. Since both the wash liquor (water + black liquor) and the feeding-out of pulp are constantly regulated, no disturbances occur here from the bottom of the digester to the digester top and a stable control process is obtained.

In a preferred embodiment, the digester pressure is measured with a pressure measuring device, the output signal of which is arranged to control the black liquor flow to the inflow at the digester top. In this way, it has been found that an automatic compensation is obtained of the varying liquid flow which derives its origin from varying chip moisture content, and thus this previously awkward factor of uncertainty has been compensated for.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1** shows diagrammatically the system utilized in the prior art;

FIG. **2** shows a diagrammatic system embodying the invention; and

FIG. **3** shows a chip feeding device.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In continuous digesters used up to now, such as sulphate digesters (FIG. **1**), chips mixed with white liquor ($NaOH + Na_2S$) and black liquor, that is, white liquor plus compounds released from pulp wood, have been led to a boiler **11** in an inflow. During stationary operation it is difficult to measure the moisture content in the incoming chip flow (at **12**). Chips are supplied in a constant flow at **13,** white liquor at **14** and a constant flow of black liquor at **15.** In another part of the digester, wash liquor is supplied in varying degree (at **16**), the pressure in the digester being measured at **17,** and the output signal of the measuring device **17** controlling a throttle valve **18** in the wash liquor pipe **16.**

There are also other inflows to the digester, but they have been omitted since they are of no importance to the object of the invention or the prior art.

The outgoing pulp from the digester (at **19**) has a varying concentration, and since it has been difficult up to now to measure this concentration it has also be difficult to obtain a constant concentration in this outflow **19.** The pressure regulating circuit **16–18,** which is placed at the digester bottom, is supplied, as mentioned before, with a varying amount of wash liquor depending on the digester pressure (at **17**).

Attempts are made to keep the amount of chips to the digester (at **13**) and the amount of pulp from the digester (at **19**) constant with the help of flow regulating devices. Attempts have been made to keep the chip level in the digester **11** constant with the help of a rotatable bottom scraper **20,** the number of revolutions of which can be varied. The speed of the bottom scraper **20** affects the concentration of the outgoing pulp. The scraper **20** is driven slowly by means of a motor (not shown), and the speed of the scraper **20** can be varied, either by means of an intermediate gear or by means of speed control on the motor. The level is measured with a level meter **21** at the upper part of the digester **11.**

This method of trying to keep the concentration of the outgoing pulp constant does not work very well because of the dynamic properties of the digester, and in spite of the fact that the flow in measured (at **22**) and the amount of pulp from the digester is controlled. It takes **7–12** minutes for a change in the speed of the bottom scraper to manifest itself in a changed level at the top of the digester, and therefore this regulating circuit has less satisfactory properties with inferior fluid balance as a result. Because of the inferior fluid balance in the digester **11,** an up-stream of hot liquor occurs regularly from the boiling zone **23** and upwards, and this disturbs the process and deteriorates the final product.

In FIG. **2** a digester **23** having a rotatable bottom scraper **24** with variable speed is shown. The variable speed of the scraper is obtained from the drive device over a variable gear, and the drive device can also be speed controlled. Element **25** is a regulator for gearing or speed control. A concentration meter **27** is placed in the outflow pipe for finished pulp **26,** for example a concentration meter of the kind manufactured by A B KALLE REGULATOR. A customary flow meter **28** is also placed in the outflow pipe, said flow meter controlling a throttle valve **29** for the pulp flow. Wash liquor (water + black liquor) is supplied in constant quantity at the lower part of the digester **23** (at **30**).

A pressure meter **31** at the boiling zone of the digester **23** measures the digester pressure, and its output signals are transmitted to a control valve **32** for black liquor. Chips are supplied through a feeding device **34** and white liquor is supplied at **33.**

FIG. **3** shows the segmental wheel **41** and the cooking vessel **36** with a chip screw **37** driven by a motor **38.** Chips are fed from the screw to a chip chute **39,** and a mixture of chips and lye is fed through a high-pressure crock **40** to the digester top, where white and black liquor are further fed, according to FIG. **2.** Part **34** in FIG. **2** corresponds to the elements shown in FIG. **3.** The control is made with the motor **38** or a gear close to the motor. The speed of the chip screw **37** is altered proportionally to the speed of the cell wheel **41.** In the space containing the chip screw **37,** that is the cooking vessel, the chips stay for about **5** minutes, and if an attempt were made to control the flow to the digester by controlling the segmental wheel **41,** the through transport delay would be great. This is now avoided by controlling the speed of the chip screw.

A level meter **35** is arranged to control the chip feeding, so that a constant chip level is easily obtained in the digester, while compensation for varying chip moisture content is also obtained through the black liquor control.

The above-mentioned arrangement is also applicable in the case of continuous digesters with a separate impregnation zone (the impregnation zone is the part which corresponds to the upper part of the digester described).

The invention may be varied in many ways within the scope of the following claims.

I claim:

1. A continuous digester comprising a boiler with a rotatable bottom scraper with a drive motor, chips and lye inflow at the top of the boiler, wash liquor inflow means to the bottom of the boiler, and the pulp outflow means from the bottom of the boiler, said digester comprising:

a. a level meter for measuring the liquid level in the top of the digester, chip feeding means connected to the chip inflow means, and means responsive to the output signal of said level meter to control the chip feeding means;

b. a concentration meter in the pulp outflow means, means for controlling the drive motor, said motor controlling means including means responsive to a signal from the concentration meter to regulate the speed of the scraper to maintain a predetermined concentration of the outgoing pulp; and

c. a flow meter and a throttle valve in the pulp outflow means, and means responsive to the flow meter for controlling the throttle valve to obtain a predetermined outflow for the outgoing pulp.

2. A continuous digester according to claim **1,** having the concentration and flow meters arranged in series in the pulp outflow means.

3. A continuous digester according to claim **1,** having a pressure measuring device associated with the digester for measuring its pressure, and means responsive to the output signal of said pressure measuring device for controlling the flow of black liquor at the chip and lye inflow means.

4. A continuous digester according to claim **1,** in which said means for controlling the throttle valve includes means to maintain a constant outflow for the outgoing pulp.

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