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FLOW RECTIFIER FOR PAPER STOCK

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FIG. 1.

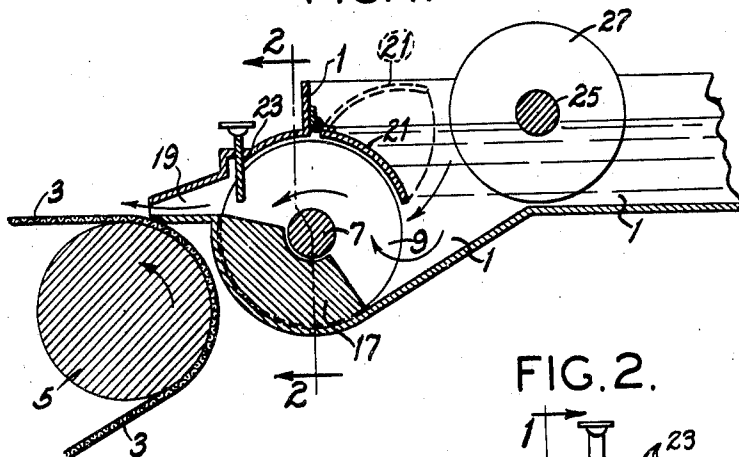


FIG. 2.

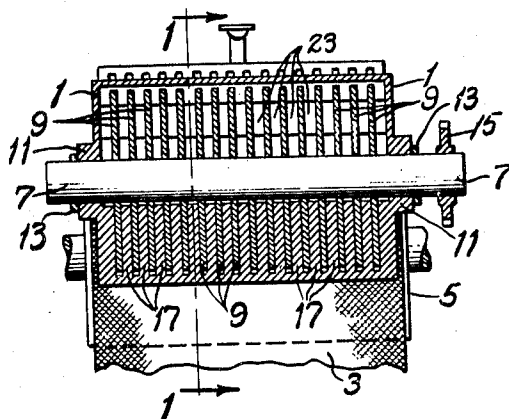


FIG. 4.

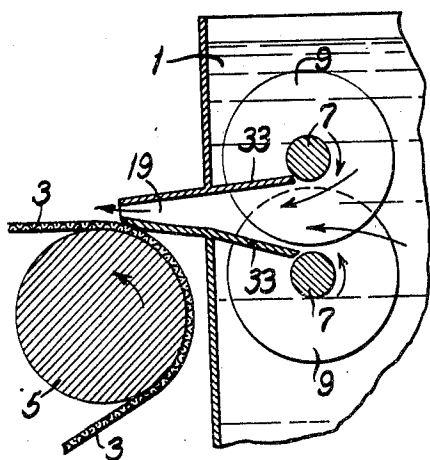
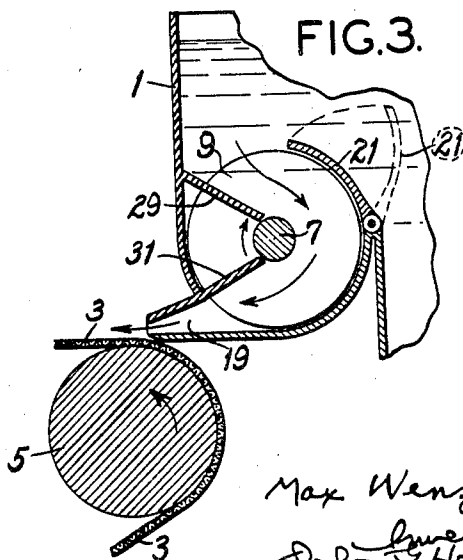


FIG. 3.



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FLOW RECTIFIER FOR PAPER STOCK

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This invention relates to a flow rectifier for the watery paper stock as it is fed to the traveling wires or sieves and cylinder machines of the paper and allied industries.

Among the several objects of the invention may be noted the provision of a flow rectifier of the class described which serves to establish a uniform direction of flow and speed of flow of paper stocks at the points of the various inlet channels which are of importance; a rectifier of the class described which effectively prevents damming up of the stock; a flow rectifier of the class described which reacts upon the stream of stock uniformly and evenly at all points throughout the depth and breadth of the stream; and a rectifier of the class described which establishes a stream of prevalently laminary arrangement. Other objects will be in part obvious and in part hereinafter described.

The invention accordingly comprises the elements and combinations of elements, features of construction, and arrangements of parts which will be exemplified in the structures hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which are illustrated several of various possible embodiments of the invention,

Fig. 1 is a vertical, longitudinal section of a flow rectifier embodying the present invention;

Fig. 2 is a vertical section taken substantially along line 2—2 of Fig. 1;

Fig. 3 is a vertical section similar to Fig. 1 showing an alternative embodiment of the invention; and,

Fig. 4 is a vertical section similar to Figs. 1 and 3 showing a second alternative embodiment of the invention.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

One type of flow rectifier of the class herein concerned, as described in the prior art, comprises a rotating shaft positioned at right angles to the thread of the paper stock stream and carrying a number of spaced discs having smooth surfaces. The operation of this type

of flow rectifier is essentially based upon the influence which it exerts in imparting the parallel motion of the rotating discs upon the turbulent stream, and to the ability of the discs to accelerate or retard, while rotating, the various regions of the stream of stock. This latter action takes place through the surface friction occurring between the discs and the stock. However, the above form of rectifier in its usual position (centralized vertically in the sluice or the like) does not exert an equal influence upon the liquid stream throughout its breadth and depth. Counter-current motions, which are considerably undesirable, are created within the cross section of the stream. These counter-current motions give rise to varying velocities and direction, which develop a turbulent stream instead of the desired stable and predominantly laminary stream. The uneven effect is particularly noticeable directly behind the shaft carrying the disc.

According to the present invention, the advantageous features of the rotating disc are retained, but the turbulence creating features are dispensed with.

Referring now more particularly to Fig. 1, there is illustrated at numeral 1 a sluice or the like which carries the paper stock to the customary screen or sieve 3 carried by the breast roll 5. At numeral 7 is indicated a shaft which extends across the sluice 1 (see Fig. 2). Carried by the shaft 7 are a relatively large number of spaced, circular discs 9. The discs 9 are secured to the shaft 7 in a non-rotatable manner.

Suitable bearings 11 in the sluice 1 serve to support the shaft 7, and longitudinal motion thereof is restrained by collars or the like 13. A driving gear 15 is provided, which may be attached to a suitable change-speed motor or the like, for rotating the shaft 7 together with the disc 9. The device thus far described is essentially in a form known to the prior art.

According to the present invention flow is rectified and turbulence prevented by the provision of flow obstructing members 17. In the Fig. 1 embodiment these members 17 comprise sectors which are affixed to the bed

of the sluice 1 and which, in cross section, substantially fill the interval between succeeding disc 9. It will be understood, of course, that sufficient space is left between the sectors 17 and the disc 9 to permit rotation of said disc 9. The sectors 17 extend as close as is practicable to the shaft 7. It will be seen that the sectors 17, by occupying substantially all of the position available between the discs 9 in the region of their angular extent, prevent flow of stock through said region and confine said flow to a substantially semi-circular portion of the disc 9. A spout 19 forwardly terminates the sluice 1 and delivers directly upon the wire belt or sieve 3.

With the obstruction members or sectors 17 in position, it will be seen that the flow of paper stock is confined substantially to one side of the rotating discs 9, and is in depth equal to or less than the radii of the discs. Thus, instead of being subjected to two directions of rotation (the top of the discs and the bottom of the discs) the stream is subjected only to rotation substantially in one direction. Furthermore, there is no void immediately behind the shaft 7 which might give rise to swirls and undesirable current turbulence.

Auxiliary means are in some instances desirable further to confine the flow of stock to an even more restricted area of the rotating disc 9. For example, a hinged lid portion 21 may be provided. The lid 21 extends substantially across the entire width of the series of discs 9, and is secured to the walls of the sluice 1. It will be seen that as the lid 21 is brought closer to the peripheries of the discs 9, the area of entrance for the stock stream to said disc 9 is decreased, and the flow is thereby confined to still a smaller region of the disc 9.

Additional means for confining the flow to a predetermined region of the discs 9 comprise a series of pins 23, which are of substantially the same width as the interval between the discs 9 (see Fig. 2), and which are preferably vertically adjustable either singly or in groups. It will be seen that the pins 23 effectively reduce the area at which the stream is permitted to contact with the rotating discs at a point where it is most effective to rectify the flow past the discs. In practical construction, the pins 23 have proved to be the most advantageous means for carrying out the present invention.

Additional control of the character of the flow, or the speed of the flow, may be attained by changing the speed of the discs 9, or by reversing the direction of their rotation; for example, when the discs are rotating with the flow of stock, the rate of flow is increased, while when the discs are rotating against the direction of flow of stock, the rate of flow is decreased. This control of speed and direc-

tion is advantageous in connection with the use of stock of varying viscosity.

Additional rectification may be provided for by a second shaft 25 carrying a series of discs 27, similar to the disc 9. The discs 27 are shown as immersed only half way in the sluice 1. When such a condition is achieved, the effect is similar to that of the flow-restricting members 17, 21, and 23, and no flow-restricting members per se are necessary, though they may be provided.

Additional embodiments of the invention are shown in Figs. 3 and 4. Referring to Fig. 3, it will be seen that the shaft 7 and discs 9 are substantially the same as in the Fig. 1 embodiment. In place of the sectors 17, however, a number of pins 29 are provided which, relatively, are positioned near the top of the discs. A second series of pins 31, positioned relatively near the bottom of the discs 9, cooperate with the pins 29 to direct the flow in a manner which confines it at all times to portions of the discs rotating in one direction. That is, as long as the stock is in contact with the discs 9, said discs are rotating in the same direction for all of the stock contacting. The hinged lid 21 is again provided for further adjustment of the area of discs exposed to the flow. As illustrated, the embodiment of Fig. 3 is particularly adapted for use with deep sluices, while that of Fig. 1 is shown as adapted for shallow sluices. It is to be understood, however, that the embodiments are interchangeable in this respect.

Fig. 4 illustrates still a further embodiment of the invention in which, in distinction to the Fig. 1 and Fig. 3 embodiments, a pair of shafts 7 are provided, with series of discs 9 affixed to each shaft. The discs 9 are arranged to mesh, so that the shafts 7 may separately be rotated in such a manner that the juxtaposed portions of the discs 9 are moving in the same direction. The discs 9 do not fit so closely together as to leave no space therebetween for the passage of stock, but on the contrary, mesh sufficiently loosely to permit the passage of the desired flow. Pins 33 are provided for each set of discs 9. The pins 33 desirably completely fill the space between the separate discs, as in prior embodiments, thereby reducing the region at which the spout contacts with the surface of the discs and avoiding the creation of turbulence and the like. The pins 33 preferably guide stock to the outlet spout 19, whence it is delivered to the wire belt or sieve 3.

It will be apparent from the foregoing that the precise nature and position of the flow-obstructing members are inconsequential, so long as they perform the function of directing the flow of stock to confine it to regions of the rotating discs moving in a uniform direction. Thus it will be seen that the invention, broadly, comprises the provision with a

rotating disc type of rectifier, of a number of flow-obstructing elements so positioned as to restrict the flow of stock and thereby avoid the formation of uneven flow and turbulence.

It is to be noted that in all of the described embodiments the discs 9 may be rotated in either direction to secure the desired effect.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs.

2. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs to an area all of which is normally moving in a uniform direction.

3. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstructing members extending from the peripheries of said discs substantially to said shaft, and substantially filling the space between successive discs.

4. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the flow of stock substantially to one side of said shaft.

5. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstruct-

ing members comprising sectors substantially filling the space between said discs, from their peripheries to said shaft, throughout the angular extent of said sectors.

6. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstructing members comprising pins substantially as wide as the space between said discs and extending substantially from the peripheries of said discs to said shaft.

7. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstructing members comprising pins substantially as wide as the space between said discs, said pins being adjustable as to the extent to which they are positioned between said discs.

8. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstructing members including a lid mounted near the peripheries of said discs and rotatable to permit more or less peripheral area of said discs to receive flow of stock.

9. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said flow obstructing members confining the flow of stock to a depth no greater than the radii of said discs.

10. A flow rectifier for paper stock and the like comprising a rotatable shaft and a series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs, said shaft being variable both in speed and direction of rotation, thereby to accelerate or retard the flow of stock through said discs.

11. A flow rectifier for paper stock and the like comprising a rotatable shaft and a

series of spaced discs mounted on said shaft, said shaft being positioned across the direction of flow of said stock, said discs having radii equal to or greater than the depth of flow of said stock.

12. A flow rectifier for paper stock and the like comprising a pair of rotatable shafts, positioned across the direction of flow of said stock, and a series of spaced discs mounted on each of said shafts, said discs intermeshing, and said shafts being rotatable in directions such that the juxtaposed regions of said discs are moving in a uniform direction.

13. A flow rectifier for paper stock and the like comprising a pair of rotatable shafts positioned across the direction of flow of said stock, and a series of spaced discs mounted on each of said shafts, said discs intermeshing, and flow obstructing members positioned between said discs adapted to restrict the region in which said stock is in contact with said discs.

In testimony whereof I have signed my name to this specification this eleventh day of December, 1931.

MAX WENZEL.

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