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METHOD AND APPARATUS FOR DETECTING PERFORATED SCREENS

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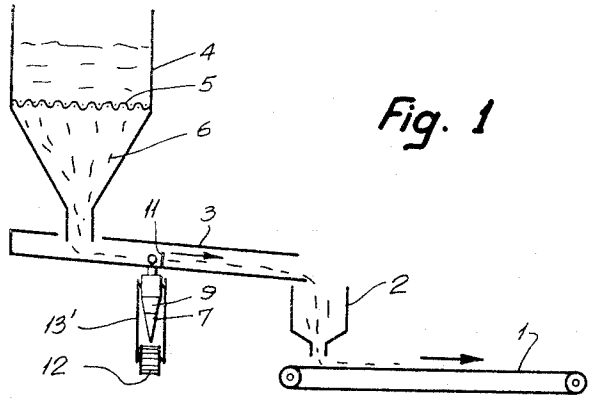


Fig. 1

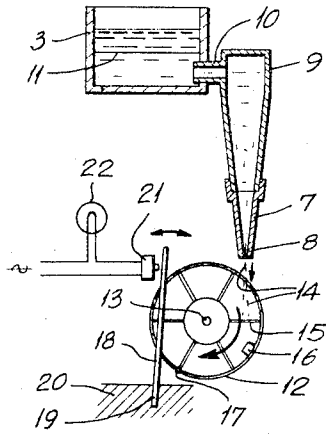
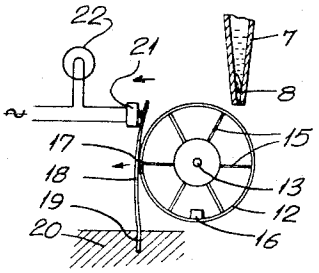


Fig. 2

Fig. 3



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METHOD AND APPARATUS FOR DETECTING PERFORATED SCREENS

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The present invention relates to a method and an apparatus for detecting perforated filter screens, more particularly to be used in the manufacture of paper, cardboard, and the like, from wood pulp and the like.

In the manufacture of paper, cardboard, and the like from a pulp suspension, more particularly wood pulp suspension, it often happens that the pulp, after cooking, contains uncooked particles forming clots or chips which, when incorporated to the paper or cardboard, render the latter useless. There is therefore provided means for screening the pulp suspension before feeding the same to the Fourdrinier paper making machine. However, these filtering screens can become perforated and allow passage of the clots or chips without this condition being brought to the attention of the machine operators, and therefore it is often necessary to discard considerable quantities of useless paper or cardboard.

The general object of the present invention resides therefore in the provision of a method and of an apparatus for detecting perforated filtering screens in the manufacture of newsprint, cardboard, and other pulp products and which gives an immediate indication of the presence of clots or chips in the pulp just prior feeding of the same to the Fourdrinier paper making machine, thereby enabling immediate stoppage of the machine and thus avoiding waste of paper or cardboard.

Yet another object of the present invention resides in the provision of an apparatus of the character described which is easily adaptable to existing paper making machines with a minimum of modifications to these machines.

Yet another object of the present invention resides in the provision of an apparatus of the character described which is of simple construction, requires a minimum of upkeep and always gives a positive indication of perforated filtering screens.

The foregoing and other objects of the present invention will become more apparent during the following disclosure and by referring to the drawings, in which:

FIGURE 1 is a schematic side elevation of a part of a system for manufacturing newsprint, and showing the apparatus for detecting perforated filtering screens in accordance with the invention;

FIGURE 2 is a cross-section of the pulp feeding trough and a side elevation, partly in longitudinal section, of the detecting apparatus in accordance with the invention; and

FIGURE 3 is a partial view of the detecting apparatus in a state indicating presence of clots or chips in the pulp.

Referring now more particularly to the drawings in which like reference characters indicate like elements throughout, reference numeral 1 indicates the travelling screen of a Fourdrinier paper making machine, said screen receiving a suspension of wood pulp for forming the wet paper, from a header box 2 at the upstream end of the screen 1 with respect to the direction of displacement of its upper strand. Header box 2, which is a distributing box, is fed with a pulp suspension by means of a slightly inclined trough 3 or the like which in turn receives the pulp suspension from reservoir or hopper 4. Hopper 4 is provided with a filtering screen 5 which stops clots, chips, and the like uncooked particles which may be present in the pulp 6. However, should the filtering

screen 5 become perforated, the clots or chips will find passage onto screen 1 and eventually become incorporated to the paper or cardboard and the finished product will be useless.

As the travelling screen 1 moves at a very high speed, it is impossible for the machine operators to detect the presence of the clots or chips in the pulp, and this detection is therefore made only on the completely finished paper and even after several rolls of paper have been produced. Therefore, perforation of the filtering screens 5 results in a great waste of paper.

The method in accordance with the present invention consists in feeding a portion of the pulp suspension from a zone downstream from filter 5 through a restricted orifice to thereby form a pulp jet. When the pulp contains clots or chips, these chips block the restricted orifice and stops the pulp jet thereby providing an indication of filter perforation. A paddle wheel may be rotated by the jet to give a signal that the filter is in good condition. Stoppage of the paddle wheel signals the presence of clots or chips in the pulp suspension, and therefore that the filter 5 is perforated.

The apparatus in accordance with the invention consists of a funnel 7 which is vertically disposed and forms at its lower end a jet orifice 8 of a restricted dimension said funnel 7 being threaded at its upper larger end to a casing 9 also of conical shape and closed at its upper end and provided with a lateral connector tube 10 for feeding funnel 7 with a pulp suspension producing a hydraulic head at orifice 8.

Connector tube 10 is inserted within an opening made in a wall of trough 3 just above the bottom of said trough. Preferably, trough 3 is provided with a baffle or deflecting plate 11 just downstream from connector tube 10. Baffle 11 is transversely inclined with respect to the long axis of trough 3 for directing a portion of the pulp suspension into connector tube 10. The upper edge of baffle 10 is lower than the normal liquid level in trough 3.

A paddle wheel 12 is mounted for free rotation about a shaft 13, the latter being laterally offset with respect to the longitudinal axis of funnel 7 and located below jet orifice 8, the paddle wheel being so located that the jet 14 emerging from orifice 8 will strike the paddles 15 and will cause rotation of paddle wheel 12.

Preferably, shaft 13 is carried by arms 13' (see FIGURE 1) which are directly secured to housing 9. Paddle wheel 12 is of conventional construction and consists for instance of two spaced disks between which paddles 15 are located, being secured thereto.

Wheel 12 is provided with a weight 16 secured at its periphery whereby wheel 12 takes a rest position with weight 16 in a lowermost position, as shown in FIGURE 3, when no jet of pulp suspension strikes the paddles 15. Wheel 12 is moreover provided with a laterally protruding stud 17 at the periphery of the wheel which upon each turn of the wheel engages a resilient flexible tongue 18 to move said tongue radially outwardly from shaft 13, as shown in FIGURE 3.

Tongue 18 is secured at its lower end 19 to a support 20 which may be a portion of one arm 13' on which the shaft 13 is mounted. The free end of tongue 18 is disposed opposite the actuator button 20 of a micro-switch 21 which is connected in series in an electric circuit comprising an electric light bulb 22 and which may also comprise an electric alarm bell.

The electric circuit is fed in electricity from a standard 110 volts source of from any other suitable power source.

The apparatus in accordance with the invention operates as follows: A portion of the pulp suspension flowing through trough 3 in direction of header box 2 and travelling screen 1 of the Fourdrinier paper making machine, enters connector tube 10 and flows under gravity

through housing 9 and funnel 7, which due to the hydraulic pressure head developed in the assembly of housing 9 and funnel 7, produces at orifice 8 a jet of liquid pulp suspension which strikes paddles 15 of paddle wheel 12 and cause continuous rotation of the latter. Stud 17 secured to paddle wheel 12 causes oscillation of resilient tongue 18 which at each rotation of the wheel, actuates switch 21 which opens and closes the circuit to the electric bulb 22. Thus, the latter becomes lighted for a short time and in rapid succession.

If filter screen 5 becomes perforated and allows passage of uncooked clots or chips, a portion of said uncooked particles will immediately pass through funnel 7. The presence of only one chip is sufficient to block orifice 8 and cause accumulation of pulp upstream from the said chip, as shown in FIGURE 3, whereby the pulp jet will stop and paddle wheel 12 will also stop and take a rest position with weight 16 in its lowremost position, as shown in FIGURE 3. Under these conditions, lateral stud 17, which is angularly spaced about 90° with respect to weight 16, takes a position contacting tongue 18 and the latter causes permanent closing of switch 21 whereby electric light bulb 22 becomes continuously lighted thereby giving an indication to the operator that the filter screen 5 is perforated. The latter can therefore immediately stop the Fourdrinier paper making machine to prevent production of non usable paper.

It is obvious that the electric circuit containing switch 21 and light bulb 22 can be directly connected to the control circuit of the Fourdrinier paper making machine, whereby upon stoppage of the paddle wheel the paper making machine will become automatically stopped.

It is also understood that the detecting apparatus in accordance with the invention may be installed in any desired location of the pulp flow path of the system for producing paper, cardboard and the like, inasmuch as said location be downstream from the screens the condition of which is to be detected and upstream of the Fourdrinier machine itself.

Means can also be provided to return the pulp suspension discharged from paddle wheel 12 back into the header box 2 in order to prevent waste of pulp. The diameter of orifice 8 is selected in order to allow free passage of normal size cooked pulp particles in suspension in water but to prevent uncooked larger size particles from passing. In practice, orifice 8 will correspond to the mesh of filter screen 5.

In newsprint manufacturing from wood pulp, orifice 8 will preferably have a diameter of about one eighth of and inch but this dimension can naturally vary in accordance with the particular application. When orifice 8 is blocked by a chip it is easy to unscrew funnel 7 from housing 9 in order to clean said funnel.

In the embodiment described, a paddle wheel has been illustrated to detect the presence or absence of a pulp jet 14. However, other means for detecting said condition can be used, for instance, a pressure differential responsive electric switch which would have an operating member disposed opposite orifice 8.

While a preferred embodiment in accordance with the present invention has been illustrated and described, it is understood that various modifications may be resorted to without departing from the scope of the appended claims.

What I claim is:

1. A method for detecting perforated filter elements in the production of paper, cardboard, and the like, in which pulp in liquid suspension is filtered to remove uncooked particles before feeding said pulp to a paper making machine, said method consisting in by-passing a portion of the pulp suspension from a zone downstream from the filter elements the perforations of which are to be detected but upstream of said paper manufacturing machine, causing passage under pressure of said pulp portion through a small orifice to thereby produce a continuous stream of pulp suspension through said orifice when said pulp suspension does not contain uncooked particles, uncooked particles blocking said jet orifice and stopping said stream, detecting the absence of pulp jet and producing a signal upon such detection.

2. In a system for manufacturing paper and the like, including a Fourdrinier paper-making machine and a pulp suspension feeding circuit for said machine, said circuit comprising filtering elements for retaining uncooked pulp particles and for allowing passage of cooked pulp particles, in combination, an apparatus for detecting perforations in said filtering elements comprising a funnel defining a restricted orifice open to atmosphere through circuit in a zone downstream from said filtering elements but upstream from said paper making machine, said funnel defining a restricted orifice open to atmosphere through which said pulp suspension normally emerges as a jet, the presence of uncooked bigger size particles in said pulp suspension due to perforation of said filtering elements resulting in the blocking of said restricted orifice, and means for detecting and for signalling said blocking of said jet orifice.

3. In the system as claimed in claim 2, wherein said funnel is vertically disposed and its orifice is at its lowermost point whereby an hydraulic head is developed in said funnel to produce said jet.

4. Apparatus for detecting perforated filters in paper manufacturing and the like, wherein the manufacture is carried out in a system comprising a Fourdrinier paper making machine and a pulp suspension feeding circuit for said machine, said circuit comprising filtering elements for retaining uncooked pulp particles and for allowing passage of cooked pulp particles, said apparatus comprising a funnel having its larger end in communication with said circuit in a zone downstream from said filtering elements, but upstream from said paper making machine, said funnel defining a restricted orifice open to atmosphere and through which said pulp suspensoin normally emerges as a jet, the presence of uncooked bigger size particles in said pulp suspension due to perforation of said filtering elements resulting in the blocking of said restricted orifice, and means for detecting and for signalling said blocking of said jet orifice, comprising a paddle wheel mounted for free rotation about an axis laterally offset with respect to the longitudinal axis of said funnel and spaced from said orifice, the paddles of said paddle wheel receiving impulsions by said pulp jet emerging from said orifice to cause continuous rotation of said paddle wheel, said paddle wheel comprising an excentric weight carried thereby, whereby said wheel takes a predetermined rest position upon absence of pulp jet, and electrical means actuated by said paddle wheel in its position to give a signal.

5. Apparatus as claimed in claim 4, wherein said electrical means include a laterally protruding stud secured to the periphery of said paddle wheel, a flexible resilient tongue disposed in the path of said stud and oscillating under the action of the latter during continuous rotation of said paddle wheel, an electric switch actuated by said flexible tongue between electric circuit closing and opening position, said stud continuously engaging said tongue in the rest position of said wheel, and said switch being maintained in its circuit closing position, said circuit being a signalling circuit.

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