April 24, 1951 J. E. GOODWILLIE 2,550,552

STOCK INLET

Filed Sept. 5, 1946

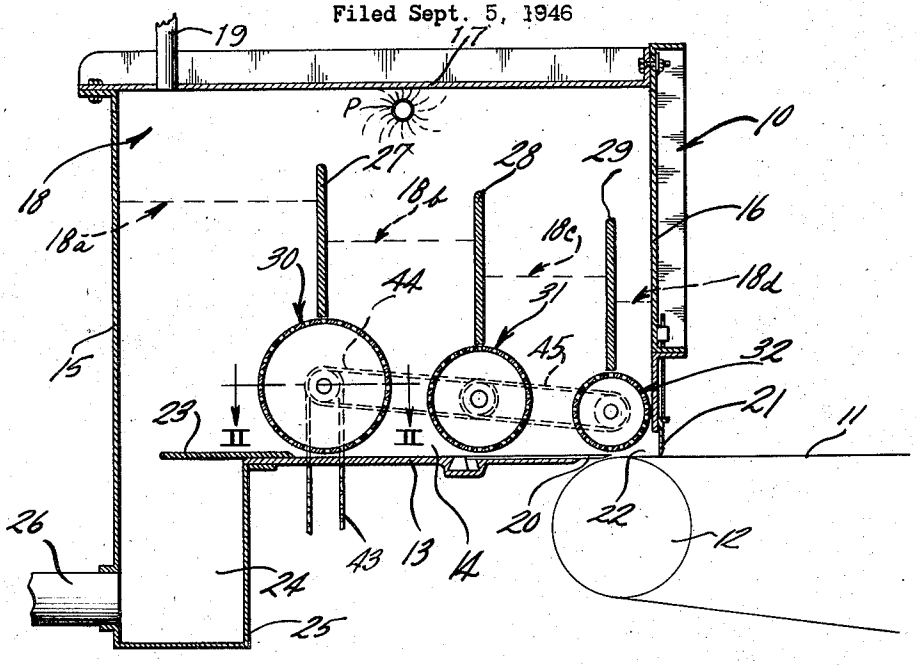


Fig. 1

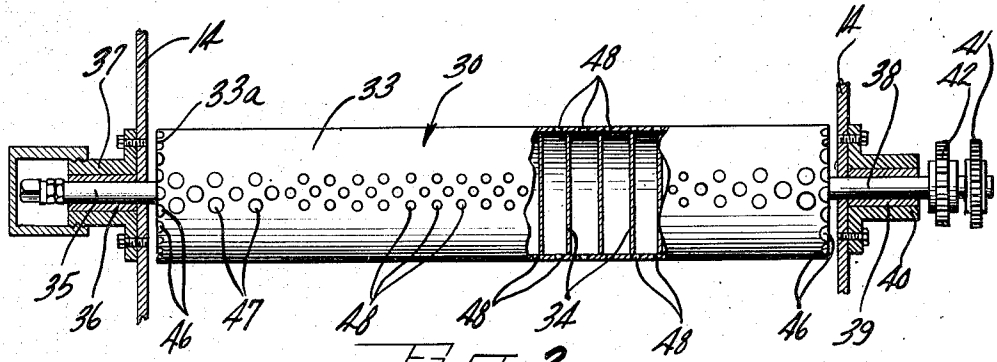


Fig. 2

INVENTOR.
JOHN E. GOODWILLIE
BY
ATTYS.

Patented Apr. 24, 1951 2,550,552

UNITED STATES PATENT OFFICE

2,550,552

STOCK INLET

John E. Goodwillie, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Application September 5, 1946, Serial No. 694,916

2 Claims. (Cl. 92—44)

1

This invention relates to a stock inlet for paper making machines equipped with a plurality of rectifier rolls arranged in tandem for successively conditioning stock as it flows to the discharge end of the inlet. Specifically, the invention deals with a paper machine stock inlet divided into tandem stock compartments by baffles and communicating with each other through rectifier rolls beneath the baffles, so that the stock must flow successively in a substantially straight line from the bottom of one compartment through a rectifier roll into the bottom of the next compartment. The heads of stock in the successive compartments can control the rates of flow of the stock, but these rates can be increased or decreased as desired, without changing the general level of stock, by regulating the air pressure in the inlet.

According to this invention a head box is provided to define a closed stock chamber preferably immediately adjacent the breast roll end of a Fourdrinier type paper making machine. This head box functions to spread the flow of stock from a pipe into the width of the slice opening to the forming wire of the paper machine without excessively disturbing the stock. A plurality of vertical baffles are provided in the head box between the inlet pipe and the outlet slice to divide the box chamber into compartments. These baffles terminate above a horizontal flat bottom wall of the box, and a rectifier roll is positioned under each baffle. The stock flow is, therefore, in a straight line from one compartment to the next, and finally to the slice outlet.

The rectifier rolls preferably decrease in diameter from the inlet to the outlet end of the box and the smallest rectifier roll is positioned immediately adjacent the slice outlet so that it will condition stock immediately before the stock leaves the box.

The rectifier rolls are perforated, and the perforations are preferably so graduated as to nullify friction drag effects on stock by the stationary walls of the box. Since all of the stock must flow through the perforations of all of the rectifier rolls, these perforations determine the actual flow capacity of the inlet and are graduated to maintain a uniform flow rate across the entire width of the machine. The larger perforations are disposed at the ends of the rolls where frictional drag effect on the stock is greatest. The holes then diminish in size toward the mid-section of the rolls to slow up the flow through the mid-sections to the same rate as the flow through the outer end sections.

2

The rectifier rolls preferably also contain spaced parallel radial disks creating separate flow paths therethrough. These disks act as baffles to destroy any cross flow velocities that might exist in the ponds of stock maintained in the box.

It is, then, an object of this invention to provide a stock inlet for paper making machines with a plurality of rectifier rolls arranged in tandem to sequentially treat stock before it is deposited on the forming surface of a paper making machine.

Another object of the invention is to provide a rectifier roll and baffle arrangement for stock boxes of paper making machines wherein the stock flows in a straight line path and is so treated and conditioned before it is deposited on the forming surface of the machine that immediate formation can occur without further conditioning of the stock.

Another object of the invention is to provide a head box for a Fourdrinier type paper making machine equipped with a plurality of spaced vertical baffles each having a rectifier roll positioned therebeneath and controlling flow into and out of compartments created in the box by the baffles.

A still further object of the invention is to provide a stock inlet with rectifier rolls arranged in tandem and in decreasing diameters to diminish the size of flow paths for the stock as it approaches the final outlet of the device.

A further object of the invention is to provide a head box for a paper making machine with rectifier rolls arranged in tandem and in sizes of decreasing diameters toward the final outlet of the box for providing a tapered or cone-like treating zone for stock flowing to the final outlet of the box.

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 longitudinal cross sectional view, with parts in elevation, of a stock inlet equipped with a tandem arrangement of rectifier rolls according to this invention.

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

As shown on the drawings:

In Fig. 1 the reference numeral 10 designates

generally a head box or stock inlet according to this invention for a Fourdrinier paper making machine including a forming wire 11 trained around a breast roll 12. The box 10 is composed of a bottom wall 13 about level with the upper run of the forming wire 11 and extending rearwardly from the breast roll 12. Side walls 14 extend upwardly from the bottom wall 13 and back and front walls 15 and 16, respectively, extend between the side walls 14 at the front and rear ends of the inlet. The top of the inlet is closed by a top wall 17. The walls 13 to 17 cooperate to define a closed stock chamber 18. This chamber can be pressured with compressed gas such as air from an inlet pipe 19 in the top wall 17. Alternately, the chamber can be evacuated through the pipe 19.

The forward end of the bottom wall 13 carries an apron 20 which projects over the upper run of the wire 11 on top of the breast roll 12. The bottom of the front wall 16 carries a slice 21 depending into spaced relation from the upper run of the forming wire 11. The space 22 between the forward end edge of the apron 20 and the slice 21 provides an outlet communicating with the wire 11. Stock flows through this outlet and under the slice 21 onto the wire to be set into a sheet on the wire. The rear end of the bottom wall 13 carries a horizontal baffle 23 projecting over the top of a sump 24 provided by a box-like inlet section 25 fed with stock from an inlet pipe 26. Stock flows upwardly through the sump 24 around the baffle 23 into the chamber 18.

The chamber 18 has a plurality of vertical baffles 27, 28, and 29 in spaced parallel relation extending transversely thereacross between the side walls 14. These baffles terminate in spaced relation above the bottom wall 13 and below the top wall 17. Chamber 18 is thereby divided into four compartments, 18*a*, 18*b*, 18*c*, and 18*d*, all communicating with a common top space in the chamber, and all communicating at their bottoms along a straight line path. The common top space of the chamber preferably receives a rotary shower pipe "P" to kill lump-forming foam on the stock ponds in the compartments, to dilute the stock if desired, and to wash the chamber.

A rectifier roll 30 is rotatably mounted under the baffle 27. A second rectifier roll 31 is rotatably mounted under the baffle 28 and a third rectifier roll 32 is rotatably mounted under the baffle 29. The rectifier rolls 30 to 32 are of identical construction but have diminishing diameters with the roll 30 positioned adjacent the inlet sump 24 being of largest diameter and with the roll 32 positioned adjacent the outlet 22 being of the smallest diameter. The rolls each have close running clearance relationship with the adjoining baffles and walls of the inlet so that all stock flowing from one compartment to the next and from the compartment 18*d* to the outlet 22 must flow through the rolls.

Each roll, such as the roll 30 shown in Fig. 2, is composed of a perforated tube 33 and a plurality of spaced parallel disks 34 extending transversely thereacross at equal intervals along the entire length thereof. The end disks 34 are inwardly from the ends of the tube so that the tube has free end edges 33*a*. Axles project from the ends of the tube and are carried by the disks inside of the tube. A front axle 35 projects freely through a bearing sleeve 36 carried in a housing 37 on the front side wall 14 of the box 10. The axle 35 of course rotates freely in the bearing sleeve 36. A rear axle 38 projects through a bearing sleeve 39 carried by a housing 40 on the rear side wall 14 of the head box. This rear axle has a pair of sprockets 41 and 42 secured thereon. As shown in Fig. 1 the sprocket 41 is driven by a chain 43 from a suitable source (not shown). The sprocket 42 drives a chain 44 trained around a driven sprocket on the rectifier roll 31 and this rectifier roll also has a driving sprocket driving another chain 45 trained around the driven sprocket on the rectifier roll 32. Thus all three rolls 30, 31 and 32 are driven through sprockets and chains from a suitable source of power (not shown).

As shown in Fig. 2, the tube 33 is perforated with circular holes which decrease in diameter inwardly from the ends of the tube to the mid-section of the tube. The very end edges 33*a* of the tube have semi-circular holes 46 at spaced intervals therearound providing a scalloped edge having relatively close running clearance relationship with the side walls 14 of the head box. The holes 47 immediately adjacent the semi-holes 46 are of relatively large diameter and the holes then decrease in diameter to relatively small holes 48 in the mid-section of the tube. These holes are so graduated as to create a uniform flow rate through the rectifier roll under each baffle 27 to 29. Since the side walls 14 have friction drag effects on the flowing stock and tend to impede the flow rate, larger holes are provided at the ends of the roll to give freer flow conditions and the stock in the middle of the roll is impeded by smaller diameter holes.

The disks 34 define radial flow chambers through the tube and the stock must flow transversely through each tube. The disks kill any cross flow velocity of the stock.

Each rectifier roll has a somewhat restraining influence on the free flow of stock so that the heads of stock in the respective compartments 18*a* to 18*d* will be at progressively lower levels. The compartment 18*d* has the lowest head of stock and the compartment 18*a* has the highest head of stock.

Further, since the rectifier rolls decrease in diameter from the receiving end to the discharge end of the stock chamber and since the baffles coact with the rolls in closely spaced relation, the flow orifices from one compartment to the next are of progressively decreasing size and stock must flow through these orifices and rectifier rolls at increasing velocities. The large diameter rectifier roll conditions the stock at a relatively low velocity rate and the succeeding rectifier rolls further condition the stock at increasing flow rates. As a result, rapidly flowing stock in fully conditioned form is fed to the outlet 22 and the stock in this rapidly flowing fully conditioned form can be immediately set into a web on the upper run of the forming wire 11 without further conditioning. The machine can therefore be run at high speeds since the stock is fed to the wire in a form suitable for immediate setting.

From the above description it will be clear that this invention provides a stock inlet with a tandem arrangement of compartments joined at their bottoms through rectifier rolls preferably having progressively decreasing diameters to create a straight line flow path of decreasing size thereby increasing the flow rate of stock from the inlet to the outlet end of the stock chamber and presenting stock to the forming surface of a paper machine in a condition suit-

able for immediate setting. Because the stock flow is in a straight line direct to the slice outlet, no undue turbulence conditions can be created such as exist, for example, when the stock passes alternately over and under baffles. In addition, of course, the rectifier rolls further quiet the stock flow in the straight line path. If desired the stock chamber can be pressured with gas or the like to increase the flow rate but without disturbing the progressive increase in flow rate through the successive rectifier rolls. The gas pressure is equally applied to the tops of all of the ponds of stock in the compartments since these ponds are fully exposed to a common top space in the chamber. Alternately, the space can be evacuated instead of being pressured. This gas pressure or evacuation arrangement is varied at will by manipulation of control valves (not shown) and is effective to produce the desired pressure of stock at the slice while still maintaining an efficient stock level in the head box. Thus proper distribution of stock and water in a head box can best be obtained by maintaining the stock level within certain limits, and varying these limits was heretofore necessary to meet required slice pressures. Now, according to this invention, the slice pressures are met without variation in general stock level by regulating the gas pressure on top of the stock.

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 stock inlet comprising a box defining a stock chamber having an outlet at the forward bottom end and an inlet at the rear bottom end, a plurality of baffles in said chamber ahead of said outlet and terminating in spaced relation above the bottom of the chamber, a rectifier roll rotatably mounted beneath each baffle in close running clearance relation with the baffle thereabove and the bottom of the box therebelow, said rectifier rolls and baffles dividing the chamber into a plurality of compartments between the inlet and outlet for the chamber, and said

rectifier rolls being of progressively decreasing diameter to coact with the baffles for providing flow passages through said rolls only between the compartments of decreasing size thereby increasing the flow velocity of stock between the compartments for feeding of stock at high velocity to the outlet.

2. A stock inlet comprising a closed box having a stock intake at one end thereof and a stock outlet at the other end thereof, a plurality of longitudinally spaced transverse vertical baffles in said box ahead of said outlet and spaced from the top and bottom of the box, said baffles dividing the box into stock compartments, the bottoms of successive baffles extending closer to the bottom of the box to provide gaps of diminishing height between the intake and the outlet, a rectifier roll under each baffle in closely spaced relation with said baffle and the bottom of said box to fill said gaps and define restricted paths between said compartments, means for feeding stock through said intake to the bottom of the first compartment, an outlet slice at said outlet communicating with the bottom of the last compartment, said compartments having open communication at their top ends with a common space in the upper end of the box, and means for creating a pressure differential between said closed box and the atmosphere.

JOHN E. GOODWILLIE.

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