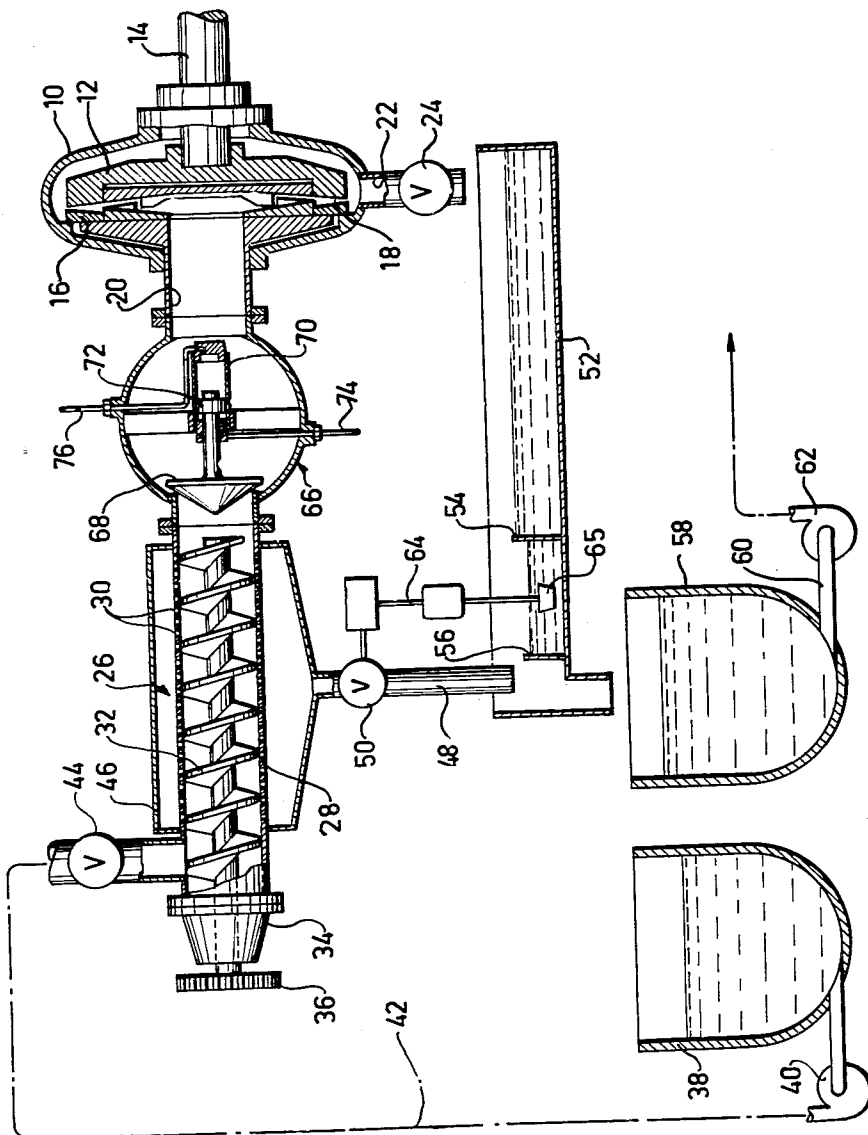


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PULP REFINING APPARATUS

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PULP REFINING APPARATUS

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This invention relates to apparatus in refiners for paper pulp and similar suspensible material.

More particularly this invention relates to refiners which are provided with two grinding members arranged rotatably relatively to one another and fed with a liquid suspension of pulp or similar suspensible material. The suspension before its supply to the refiner has been subjected to a treatment of chemical or mechanical nature so as to obtain a disintegration of the lignocellulose-containing starting material, such as wooden chips, for example, or to draw apart the fibres thereof.

Within the refiner a further treatment of the pulp is effected and in order to direct this treatment as favorable as possible in a desired form with lowest possible consumption of power, it is advantageous to operate with relatively high concentrations of the pulp in the suspension which may be constituted by a pulp suspension in water. However, such concentrations can normally be pumped with difficulty only for which reason it has already been proposed to arrange ahead of the refiner separate concentrators or dewaterers having the form of a perforated trough housing a conveyor screw, for example. These known devices have little capacity relatively to a given surface unit thereof for which reason they require large space, if a concentration to desired values of the pulp in the suspension shall be obtainable at all.

One main object of the present invention is to provide an apparatus of the type set forth which eliminates the drawbacks inherent in devices known hitherto.

Another object of the invention is to provide an apparatus of the type set forth the operation of which results in a highly effective separation or expulsion of liquid from the pulp suspension.

A further object of the invention is to provide an apparatus which has a dewatering effect as great as or surpassing that obtainable in an absolute vacuum.

A still further object of the invention is to provide an apparatus of the type in consideration whose dewatering ratio is adjusted automatically in response to the concentration of the pulp suspension treated in and withdrawn from the refiner.

Further objects and advantages of the invention will become apparent from the following description considered in connection with the accompanying drawing which forms part of this specification and which is a more or less diagrammatic sectional view of a refiner apparatus embodying the present invention.

Referring to the drawing, reference numeral 10 denotes a casing of the refiner within which is mounted a grinding disc 12 carried by a rotatable shaft 14, and a stationary grinding disc 16, the surfaces of said discs facing one another being formed with grinding surfaces 18 for treatment of pulp obtained from wood or other material of organic nature. The pulp is introduced in the form of an aqueous suspension, for example through a central duct 20, and is withdrawn through a duct 22 disposed in the lower part of the casing 10 and preferably controlled by a valve 24.

Connected to the inlet duct 20 is a concentrator or dewaterer generally denoted by 26. Said dewaterer comprises a suitably cylindrical tube 28 formed with perforations 30 which may have a conically tapering shape

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in a direction from the outside to the inside. The tube 28 houses a rotatable scraper device which in the embodiment shown has the form of a conveyor screw 32. Said screw may have a constant area of interspaces between the threads or the interspaces may have reduced areas in the direction of the movement of the pulp suspension through the tube 28. The screw 32 is mounted with small spacing from the perforated inner face of the tube 30 so as to be capable of effectively scraping off those fibres which after the dewatering step remain deposited on the surface. The screw 32 is guided through a sealing box 34 and is driven from outside of the tube 28 through a gear 36, for example.

The pulp suspension, the concentration of which is to be increased, is pumped from a bin 38 by a pump 40 under superatmospheric pressure through a conduit 42, which if desired is governed by a control valve 44, to the inlet side of the dewaterer 26. The tube 28 is concentrically surrounded by a cylindrical casing 46 which adjacent the perforations 30 forms a closed space with a lower drain 48 controlled by a valve 50.

During the passage of the pulp suspension through the tube 28 water is expelled therefrom and escapes through the perforations 30 into the casing 46 so that the concentration of suspension is increased gradually. The suspension enriched in this manner after having passed the interspace between the grinding surfaces 18 flows through a flute 52 provided with sills 54, 56 to a collecting bin 58. Disposed in the lower part of this bin is a drain 60 with a pump 62 for further feed of the suspension to a place for subsequent treatment. Located in the zone formed by the sills 54 and 56 is a testing member 65 of a concentration control device 64 which is actuated in response to the degree of concentration of the suspension leaving the refiner. The control device in turn actuates the valve 50 so as to cause this latter more or less to throttle the drain 48 and thereby to produce a variable counter-pressure in the casing 46. This counter-pressure adjusts the pressure difference on both sides of the perforated tube 28 and thereby the intensity of the dewatering operation determining the concentration of the pulp when entering the refiner.

The superatmospheric pressure produced by the pump 40 may amount to between some tenths and several kilograms per square centimetre which may result in a pressure difference of such magnitude between the inside of the perforated tube 28 and the space surrounded by the collecting casing 46 as to ensure a quick and effective dewatering. With a pressure difference of one kilogram per square centimetre dewatering pressure is obtained which is equal to the maximum value which can be reached by means of absolute vacuum. The dewaterer or concentrator thus has an extremely good capacity calculated on any surface unit of the tube 28. The concentration in the pulp suspension may be increased in the concentrator from 5–6 percent to 10 percent, for example, with which percentage the suspension thus enters the refiner. The screw 32 ensures that the deposits of fibres around the perforations 30 continuously are removed and conveyed towards the refiner.

In the embodiment shown a device generally denoted by 66 is disposed between the refiner and the concentrator for creation of a counter-pressure within the dewaterer or concentrator. This device is necessary in particular in connection with such refiners which operate under a pressure too low for the dewaterer. In the embodiment shown the device comprises a valve body 68 which with a conically tapering surface is directed towards and controls the outlet from the interior of the dewaterer. The valve body 68 is operated by a servo-motor 70 within which a piston 72 connected with the valve body is mov-

able. A liquid or gaseous pressure fluid is supplied to the servo-motor at one or the other side of the piston 72 through pipes 74 or 76, respectively. The valve body 68 produces an adjustable counter-pressure determined by the servo-motor 70 and acting against the flow of the suspension enriched in pulp content discharged from the dewaterer. The valve body may entirely close the tube 28 in the beginning stage of the dewatering operation until the pressure has been built up in the tube whereupon the valve body opens the outlet.

While one more or less specific embodiment of the invention has been shown and described, it is to be understood that this is for purpose of illustration only, and that the invention is not to be limited thereby, but its scope is to be determined by the appended claims.

What I claim is:

1. A pulp refining apparatus comprising, a refiner having two grinding members rotatable relatively to one another, means for introducing a pre-concentrated pulp suspension between the grinding members, a perforated tube, a scraper member disposed within and rotatively operative within the tube, said tube being connected to the inlet side of the refiner, a casing arranged around the perforated tube and having its inner wall surfaces spaced therefrom to thereby provide for an annular spacing between the tube and the inside of the casing, a pump for supplying the pulp suspension to the interior of the tube, a drain leading from the casing for liquid expelled into the casing through the perforations in the tube, and valve means in the drain for controlling the liquid flow there-through to thereby develop a counter pressure inside of the casing around the perforated tube.

2. A pulp refining apparatus comprising, a refiner having two grinding members rotatable relatively to one another, means for introducing a pre-concentrated suspension between the grinding members, a perforated tube, a rotative scraper member within the tube, said tube being

connected to the inlet side of the refiner, a casing arranged around the tube and having its wall spaced from the outside of the tube, said casing collecting fluid expressed from the inside of the tube through the perforations therein, a pump for feeding the suspension under pressure to the interior of the tube, means at the outlet end of the tube and between said end and the inlet of the refiner, for setting up regulatable counter pressure in the tube, the casing having an outlet, and means operative in the said outlet for developing a counter pressure within the casing around the perforated tube.

3. A pulp refining apparatus as provided for in claim 2, wherein the refiner is provided with an outlet, a collection receptacle in which the suspension collects when expelled from the refiner outlet, valve control means located in the collection receptacle and actuated according to the degree of concentration of the suspension in said receptacle, said means being effective to adjust to said valve control means and regulate the flow therethrough according to the degree of concentration of the material leaving the refiner.

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