

# PATENT SPECIFICATION

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## (54) METHOD AND APPARATUS FOR CLASSIFYING A SUSPENSION

(71) We, OY TAMPELLA AB., a Finnish Joint Stock Company, of Tampere, Finland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to a method and apparatus for classifying suspensions, especially pulp suspensions.

In such methods, the suspension is fed to one side of a sieve member, the reject fraction (for example, thickened suspension) is removed from the same side of the sieve member and the accept fraction (for example, liquid) is removed from the opposite side of the sieve member, whilst at least one surface of the sieve member is swept by one or several blades.

The classifying apparatus used in such methods generally comprises a screen drum of a certain mesh size so that only the accept pulp passes through. In order to prevent the screen drum from clogging, it is provided with rotating blades which produce hydraulic pulses and detach the pulp which has accumulated on the screen surface. The blades are often fitted obliquely to the longitudinal axis of the screen drum so as to promote the travel of the reject pulp in the desired direction towards the reject pulp outlet.

In practice, the pulp suspension forms a network on the surface of the screen, which network periodically becomes removed by the blades.

In conventional classifying methods using apparatus of this type, the rotational velocity of the blades is always maintained at a high level in order to ensure that the apparatus operates reliably. The present invention is based on our surprising observation that energy losses associated with the maintenance of such a high velocity level can greatly be reduced.

The present invention provides a method for classifying a suspension which comprises feeding the suspension to one side of a sieve member, withdrawing a reject fraction from the same side of the sieve member, and

withdrawing an accept fraction from the opposite side of the sieve member, while at least the upstream sieve member surface is swept by one or more blades, and the velocity difference between the sieve member and the blade or blades is regulated in accordance with the pressure differential across the sieve member as measured at points remote from the blades.

The present invention also provides a classifying apparatus for carrying out the method according to the invention, comprising a sieve member, means for feeding the suspension to one side of the sieve member, means for withdrawing the reject fraction from the same side of the sieve member, means for withdrawing the accept fraction from the opposite side of the sieve member, one or more blades arranged to sweep at least the upstream surface of the sieve member, a driving device for moving the sieve member and/or the blade or blades relative to one another to effect such sweeping, means for measuring the pressure differential across the sieve member at points remote from the blades, and means for regulating the velocity of the driving device in accordance with the pressure differential.

The invention is based on our observation that the network which forms on the surface of the sieve member, e.g. the screen, fulfils a vital part in the filtering and classifying operation. The thickness of the filtering fibre network, and thereby the classification, is affected by the mesh size and the shape and velocity of the cleaning blades and, when other circumstances remains constant, it can be calculated from the pressure differential across the sieve member. That is to say, as the network becomes thicker the pressure differential increases, and *vice versa*. By increasing the sweeping velocity the network is broken up and becomes thinner, and by decreasing the sweeping velocity the network builds up and becomes thicker. According to the present invention, therefore, an optimum pressure differential (or range of pressure differentials) across the sieve member is selected according to the pulp type, rate of flow, etc., and this pres-

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sure differential is maintained by regulating the sweeping velocity.

The pressure differential across the sieve member is measured at a distance away from the blades and the pulsations produced by them. Conventional measuring apparatus may be used for this purpose.

It will be appreciated that, without departing from the basic concept of the present invention, many modifications will be possible.

For example, in some embodiments of the present invention, blades may be fitted in both the inner and outer surfaces of the screen drum, in which case the blades sweeping the inner surface of the drum may advantageously be fitted to rotate in the direction opposite to that of the blades sweeping the outer surface. If desired the blades may be hollow and open towards the screen drum so that a rinsing liquid can be fed onto the drum or so that pulp may be withdrawn through the blades.

In other embodiments the blades may be fixed and the screen drum may be rotated. In yet other embodiments the pulp suspension may be fed outside and around the screen drum and the accept fraction can be withdrawn from inside the drum.

These and other modifications, and their various combinations, will be apparent to those skilled in the art. Reference is also made in this respect to our Patent Specification No. 1 535 478.

One embodiment according to the present invention will now be described in more detail, by way of example only, with reference to the accompanying drawing, which depicts a side elevation, partially as a cross section, of a pulp classifying apparatus suitable for carrying out the method of the invention.

Referring now to the drawing, the pulp to be sieved is fed tangentially in through the inlet 1 in the upper part of the classifying apparatus and then flows downwards through the vertical sieve drum 2, whereby the accept fraction passes from the pulp through the mesh of the sieve drum 2 into the annular space between the sieve drum 2 and the outer mantle 3 and is removed from there via outlet 4. The reject pulp settles at the bottom of the classifier, from where it is removed through the reject outlet 5. A shaft 7 rotated by a motor 6 is fitted centrally and coaxially inside the sieve drum 2, a plurality of blades 9 being attached to the shaft 7 by means of arms 8. The blades 9 extend obliquely from one end of the sieve drum 2 to the other and have been fitted to sweep the inner surface of the sieve drum 2 very closely in order to detach, by means of hydraulic pulses, pulp adhering to the surface thereof.

In accordance with the invention, the

pressure is measured at the inlet 1 and outlet 4 in such a manner that the instruments 10 detect and record the difference between the inlet and outlet pressures and the velocity of the motor 6 is regulated on the basis of this difference by means of a control member 11 in such a manner that if the pressure difference increases above a certain allowed level the revolutions of the motor 6 increase and if the pressure difference decreases below a certain allowed level the revolutions of the motor decrease. Thus the classifying apparatus uses as little energy as possible for obtaining the desired classification result.

Suitable devices for measuring the pressure differential and for controlling the speed of the electric motor are commercially available from various instrument manufacturers, including Foxboro and Taylor Instrument Company.

For example, one suitable pneumatic system comprises the following instruments:

- (a) D/P Transmitter Taylor 323 TD 00263.
- (b) Indicating Controller with mounting shelf and cable: Taylor 1412 RZ 1300, Taylor 1041 FA 00001, Taylor 1041 FZ 12300, and
- (c) Pneumatic to current converter: Taylor 1405 TA 63200.

A suitable electric system comprises:

- (a) D/P Transmitter: Taylor 1323 TD 11263, and
- (b) Indicating Controller with mounting shelf and cable: Taylor 1312 RA 60002, Taylor 1000 FA 00001, Taylor 1029 FB 11500.

The electric motor used for speed control may be a DC motor with a Thyristor power supply unit or an AC motor provided with an inverter supply unit. These motors have their own speed control circuits and the indicating controller simply modifies the speed setting.

WHAT WE CLAIM IS:

1. A method for classifying a suspension which comprises feeding the suspension to one side of a sieve member, withdrawing a reject fraction from the same side of the sieve member, and withdrawing an accept fraction from the opposite side of the sieve member, while at least the upstream sieve member surface is swept by one or more blades, and the velocity difference between the sieve member and the blade or blades is regulated in accordance with the pressure differential across the sieve member as measured at points remote from the blades.

2. A method as claimed in claim 1, wherein the velocity difference between the sieve member and the blade or blades is so regulated as to maintain the pressure differential across the sieve member between two predetermined values.

3. A method as claimed in claim 1, wherein the velocity difference between the sieve member and the blade or blades is so

- regulated as to maintain the pressure differential across the sieve member substantially constant at a predetermined value.
4. A method as claimed in any one of claims 1 to 3, wherein the pressure of the suspension is measured at its inlet point and the pressure of the accept fraction is measured at its outlet point at a distance away from the blade(s).
5. A method as claimed in any one of claims 1 to 4, wherein the suspension is a pulp suspension.
6. A classifying apparatus for carrying out the method as claimed in claim 1, comprising a sieve member, means for feeding the suspension to one side of the sieve member, means for withdrawing the reject fraction from the same side of the sieve member, means for withdrawing the accept fraction from the opposite side of the sieve member, one or more blades arranged to sweep at least the upstream surface of the sieve member, a driving device for moving the sieve member and/or the blade or blades relative to one another to effect such sweeping, means for measuring the pressure differential across the sieve member at points remote from the blades, and means for regulating the velocity of the driving device in accordance with the pressure differential. 30
7. A classifying apparatus as claimed in claim 6, wherein the sieve member is a screen drum.
8. A classifying apparatus as claimed in claim 6 or claim 7, wherein the means for measuring the pressure differential is connected between the inlet for feeding the suspension and the outlet for withdrawing the accept fraction. 35
9. A method as claimed in claim 1, carried out substantially as described herein with reference to the accompanying drawing. 40
10. A classifying apparatus as claimed in claim 6, substantially as described herein with reference to, and as illustrated in, the accompanying drawing. 45
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