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SCREEN FOR PAPER STOCK AND THE LIKE

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Fig. 1.

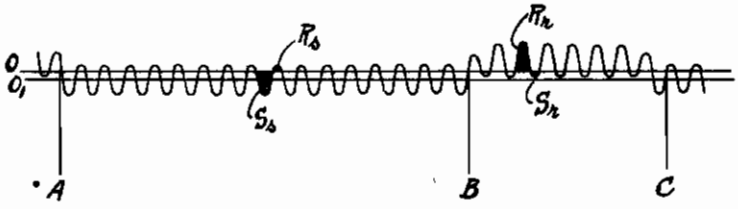


Fig. 2.

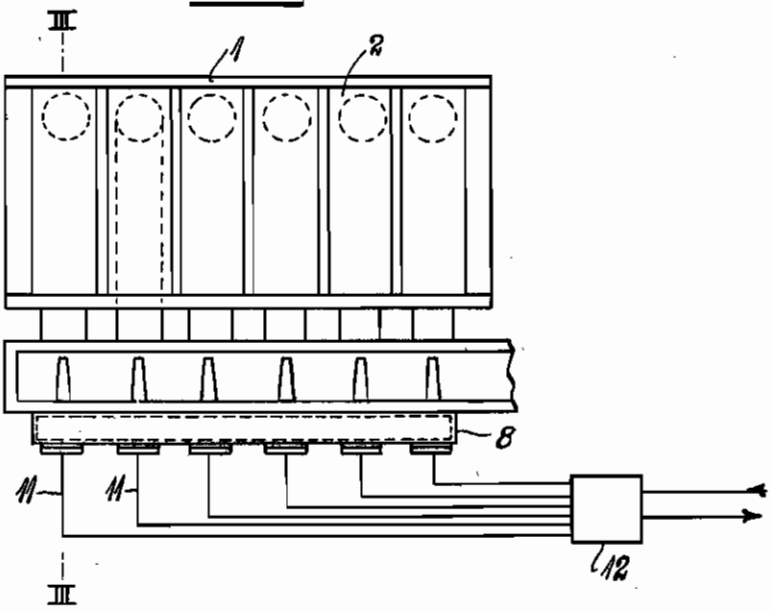
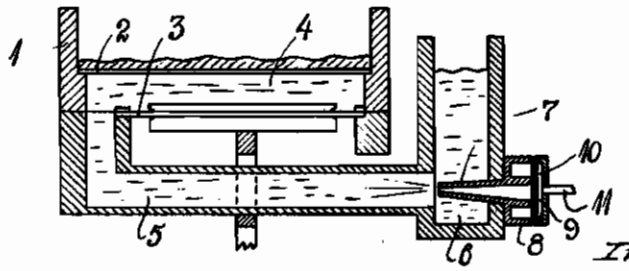


Fig. 3.



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ALIEN PROPERTY CUSTODIAN

SCREEN FOR PAPER STOCK AND THE LIKE

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The present invention relates to screens for paper stock, wood pulp and the like. Such screens are usually provided with means for automatic cleaning of the screen apertures. The method most frequently used consists substantially in generating pulsatory increases of pressure in the suspension on the discharge side of the screen, which increases of pressure have the effect that the suspension with short periodical intervals is driven back through the screen apertures. The pulsatory increases of pressure are usually generated by means of vibrating members disposed on the discharge side of the screen, or by oscillating the screen plates themselves.

The main object of the invention is to provide an improved method of operating screens of the kind described, by means of which method a better cleaning of the screen holes may be obtained.

The invention comprises further means for carrying out the method according to the invention.

In the following the invention will be described as applied to a screen of the plane type; it will, however, be understood that the invention with advantage may be used for screens of other types too, for instance for rotatable screens.

In screens of the plane type, the pulsatory increases of pressure are usually generated by means of oscillating diaphragms disposed below the screen plates and enclosing a chamber between the screen plate and the diaphragm. The diaphragms are usually operated from excentrics or cams. If a compulsory driving of the diaphragms by means of excentrics is used, the pressure in the said chambers will vary substantially according to a sinus function. A complete working period consists of a screening period and a cleaning period. The screening period occurs when the diaphragm is moved downwardly, the stock being sucked from the upper side of the screen plates through the slitlike apertures and down into the diaphragm chamber. During the cleaning period the diaphragm is moved upwardly and forces a minor part of the stock from the diaphragm chamber and back through the screen apertures.

The cleaning effect depends substantially on the relative difference between the maximum underpressure during the screening period and the maximum overpressure during the cleaning period. During free running of the screen, that is when the static altitude of fall is like zero and the liquid level in the discharge box is at the same height as the liquid level above the screen, the pressures during the screening and cleaning period will be of equal heights, but in the first case positive and in the second case negative. With increasing capacity of the screen the static altitude of fall must be increased, i. e. the liquid level in the discharge box must be lowered, with the result that the maximum pressure during the cleaning period will decrease and the maximum pressure during the screening period correspondingly increase. Thus the effectivity of the cleaning period will decrease as the static altitude of fall increases. According to the methods hitherto known for operating screens of this kind every working period is identical with the subsequent working period.

According to the present invention the mean pressure in the chambers between the screen plates and the diaphragms is automatically raised to a pressure beyond the mean pressure which prevails in the said space when the outlet from the same is closed, the period during which the mean pressure in the said space is raised being short in relation to the interval between two such periods.

The invention will now be described with reference to the accompanying drawing in which:

Fig. 1 shows a diagram illustrating the pressure variations in the stock below the screen plates in a screen operated according to the invention,

Fig. 2 diagrammatically shows a plan view of a screen plant provided with means for carrying out the method according to the invention. and

Fig. 3 is a section along the line III—III on Fig. 2, on a somewhat enlarged scale.

On Fig. 1 0—0 designates the zero-line during operation and 0'—0' the zero line during free running. The wave line indicates the pressure in the suspension on the discharge side of the screen plates. The course of this curve between the lines A—B corresponds to the usual operation of a plane screen. The hatched parts R_s and S_s represent the cleaning and screening period respectively.

The new feature according to the present invention consists therein that the frequent pressure variations are superposed by a periodical pressure increase, being on Fig. 1 represented by the section B—C. The period of time corresponding to this section is in the following description designated by "the large cleaning period" and the period A—B by "the large screening period." The hatched parts R_r and S_r represent respectively the cleaning and the screening periods in the "large cleaning period" corresponding to the parts R_s and S_s in the "large screening period." The increase of pressure dur-

ing the "large cleaning period" may conveniently be chosen so that the suction action (S_r) in this period forms only a fraction of the suction action (S_s) in the "large screening period." A large screening period and a large cleaning period together constitute a large working period. The large cleaning period is according to the invention given a comparatively short duration in proportion to the large working period, the ratio being preferably made to lie between $^1/_{10}$ and $^1/_{100}$.

In order thoroughly to understand the arrangement of this diagram it is necessary to have a knowledge of certain properties of the pulp-suspension that is to be graded. Taking for example a mass of cellulose with a concentration of, say, 5 per cent, it can be observed that the separate particles of fibre combine together in tangled clumps, provided the pulp is allowed to flow quietly enough. In consequence of this combination the fibres will therefore be unevenly distributed in the water. When these clumps of fibres come to be sucked through a narrow slot there will first take place a partial expression of water from the clump and when the underpressure beneath the screen plates becomes sufficiently great the whole clump will be sucked through the slot. Meanwhile it may sometimes happen that such a clump comes to lie over the slot at the close of the suction period and that the suction pressure is not strong enough to draw it through the opening. The result will be that at the place in question there will lie a layer of fibres largely deprived of water, whieh layer will choke up the openings and prevent further passage of the pulp. The short cleaning period is fully sufficient to raise the layer of fibres from the plates and free the apertures from stoppages of this kind, so that the pulp can once more flow through. Meanwhile there are other kinds of impurities which may cause the slot apertures to become closed again. Among these may be mentioned solid particles of such shape and dimensions that they are able to wedge themselves firmly into the apertures. Deposits of resin are also common, and clumps of fibres which originally lay quite loose in the apertures will in course of time become "packed in" according as the deposition of resin increases. Against impurities of this kind there is needed quite a different and more vigorous process of cleaning than what takes place in the so-called "large screening period." From the above it will be understood that the arrangement shown in the new diagram of operation affords means of attaining a better cleaning of the screen plates and of thereby maintaining the capacity.

The working diagram shown applies to a single screen plate. Usually a level screen comprises several, for example 12, such plates and the time of beginning the large cleaning period may advantageously be arranged in such a manner that only one of the 12 plates is cleaned at a time. In this way $^1/_{12}$th of the screen will in reality be rendered unproductive, but this reduction in effectivity of the screen will be abundantly compensated for by a considerably increased capacity of the plates that are functioning. It is a well-known fact that newly cleaned screen plates have a considerably higher capacity than plates which have been operating for, say, a couple of hours. The large cleaning period should in reality correspond to the washing with jets of water or steam from the upper side of the screen plates, which method of cleaning is employed at certain intervals. The difference is, however, that by the new system the dirt in the slots is driven back to the upper surface of the plates, whereby pollution of the pulp is avoided. Moreover, the large cleaning period according to the new diagram sets in more frequently, so that depositions of resin should not make themselves felt so much as was formerly the case. On washing the plates from their upper surface all dirt removed from the slots is driven down into the diaphragm chamber and thus pollutes the pulp. As the washing often takes place while the screen is in operation it may also happen that particles of dirt floating in the pulp are forced through the apertures, whereby the pulp is still further polluted.

In order to attain the automatic periodical increase in pressure there may advantageously be arranged in connection with the chambers on the discharge side of the plates pipes for periodical conveyance of liquid under pressure to the said chambers.

In Figs. 1 and 2 is schematically shown a suitable form of execution for appliances for the utilisation of the invention. In this form of execution the aforesaid pipes are connected with ejectors discharging into channels running transversely under the diaphragm chambers and leading from each chamber to a discharge box or channel common for all the chambers.

In Figs. 2 and 3 the figure 1 indicates a screen trough in which are placed 6 screen plates 2. Under the plates are placed ordinary diaphragms 3, which by means of a mechanism, not shown, are kept in oscillating movement in order to bring about a pulsatory pressure in the diaphragm chambers 4. From these chambers the pulp passes through a channel 5 running transversely under each chamber, which channels discharge into a common discharge box 6.

The apparatus according to the invention comprises a water supply pipe 7, working in connection with each diaphragm chamber, which pipe in the form shown on the drawing is constructed as an ejector, and which discharges into the channels 5. By letting the ejector discharge into the transversely placed channels 5 it is ensured that the conversion of the kinetic energy of the liquid to pressure energy will take place with the greatest effectivity.

The liquid is conveyed under pressure to the ejectors from a common supply channel 8. The opening and closing of the separate ejectors is effected by means of a valve introduced before each ejector, which valves are controlled automatically from a control device acting in common for all of them. In the form of execution shown on the drawing these valves are constructed in the form of a diaphragm 9, for example of rubber, outside of which there is a chamber 10 which by a pipe 11 is connected with a control device 12 common for all the ejectors. The valves operate in the manner that, when liquid is not to be conveyed to them, i. e. in the "large screening period", pressure is maintained against the inlet ends of the injectors by keeping the chamber 10 under pressure. When the injectors are to be brought into action, i. e. during the "large cleaning period", the pressure in the chamber 10 is diminished and the liquid under pressure flows from the channel 8 through the injector and into the channel 5.

The control apparatus 12 may be executed in any suitable and known manner, for example by use of a rotating member which by successive

movements brings the pipe 11 into connection with a chamber in which the pressure is low, while the pipes otherwise are in constant communication with a chamber in which high pressure prevails.

As pressure liquid for the ejectors may be used water or, for instance, the pulp in suspension.

Any more detailed description of working of the apparatus will presumably be unnecessary, as it will at once be understood by experts on reference to the above account of the mode of procedure in accordance with the invention.

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