

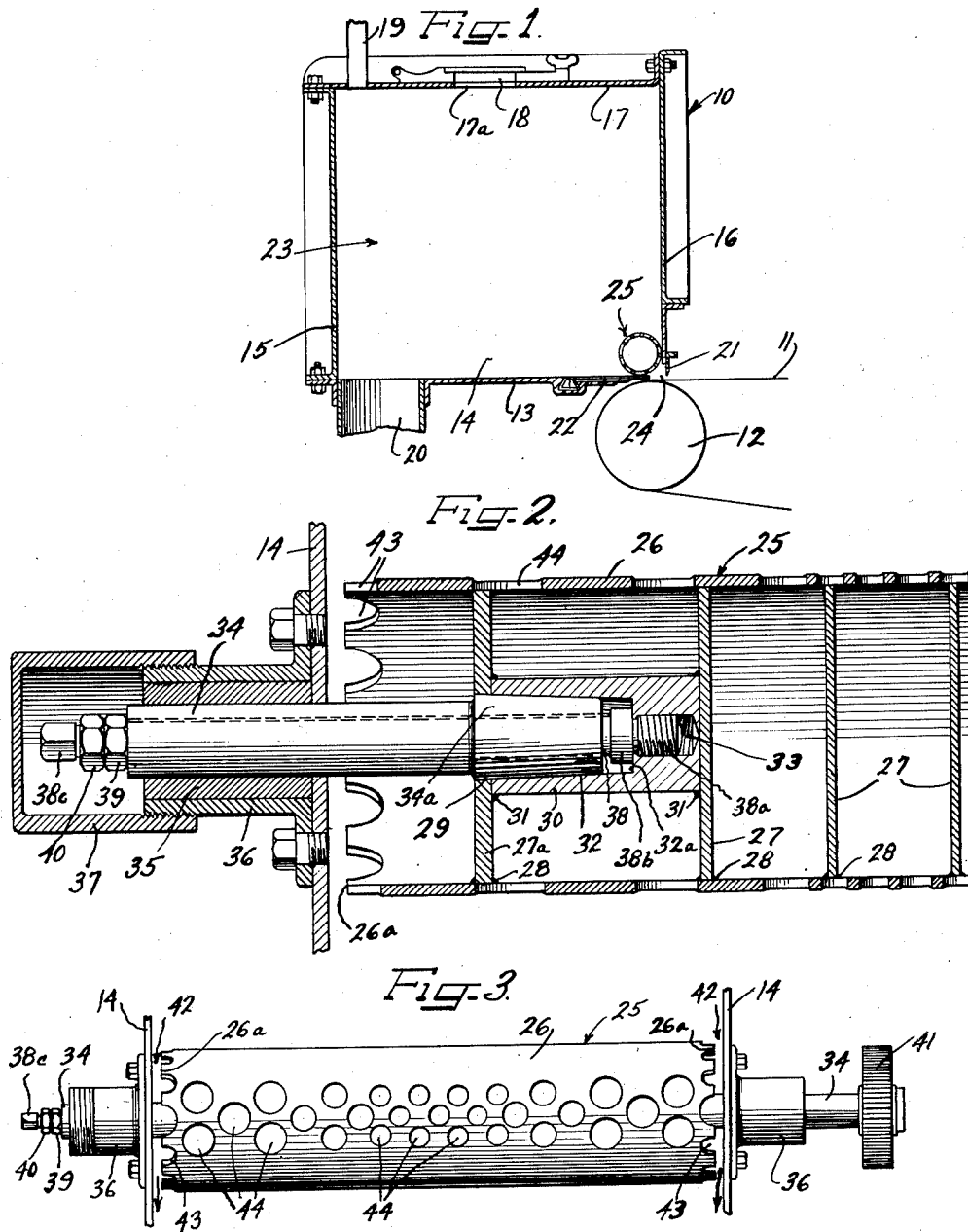
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RECTIFIER ROLL

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RECTIFIER ROLL

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This invention relates to paper making machine rectifier roll constructions for increasing the permissible speed of operation of paper machinery by correcting or rectifying the condition of stock immediately before it is deposited on the forming surface of the paper machine so that very little if any additional conditioning or rectifying of the stock need be done on the forming surface. Specifically the invention deals with a rectifier roll construction which insures the uniform feeding of paper stock across the entire width of a paper forming surface and eliminates heretofore encountered drag effects on stock flow adjacent the edges of the forming surface.

According to this invention a rectifier roll is rotatably mounted in the stock inlet of a paper machine immediately in advance of the final discharge outlet and as close to the forming wire of the machine as is possible. The rectifier roll is composed of a perforated tube and a plurality of spaced parallel disks extending transversely across the interior of the tube with the outermost disks being spaced inwardly from the ends of the tube. The ends of the tube have relatively close operating clearance relationship with the side walls of the inlet. The tube is perforated along its entire length and around its entire periphery. The perforations decrease in size inwardly from the ends of the tube. The very ends of the tube are scalloped with semi-holes. Stock from the inlet must flow through the tube before it can reach the forming surface of the machine. Heretofore, friction drag effect of the side walls of the inlet on the stock caused stock flow conditions which were more rapid intermediate the side edges than at the side edges. As a result uneven stock formation took place initially on the wire and had to be corrected by shaking the wire, by providing prolonged forming time, and the like, thereby slowing up production of the machine. The present rectifier rolls eliminate the heretofore encountered drag effect by eliminating end heads on the roll and by so graduating the holes in the roll that the stock stream meets the identical resistance across its entire width and is evenly fed to the forming surface at a single selected velocity. As a result the stock is in good condition for immediate forming into paper and can be set immediately into a sheet on the forming surface. This of course permits faster operation of the machine because mechanical correcting conditions and the time necessary to permit the correcting operations are eliminated. The rectifier rolls of this invention put the stock on the forming surface in a form ready for immediate setting into a paper sheet.

It is then an object of this invention to provide a headless rectifier roll.

A further object of this invention is to provide a rectifier roll construction for paper making

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machines which has perforations of decreasing size extending inwardly from the ends thereof.

Another object of the invention is to provide a rectifier roll for the feed boxes of paper making machines which is composed of a perforated tube and a plurality of spaced disks extending transversely in the tube and inwardly from the ends of the tube to direct flow of stock through the tube.

Another object of the invention is to provide a rectifier roll for the stock inlet of a Fourdrinier type paper making machine which has a perforated tube receiving stock as it flows out of the inlet and which contains a plurality of spaced parallel baffles to direct the stock transversely through the tube thereby eliminating cross flow effects.

Another object of the invention is to provide a rectifier roll construction which eliminates the skin drag effect heretofore encountered in connection with the feeding of paper stock onto the forming wire of a paper making 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, illustrates one embodiment of the invention.

In the drawings:

Figure 1 is a somewhat diagrammatic vertical cross sectional view of the wet end of a paper making machine having a stock inlet equipped with a rectifier roll according to this invention.

Figure 2 is an axial cross sectional view, with parts in elevation, of the rectifier roll of this invention and illustrating the manner in which the roll is mounted relative to the side wall of the stock inlet.

Figure 3 is a plan view of the rectifier roll of this invention and illustrating the same mounted on the side walls of the stock inlet.

As shown on the drawings:

In Fig. 1 the reference numeral 10 designates a head box or stock inlet for a Fourdrinier type paper making machine including a forming wire 11 and a breast roll 12. The inlet 10 has a bottom wall 13 extending rearwardly from the upper run of the forming wire 11 behind the breast roll 12. Side walls 14 extend upwardly from the bottom wall 13. A back wall 15 extends between the side walls 14 at the rear end of the bottom wall 13. A front wall 16 is provided on the front end of the box. The top is closed by a top wall 17 which has an aperture or doorway 17a closed by a door 18. A pipe 19 extends from the top wall 17. The bottom wall 13 receives the discharge end of a feed pipe 20. A slice 21 is carried by the front wall 16 in spaced relation above the upper run of the forming wire 11 at the breast roll 12. An apron 22 is carried by the

bottom wall 13 and extends forwardly over the breast roll 12.

The inlet 10 therefore has a closed chamber 23 for stock received through the inlet pipe 20. The stock flows onto the wire 11 at the breast roll 12 through a discharge opening or outlet nozzle 24 provided between the front edge of the apron 22 and the bottom edge of the slice 21. Stock in the chamber 23 may be subjected to pressure by admitting compressed air or other gas into the chamber on top of the stock through the pipe 19.

In accordance with this invention a rectifier roll 25 is rotatably mounted in the chamber 23 immediately adjacent the outlet 24 so as to rectify or condition stock flowing from the chamber 23 to the outlet 24.

As best shown in Fig. 2 the rectifier roll 25 is composed of a metal tube 26 preferably formed of corrosion resistant metal such as brass, bronze, corrosion resistant steel, or the like. The tube 26 is cylindrical and receives a plurality of circular metal disks 27 at spaced intervals along the length thereof. These disks 27 extend transversely of the tube interior and are welded to the tube at various points such as 28. The end disks such as the disk 27a may be somewhat thicker than the intermediate disks but are spaced inwardly from the end edges 26a of the tube. These end disks are centrally apertured at 29. Blocks such as 30 are interposed between each end disk 27a and the next adjacent disk 27 and are welded thereto as at 31. Each block 30 has a tapered recess 32 extending inwardly from the end face of the block that is secured to the disk 27a. The recess 32 is aligned with the aperture 29 and converges to a back wall or bottom shoulder 32a. A threaded well 33 extends axially inward from the back wall 32a.

The end edges 26a of the tube 26 are disposed closely adjacent the side walls 14 of the inlet 10 and an axle 34 projects from the ends of the tube through each side wall 14 and through a bearing sleeve 35 carried in a housing 36 secured on the outer face of each side wall. The outer end of the housing 36 is closed by means of a screw cap 37. The axle 34 has a tapered head portion 34a on the inner end thereof fitting through the aperture 29 and snugly seating in the recess 32. A bolt 38 projects through the axle 34 and has a threaded end 38a threaded into the well 33. A head 38b is provided adjacent the threaded end 38a and is bottomed on the wall or shoulder 32a. The outer end head 38c is adapted to be engaged by a wrench for threading the end 38a tightly in the well 33. The head 38c is adapted to fit through the axle 34 and projects beyond the end of the axle. A nut 39 is threaded on the outer end of the bolt 38 into thrusting engagement with the end face of the axle 34 to force the head 34a thereof into tight wedging engagement with the recess 32. A lock nut 40 coacts with the nut 39 to hold the same in tight position.

The axle projecting through the rear wall 14 is longer than the axle projecting through the front wall 14, as shown in Fig. 3, and receives a gear 41 thereon for driving the roll.

As shown in Fig. 3 the ends 26a of the tube must have operating clearance relationship with the side walls 14 since the tube rotates relative to the side walls. Heretofore rectifier rolls were equipped with end heads and the spaces between these end heads and side walls of a stock inlet in which the roll was mounted afforded restricted passageways for the flow of stock. These restricted passageways, being bounded on one side

by a stationary wall and on the other side by a rotating surface, disturbed even flow of stock and created a stock condition differing from the condition of a main body of stock flowing through the roll. As a result the outer edges of the flowing stream of stock contained stock in a different condition than the main body of stock between said edges. Further, the stationary side walls, such as the walls 14 of the stock inlet, have a frictional drag effect upon the stock tending to impede its forward flow through the outlet 24 onto the forming wire 11 and the main body of stock between the side edges therefore normally has a faster flow rate than the side edges.

In the present invention, however, the end heads of the rectifier roll have been eliminated and the first supporting disks have been spaced inwardly from the ends of the tube as shown in Fig. 2 so that the edges 26a of the tube are free and uncovered. The passageways 42 between the edges 26a and the walls 14 are thereby bounded on one side by the stationary wall 14 and on the other side only by the relatively thin edges of the tube. As a result the disturbing influences on the stock are reduced to a minimum.

In accordance with this invention the tube 26 is perforated with holes that decrease in diameter inwardly from the edges 26a of the tube. Holes 43 are formed in the very edges 26a of the tube to provide a scalloped edge. These holes 43 have full communication with the passageways 42 to open up flow of stock through the passageway at the identical rate occurring along the entire length of the roll. The holes 43 extend radially and as shown are semi-circular holes. Additional full circular holes 44 extend radially through the tube 26 and decrease in diameter from the ends of the tube to the middle of the tube. The holes 44 are so graduated as to create a uniform rate of flow through the outlet 24 of the inlet 10 across the entire width of the inlet between the side walls 14. Thus free flow through the middle section of the tube 26 is impeded by the smaller holes 44 to compensate for frictional drag imposed by the stationary side walls at the outer ends of the tube. These outer ends of the tube have larger holes therethrough and have open passageways 42 at the ends thereof all of which coact to maintain a uniform flow rate across the entire machine.

The disks 27 and 27a provide baffles which insure radial flow of stock through the tube and prevent development of cross-flow or eddy current conditions.

The rectifier roll 25 can be driven in either direction as desired. It is preferably rotated at a rate faster than the rate of flow of stock there-through.

The rectifier rolls of this invention have eliminated all skin or frictional drag effects on stocks caused by the walls of a stock inlet. They have corrected uneven stock flow conditions and have conditioned the stock so that it can be immediately set into a paper sheet. As a result machines equipped with rectifier rolls of this invention can be run much faster to produce a better quality of paper than was possible even at the slower speeds.

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. A rectifier roll construction for a paper making machine comprising a perforated metal tube, a pair of radially extending disks in spaced opposed relation in said tube inwardly from the end of the tube, the outermost of said disks having a central aperture therethrough, a recessed block extending between said disks and secured thereto, said recessed block having a threaded inner end and a tapered outer end, an axle having a tapered head projecting through the aperture in the outermost disk and snugly seated in the tapered portion of the recess of said block, a bolt extending through said axle and threaded into the threaded inner end of the recess of said block, and a nut threaded on said bolt acting on the outer end of the axle to force the same into wedged engagement in the tapered recess.

2. A rectifier roll for a paper making machine comprising a perforated tube having perforated edges providing scalloped ends, spaced parallel disks in said tube providing radial baffles therein, and the outermost disks being spaced inwardly from the ends of the tube to provide unobstructed outer ends for said tube.

3. In a paper machine stock inlet having an interior space for the flow of stock therethrough defined by opposed side walls, and bottom, front and rear walls, the improvement of a rectifier roll extending transversely thereacross and having open end faces in closely spaced relation to said side walls, a pair of baffles each extending radially across the interior of said roll axially inwardly from the corresponding open end face thereof, and a stub axle extending through each of said side walls into the adjacent end of said roll, said axles being secured to said baffles to rotatably support said roll while leaving open the ends of said roll to eliminate friction drag effects on stock flowing through the inlet immediately adjacent said side walls.

4. In combination with a paper machine stock inlet adapted for the flow of stock therethrough and having opposed side walls, a bottom wall and a front wall cooperating with said bottom wall to define a stock outlet opening immediately adjacent a forming wire, the improvement of a rectifier roll mounted in said inlet immediately adjacent the outlet opening thereof to rectify stock flowing therefrom onto said wire, said rectifier roll comprising an elongated cylindrical tube extending transversely across said inlet and having scalloped open ends closely spaced from said side walls to eliminate frictional drag exerted on stock flowing through the inlet adjacent said side walls by said roll, said tube also having perforations therethrough along the length thereof for stock flow radially through the tube, said perforations diminishing in size axially inwardly from each of said open ends to the center thereof, said scalloped open ends and said diminishingly sized perforations cooperating to effectively rectify stock at a uniform stock flow rate across the entire width of said outlet opening.

5. A cylindrical roll for rectifying stock flowing through a paper machine comprising a perforated tube having scalloped open ends, axially spaced parallel disks in said tube providing radial baffles therein for channelling stock flow radially of the tube, and the outermost disks being spaced inwardly from the ends of the tube to accommodate uniform radial stock flow through the tube across the width of the tube including the extreme end portions thereof.

6. In combination with a stock inlet having a discharge outlet, a rectifier roll mounted in said inlet to extend transversely thereacross immediately adjacent said outlet, said rectifier roll having unobstructed scalloped open ends in closely spaced clearance relation to the sides of the inlet together with graduated surface perforations of diminishing size inwardly from said ends to the center thereof, said perforations being arranged to maintain a uniform stock flow rate across the entire width of the outlet, and said unobstructed scalloped open ends eliminating stock drag effects along said sides.

7. A roll for rectifying stock flow through a stock space having spaced side, bottom and end walls comprising an open-ended perforated tube having perforations around the circumference of the tube open end faces to form a scalloped open end in close running spaced relation to said side walls, the scalloped open ends of said tube cooperating with said walls to provide for the flow of stock radially of said tube immediately adjacent said side walls.

8. A roll for rectifying stock flow through a paper machine comprising an elongated perforated cylindrical tube having unobstructed ends and perforations therethrough diminishing in size axially inwardly from said open ends, and axially spaced parallel baffle disks transversely spanning the interior of the tube and engaging the tube around their circumferences to divide the roll interior into a plurality of chambers including an open-ended chamber at each terminal end of the tube, said perforations accommodating the passage of stock through said chambers, said baffles channelling stock flow therethrough, and said open-ended chambers accommodating stock flow radially of said tube at the extreme ends thereof, the stock being emitted from each of said roll chambers through holes of substantially the same size as those through which it entered.

9. In a paper machine stock flow inlet having side and end closure walls defining a stock space, a rectifier roll mounted in said stock space and adapted to rectify stock contained therein, the rectifier roll comprising an elongated perforated cylindrical tube having unobstructed ends and perforations progressively diminishing in size axially inwardly from said ends, and axially spaced baffle disks extending radially across the interior of said tube, the end baffle disks being spaced inwardly from the ends of said tube, said perforated tube creating a uniform stock flow rate across the entire width of said roll and said open ends extending into close running spaced relation to the side walls of said stock space, thus accommodating stock flow radially of said tube along said side walls.

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