

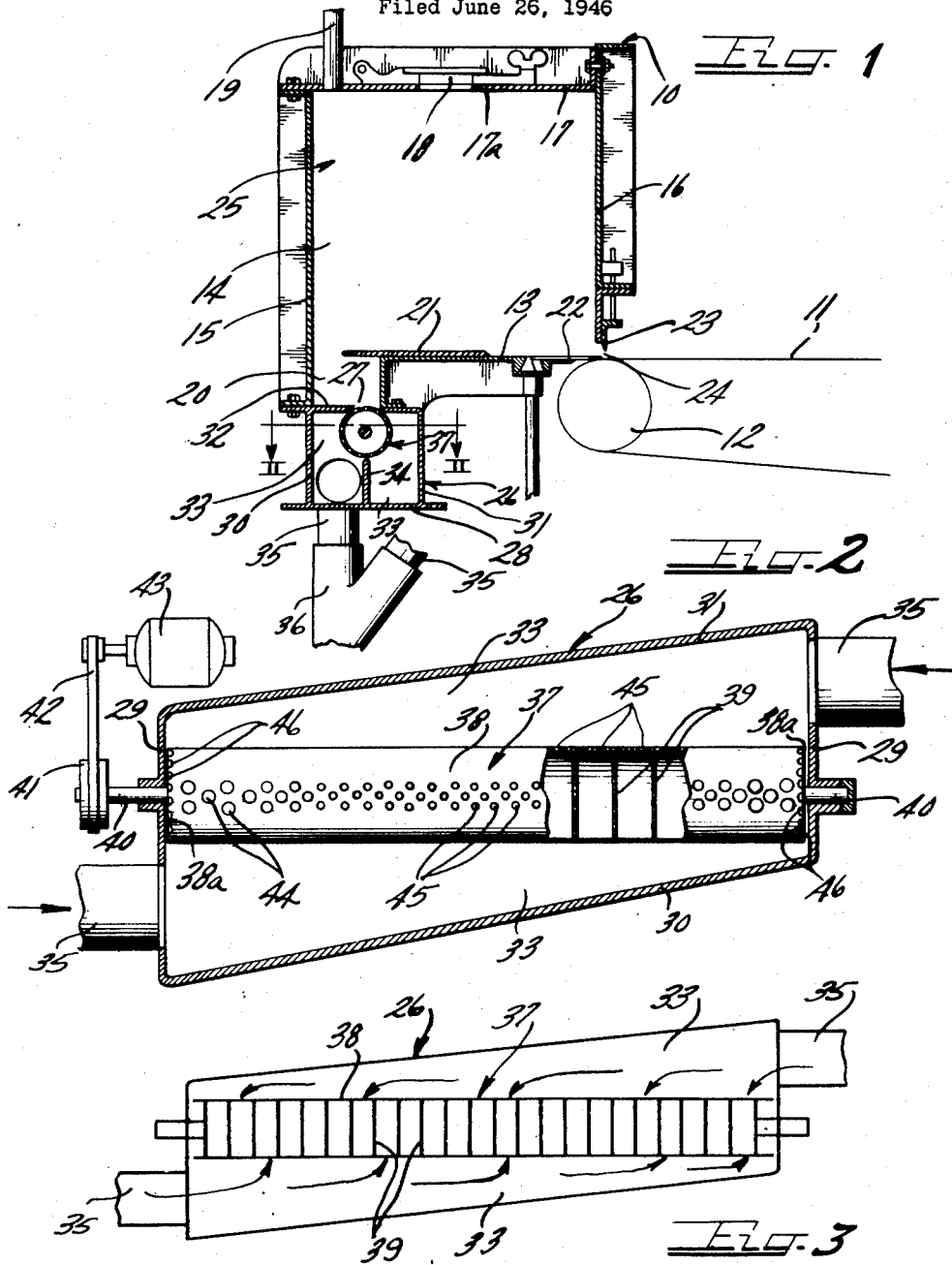
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FLOW EVENER

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FLOW EVENER

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This invention relates to a flow evener type of stock inlet for a paper making machine. Specifically, the invention deals with a cross flow stock evener for a paper making machine stock inlet wherein cross flow velocity of stock is converted into a uniform transverse or lateral exit feed velocity for insuring uniform flow conditions and fiber deposition across the entire width of the paper machine forming surface.

According to the illustrated embodiment of this invention, a stock inlet defines a closed stock chamber immediately above and to the rear of the breast roll end of a Fourdrinier type paper making machine. The discharge outlet for the chamber is provided between an apron carried by the bottom wall of the chamber and a slice carried by the front wall of the chamber. The opening or gap between the apron and slice is in communication with the upper run of the wire at the top of the breast roll. The stock inlet is equipped with a cross flow box mounted beneath the closed chamber. Stock is fed into the opposite ends of this box on the front and rear sides of the paper machine. The box has tapered conduits diminishing in size from their inlet ends. The top of the box has a slot or gap communicating with both conduits and a rectifier roll is rotatably mounted immediately under this gap to receive stock from the conduits and feed the same through the gap into the bottom ends of the inlet. The rectifier roll contains a plurality of spaced opposed radially extending or transverse disks providing baffles. These baffles direct the flow of stock through the holes in the rectifier roll to convert cross flow velocity into exit velocity and prevent formation of eddy currents or cross velocities in the chamber defined by the inlet or head box. If desired this chamber can be pressured with air or other compressed gas to force feed of stock out of the outlet thereby speeding up production and avoiding the necessity for high heads in the inlet.

It is then an object of this invention to provide a flow evener for a stock inlet wherein a rectifier roll converts cross flow velocity into desired exit velocity.

Another object of the invention is to provide a cross flow type flow evener for paper making machines wherein stock from oppositely flowing streams is directed through a rectifier roll which converts the cross flow velocity into a lateral uniform velocity and conditions the fiber arrangement in the stock to produce a stock that can be immediately set up into a sheet without

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further treatment on the forming surface of the paper machine.

A further object of the invention is to provide a cross flow type flow evener with tapered transversely extending stock conduits converging from the inlet ends thereof and having a common outlet along the length thereof together with a rectifier roll rotatably mounted in said common outlet to receive the stock therethrough before it reaches the outlet.

A still further object of the invention is to provide a rectifier roll equipped cross flow stock evener for the inlet of a paper machine.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheet of drawings which, by way of a preferred example only, illustrates one embodiment of the invention.

On the drawings:

Figure 1 is a somewhat diagrammatic side elevational view with parts in vertical cross section of a Fourdrinier type paper making machine equipped with a stock inlet having a flow evener of this invention.

Figure 2 is a horizontal cross sectional view, with parts in top plan, taken along the line II-II of Fig. 1.

Figure 3 is a diagrammatic plan view illustrating the operating principle of the flow evener of this invention.

As shown on the drawings:

As shown in Fig. 1 the reference numeral 10 designates generally a stock inlet or head box for a Fourdrinier type paper making machine including a forming wire 11 and a breast roll 12 having the forming wire trained therearound. The box 10 has a bottom wall 13 about level with the upper run of the forming wire 11 and extending rearwardly from the breast roll 12. Vertical side walls 14 extend upwardly from the bottom wall 13. A back wall 15 is provided between the side walls 14. A front wall 16 is provided between the side walls 14 at the front end of the box overlying the upper run of the forming wire at the top of the breast roll 12. The top of the box is closed by a top wall 17 which has an opening 17a therein closed by a door 18. An air inlet tube or pipe 19 is also connected to the top wall 17 to introduce air or other gas under pressure to the box. The box has an elongated sump portion 20 beneath the bottom wall 13 at the rear wall 15. This sump portion 20 extends across the full width of the box between the side walls 14. A horizontal baffle 21

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is mounted on top of the bottom wall 13 and projects over the top of the sump 20. An apron 22 projects forwardly from the front end of the bottom 13 to overlie the upper run of the wire 11 at the top of the breast roll 12. A slice 23 depends from the front wall 16 in spaced relation over the top of the wire 11 at the breast roll 12. An outlet 24 is thereby provided at the front lower edge of the box 10.

The box 10 thus has a closed chamber 25 adapted to be pressured by means of a compressed gas introduced through the tube 19, receiving stock around the baffle 21 from the sump 20 and discharging stock through the outlet 24 under the slice 23 onto the wire 11.

In accordance with this invention the box 10 is equipped with a flow evener 26. This flow evener 26 is mounted under the sump 20 and has a discharge slot or gap 27 along its top face communicating with the sump 20 across the entire width of the sump.

As shown in Figs. 1 and 2 the flow evener 26 is composed of a box having a bottom wall 28, spaced opposed parallel side walls 29 parallel with the side walls 14 of the box 10, a diagonally sloping rear wall 30 and a front wall 31 parallel with the rear wall 30, together with a flat top wall 32 containing the gap or slot 27. The walls 30 and 31 extend diagonally relative to the line of the paper making machine to define tapered flow conduits 33 on each side of a partition wall 34. These tapered flow conduits 33 decrease in size along their length from inlets 35 in the side walls 29. Feed pipe 36 supplies both inlets 35 at the opposite ends of the box 26 and stock from the inlets 35 flows longitudinally along the length of the tapered conduits 33 on each side of the partition wall 34.

As shown in Fig. 1 the partition wall 34 terminates in spaced relation beneath the outlet slot 27.

In accordance with this invention a rectifier roll 37 is rotatably mounted in the box 26 immediately above the partition wall 34 in close running clearance relationship therewith and projecting into the slot 27 into close running clearance relation with the top wall 32. The rectifier roll 37 as best shown in Fig. 2 is composed of a perforated tube 38 having a plurality of radially extending disks 39 in spaced parallel relation therein. These disks 39 are welded to the interior of the tube. The tube 38 has open ends and the edges 38a of the tube have relatively close running clearance relationship with the side walls 29 of the box. The outer disks 39 are spaced inwardly from the ends of the tube an appreciable distance and carry axles 40 which project through bearings in the side walls 29. One of the axles 40 has a pulley 41 thereon driven by a belt 42 from motor 43. The rectifier roll 37 is thus rotatably mounted in the box 26, with its axis aligned with the partition wall 34 and with the median line of the slot 27, in close running clearance with the upper edge of said partition 34 and with its upper periphery extending into the slot 27. Thus, the oppositely flowing streams of stock entering the box 26 must flow entirely through the rectifier roll 37 and through the slot 27 into the closed chamber 25.

The tube 38 is perforated around its entire periphery and along its entire length. These perforations are graduated in size to diminish in capacity inwardly from the edges 38a of the tube. Thus relatively large apertures 44 are provided in the tube near the ends thereof and these aper-

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tures graduate in size down to relatively small apertures 45 at the mid-point of the tube. The end edges 38a of the tube contain semi-apertures 46 therein. The aperture arrangement is such that a uniform flow rate along the entire length of the tube is maintained and frictional drag or skin effects on the flowing stock normally imparted by the stationary side walls 29 is compensated for by the reduced capacity holes in the mid-section of the tube.

As shown in the flow diagram of Fig. 3 stock enters the inlets 35 and flows in opposite directions through the passageways 33 in the box. These passageways are of diminishing size to compensate for discharge of stock through the rectifier roll along the length of the roll so that the identical flow velocity will be maintained along the entire length of each passageway. Stock thus flows in opposite transverse directions relative to the line of the paper making machine and across the entire width of the paper making machine. This cross flow of stock insures uniform delivery across the width of the machine. The stock from the passageways 33 flows through the apertures in the tube 38 of the rectifier roll and is guided by the disks 39 which form baffles. The baffles change the direction of flow of the stock from oppositely flowing cross streams to upwardly flowing streams free from cross velocity. In other words the baffles deflect the flow of stock from a cross flow to an exit flow. The stock flows through the rectifier roll and through the gap or slot 27 into the sump 20, thence around the baffle 21 and into the chamber 25. The stock is allowed to rise to a predetermined level in the chamber for maintenance of a desired head and the stock is then discharged uniformly out of the outlet 24 onto the forming wire for immediate setting into a paper sheet. The head of stock in the chamber 25 can be maintained under superatmospheric pressure if desired by introducing compressed gas into the chamber through the tube 19.

From the above description it will be understood that this invention provides an inlet having a cross flow box equipped with a rectifier roll to receive stock therethrough from oppositely flowing transverse streams. The rectifier roll is equipped with internal baffles which deflect the cross flow streams and form a uniform upwardly flowing stream. Any inequalities of stock distribution in the cross flow streams is rectified by the roll and the roll has perforations so graduated as to nullify friction effects on stock flow imposed by the walls of stock conduits or the like.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim as my invention:

1. In a flow evener for a paper making machine having a partition wall and side walls defining a pair of stock flow conduits adapted to receive oppositely flowing stock streams and to discharge through a common restricted outlet spaced from the partition wall, the improvements which comprise a rectifier roll having a radially perforated cylindrical tube, means journalling the tube for rotation in position interposed between said partition wall and said outlet to extend along the length thereof and cooperating with said partition wall in close running relation therewith to

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prevent discharge from either of said conduits except through said tube, and radial baffles extending across the interior of said tube and axially spaced along the length thereof to channel stock flow therethrough, said roll serving to merge the oppositely flowing stock streams for concurrent unidirectional discharge through said outlet and said baffles eliminating cross-velocities and eddy current in the merged stock streams flowing through said sleeve.

2. In a flow evener for a paper making machine having a partition wall and side walls defining a pair of oppositely tapered conduits extending across the entire width of the evener and adapted to receive oppositely flowing stock streams for discharge through a common restricted outlet vertically aligned with and spaced from the partition wall, the improvement which comprises a rectifier roll comprising a cylindrical tube having radial apertures therethrough of increasing size axially outwardly toward each end from the center thereof, means journalling said tube for rotation in position interposed between said partition wall and said outlet to extend along the length thereof and cooperating with the partition wall in close running relationship therewith to prevent discharge through either of the conduits except through said tube, and a plurality of radial baffles axially spaced along the lengths of the tube, said roll serving to merge the oppositely flowing stock streams for concurrent unidirectional discharge through said outlet and said baffles serving to eliminate cross-velocities and eddy currents within the merged stock streams.

3. In a flow evener for a paper making machine having an open topped flow box, closure means for the top of the box defining a restricted central outlet, and an upstanding partition wall defining a pair of separate adjacent stock flow conduits adapted to receive oppositely flowing stock streams and to discharge upwardly through said restricted opening, said partition wall being vertically aligned with said restricted opening, the improvement which comprises a rectifier roll interposed between said partition wall and said restricted outlet and having its axis in vertical alignment therewith, said roll cooperating with said partition wall in close running relation therewith and extending into said restricted outlet to prevent discharge from either of said conduits except through said roll, said roll also having axially spaced radially extending baffles in the interior thereof and serving to merge the oppositely flowing stock streams for concurrent upward unidirectional discharge through said outlet with said radial baffles serving to eliminate cross-velocities and eddy currents in said merged streams.

4. A stock inlet box for a paper making machine comprising a head box defining an interior closed chamber having an outlet at the forward bottom end thereof and an inlet sump at the rear bottom end thereof, a flow evener box beneath said sump defining an interior space in

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restricted communication with said sump through a discharge slot extending along the entire width of the inlet, an upstanding partition wall in said flow box space terminating in spaced relation beneath said discharge slot and dividing said flow box space into a pair of adjacent stock conduits, means for introducing oppositely flowing stock streams into said conduits for discharge through said restricted slot to said sump, and a rectifier roll interposed between said partition wall and said discharge slot, said roll extending into close running relation with said partition wall and into said slot to prevent discharge from either of said conduits through said slot except through said roll, said roll serving to merge the oppositely flowing stock stream of said conduits for concurrent unidirectional discharge upwardly through said discharge slot into said sump.

5. A stock inlet box for a paper making machine comprising a head box defining an interior closed chamber having an outlet at the forward bottom end thereof and an inlet sump at the rear bottom end thereof, a flow evener box beneath said sump defining an interior space in restricted communication with said sump through a discharge slot extending along the entire width of the inlet, an upstanding partition wall in said flow box space terminating in spaced relation beneath said discharge slot and dividing said flow box space into a pair of adjacent oppositely tapered stock conduits, means for introducing oppositely flowing stock streams into said conduits for discharge through said restricted slot to said sump, and a rectifier roll interposed between said partition wall and said discharge slot, said roll extending into close running relation with said partition wall and into said slot to prevent discharge from either of said conduits through said slot except through said roll, said roll having interior radial baffles extending thereacross and serving to merge the oppositely flowing stock streams of said conduits for concurrent unidirectional discharge upwardly through said discharge slot into said sump and said baffles eliminating cross-velocities and eddy currents within said slot.

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