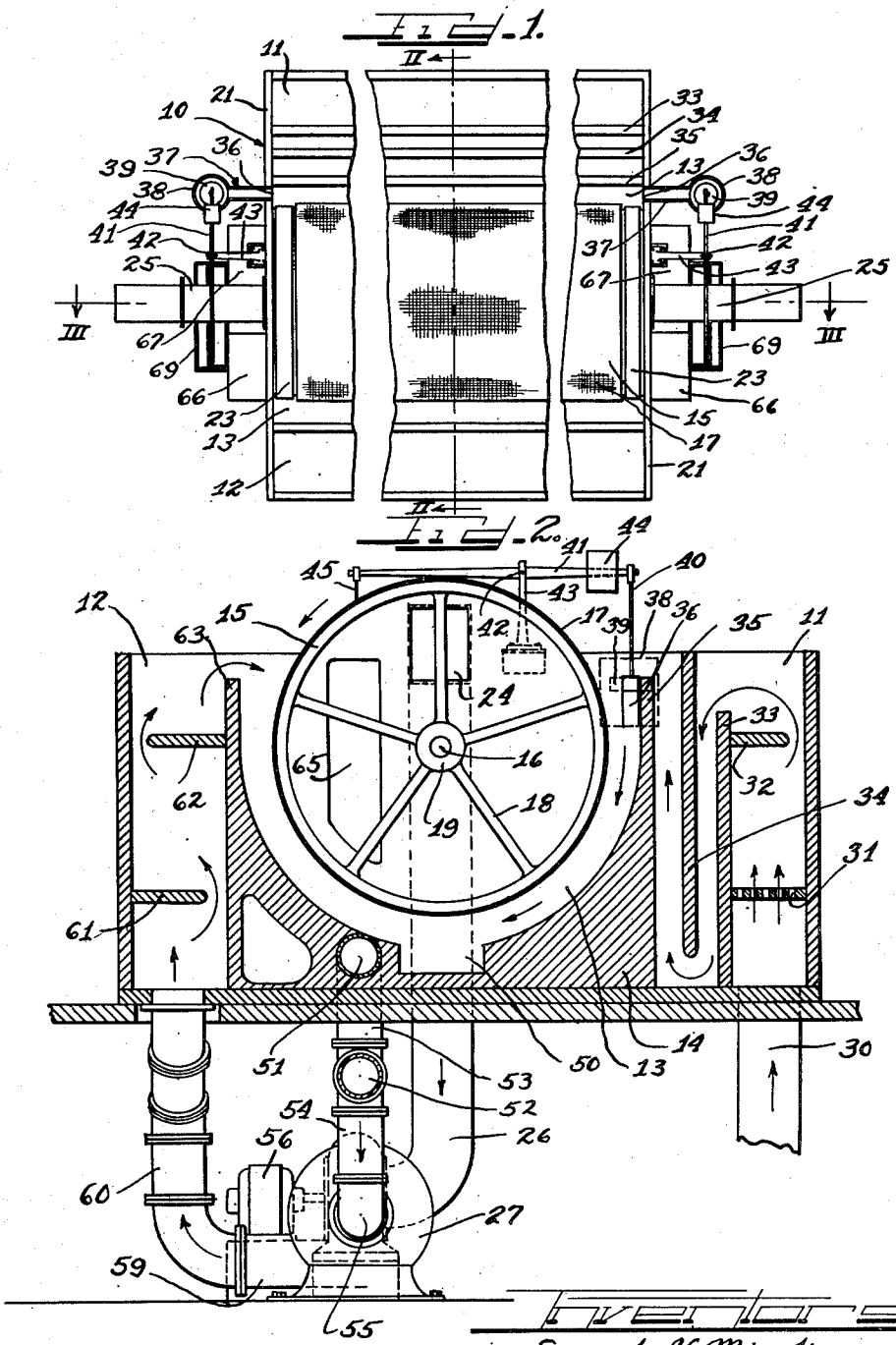
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CYLINDER PAPER MACHINE

Filed Dec. 15. 1933 2 Sheets-Sheet 1



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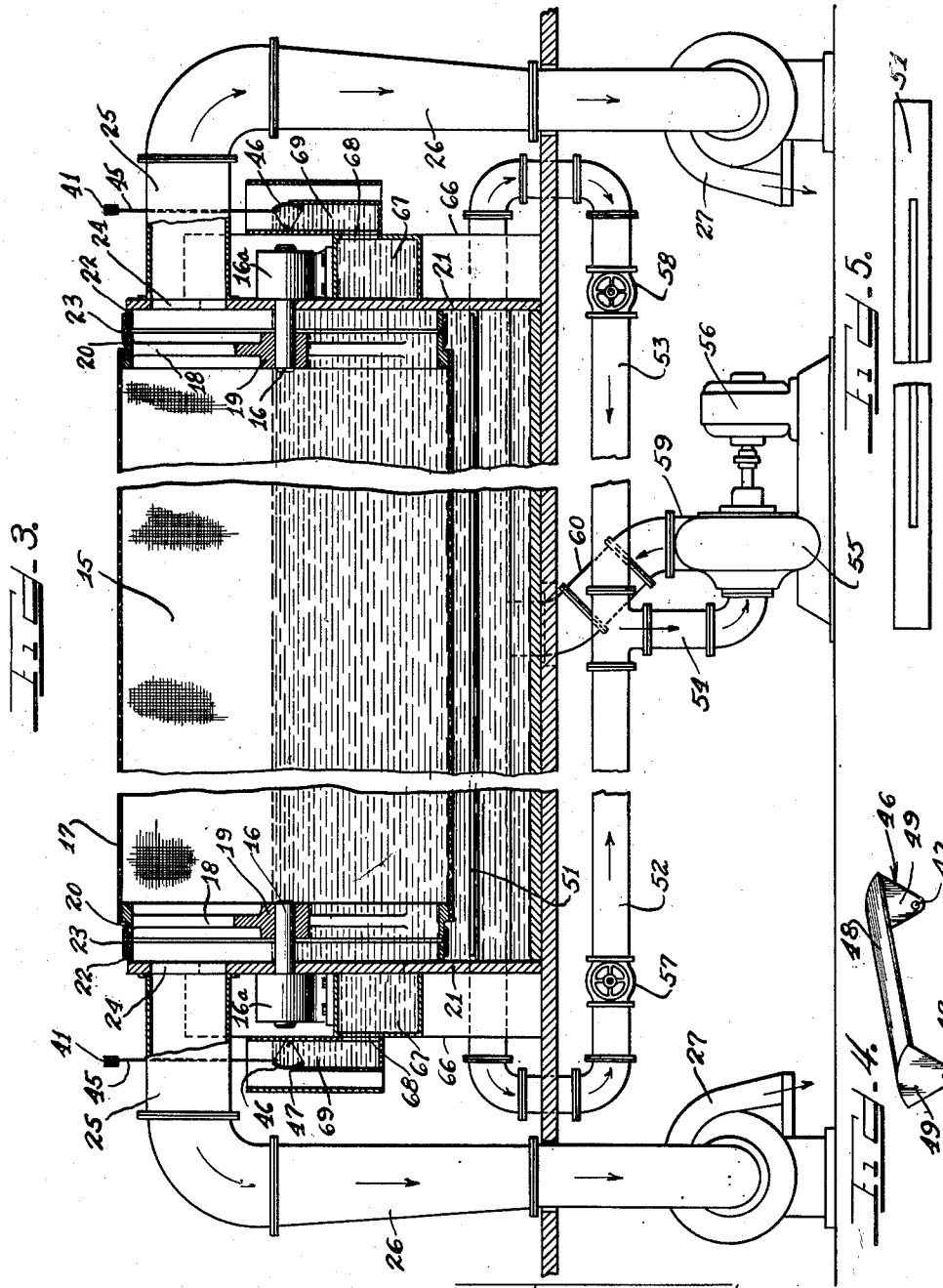


Fig. 3.

Fig. 5.

Fig. 4.

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CYLINDER PAPER MACHINE

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18 Claims. (Cl. 92—43)

This invention relates to a cylinder type of paper machine and includes a process of forming improved fibrous web materials.

More specifically, this invention relates to improvements in stock vats for cylinder type paper machines and includes means for withdrawing the denser fibers which collect at the bottoms of vats and delivering them to the web forming cylinders. The invention also includes a process of utilizing the dense fibers which settle to the bottom of the stock pond for forming a filter mat on the cylinder which prevents the finer fibers from passing through the cylinder wire and being discharged with the white water.

Manufacturers of paper boards and other cylinder-made papers have long been accustomed to the presence of considerable amounts of fine fibers in the white water discharged from the cylinder molds. Various processes and methods of recovering these fibers from the white water have been resorted to and numerous types of white water concentrators have been designed to eliminate the fiber waste.

We have now provided a cylinder type of paper machine capable of discharging white water almost entirely free of fibers. We have also perfected improvements in stock flow control to the cylinder vat.

According to our invention, a main feed box is provided on one side of the "circle" or stock vat for supplying a quiet, even flow of paper stock to the vat for creating a quiescent pond of stock around the cylinder rotatable in the vat. A second feed box is provided at the other side of the vat for supplying dense fibers which collect at the bottom of the vat from the fiber stock supplied by the main feed box. These dense fibers in aqueous suspension are flowed in a quiet, even flow, against the cylinder mold as it enters into the stock vat. A filter of dense fibers is thus formed on the cylinder thereby preventing, to a large degree, the passage of finer fibers through the cylinder screen as it advances through the stock pond.

Our invention also includes an automatic regulator for controlling the white water discharge by the stock level in the vat pond or circle.

It is therefore an object of this invention to provide a cylinder type of paper machine which largely eliminates the presence of fibers in the white water discharge.

Another object of this invention is to provide a cylinder type of paper machine which more efficiently forms a web from fibers in aqueous suspension.

Another object of this invention is to provide a de-watering apparatus for removing solids from liquid suspensions which utilizes the more dense solids as filter media for the lighter solids.

Another important object of this invention is to provide a de-watering apparatus for the efficient formation of webs composed of solids deposited on forming molds from liquid suspensions which re-circulates the settled solids for use as a filter medium on the forming molds.

Another important object of this invention is to provide a process for forming webs from solid particles in liquid suspension, by withdrawing the denser solids from the suspension to form a filter medium for the deposit of the finer solids thereon.

Another object of this invention is to provide an efficient process for forming fibrous webs on cylinder type paper machines utilizing the more dense fibers as a filter for the other fibers.

Another important object of this invention is to provide apparatus for controlling the white water discharge and level of stock in the vat pond in cylinder type paper machines.

Other and further objects of this invention will be apparent to those skilled in the art from this specification and accompanying drawings which form part of the specification.

On the drawings:

Figure 1 is a top plan view illustrating a preferred form of apparatus according to this invention.

Figure 2 is a vertical cross-sectional view, with parts in elevation, taken substantially along the line II—II of Figure 1.

Figure 3 is an enlarged broken vertical cross-sectional view, with parts in elevation, taken substantially along the line III—III of Figure 1.

Figure 4 is an isometric view of a white water discharge valve used in our preferred form of apparatus.

Figure 5 is a plan view of the slotted pipe used in the apparatus.

As shown on the drawings:

In Figure 1, the reference numeral 10 indicates, generally, the preferred form of vat for a cylinder type of paper machine according to this invention having a main feed box 11 and an auxiliary feed box 12. As shown in Figure 2, these feed boxes are located on each side of the stock pond 13 defined by the vat circle 14. A cylinder mold 15 is rotatably mounted in the stock pond 13 in spaced relation from the circle 14.

The cylinder 15 is of the usual construction having a wire mesh peripheral face 17 supported on each end by spiders 18 having hubs 19 which

are keyed to axles 16. The axles 16 are freely rotatable in bearings 16a. However, as best shown in Fig. 3, the ends of the cylinder are preferably sealed from the stock pond 13. For this purpose, the peripheries of the spiders 18 are formed with flanges 20 extending laterally from the ends of the cylinder. The end walls 21 of the vat are equipped with chime rings 22 having the same outside diameter as the flanges 20 of the spiders 18. These rings 22 are secured to the vat walls 21 in any suitable manner and extend inwardly therefrom terminating but a short distance from the laterally extending flanges 20. Straps or bands 23 are placed around the rings 22 and the flanges 20 thereby sealing the ends of the cylinder from the stock pond 13. Since the straps 23 are only in frictional engagement with the rings and spider flanges, the cylinder may rotate relatively to the rings 22.

The end walls 21 of the vat, as shown in Fig. 3, extend considerably above the stock level of the vat and are provided near their tops with openings 24 to which are secured pipes or ducts 25 for communicating with the interior of the cylinder 15. The ducts 25 are connected through ducts 26, to air blowers 27. In this manner, air is sucked from the interior of the cylinder, thereby aiding the fibrous web formation on the wire mesh 17 of the cylinder.

As best shown in Fig. 2, the fibrous stock in aqueous suspension is supplied to the main feed box 11 through a feed pipe 30. The stock then passes through a perforated flow-evener board 31 and flows upward around the horizontal baffle board 32 over a vertical baffle 33. The stock then flows downward under the vertical baffle 34 and up over the weir portion 35 of the circle 14 into the stock pond 13 in the vat.

As shown in Fig. 1, openings 36 are provided in the end walls 21 of the vat structure adjacent the weir 35 for receiving trough members 37 opening into cylindrical pot-like members 38. Floats 39 are freely movable in the cylinder members 38. Thus the stock level maintained in the vat pond 13 seeks its own level in the open troughs 37 and cylinder members 38, thereby actuating the floats 39. The floats 39 are connected by means of rods 40 (Fig. 2) to lever arms 41 pivoted about axis 42 on stands 43 secured to the vat walls 21. A weight 44 is manually adjustable on the lever arm 41 to limit the action of the float 39 as the operation of the machine may require. It is obvious that, if the level of stock in the pond 13 rises, the level of the stock in the cylinder members 38 will also rise, thereby lifting the floats 39 and moving the rods 40 upward to tip downward those portions of the lever arms 41 beyond the pivots 42.

The ends of the lever arms 41 away from the floats 39 and rods 40 are secured to rods 45 which, as shown in Figure 3, and as will be more fully hereinafter described, control the operation of white water discharge valves 46.

As the stock flows into the pond 13, most of the fibers are deposited on the screen surface 17 of the cylinder 15 forming a fibrous web. However, foreign materials and the more dense fibrous particles collect at the bottom of the pond. A sump portion or catch basin 50 is provided at the bottom of the circle 14 for collecting the foreign materials.

According to this invention, we have now provided means for re-circulating the dense fibers which find their way to the bottom of the pond. For this purpose, a slotted pipe 51 extends longitudinally across the bottom of the circle 14 as shown in Figs. 2 and 3. The slotted pipe 51 is connected through pipe lines 52 and 53 at each end thereof to a pipe 54 leading to the intake end of a centrifugal pump 55 driven by a motor 56. Valves 57 and 58 are provided in the pipe lines 52 and 53, respectively, for controlling the flow through the pipes.

The discharge end 59 of the centrifugal pump 55 is connected through a pipe line 60 to the feed box 12. The dense fibers at the bottom of the pond 13 are thus sucked through the slotted pipe 51 and pumped into the feed box 12 where they flow upwardly around the vertical baffles 61 and 62 and over the weir 63 of the circle 14. These dense fibers are thereby directed against the wire mesh 17 of the cylinder 15 as the cylinder first enters into the stock pond 13. These dense fibers are thus initially deposited on the bare wire surface 17 and, as the cylinder rotates through the pond 13, the initially deposited fibers act as a filter for the finer fibers and thereby prevent the passage of these finer fibers through the wire mesh into the interior of the cylinder.

The re-circulation of the dense fibers from the bottom of the stock pond greatly speeds up production and makes possible the use of fibrous stock containing a considerable amount of fines which ordinarily pass through the cylinder screen. The formation of a filter mass composed of material which itself is part of the fibrous web being formed greatly increases the efficiency of the machine.

As shown in Figs. 2 and 3, the end walls 21 of the apparatus are provided with vertically extending openings 65 communicating with vertical discharge boxes 66. The boxes 66 are open at their middle portions to communicate with horizontally extending boxes 67 which form supports for the axle bearings 16a for the cylinder 15.

The boxes 67 are provided on one side with openings 68 (Fig. 3) communicating with weir boxes 69 in which the valves 46 are pivoted.

Thus, white water from the interior of the cylinder 15 flows through openings 65 in the end walls 21 into vertical boxes 66. The boxes 66 communicate at one end with horizontal boxes 67 having a closed top and side but communicating, through an opening 68, with weir boxes 69. The effective height of the weir boxes 69 is varied by the valves 46 which are raised and lowered by the rods 45 which are actuated by the lever 41.

As shown in Fig. 4, the valves 46 are merely slice boards having an arcuate face 48 and end plates 49 pivoted at points 47 on the side walls of the weir boxes 69. The valves 46 are therefore merely preferred forms of adjustable slice bars and as they are lowered, obviously the liquid level of the white water in the cylinder is lowered. Since the valves 46 are controlled by the stock level in the pond 13, it is obvious that this feature maintains a constant level of stock in the vat pond because a rise in the level of the pond raises the floats 39 which lowers the valves 46 and thus lowers the white water level in the cylinder. Since an increased differential head is thereby created, it is obvious that more white water will flow from the pond 13 into the cylinder and thus tend to restore the original stock level in the pond. The valves 46 therefore maintain a constant level of stock in the vat by controlling the white water discharge.

Our invention, therefore, comprises an automatic white water discharge control, a re-circulation system for the dense fibers in aqueous sus-

pension, and the provision of exhaust fans for drying and holding the web on the wire as it emerges from the stock pond on the cylinder. The suction created by the fans in addition to preventing slippage of the sheet on the cylinder also improves the formation of the sheet. As is usual in cylinder type machines, a felt removes the web from the cylinder with the aid of a couch roll. The exhaust fans drain the pond of water formed behind the couch roll through the cylinder mesh thereby keeping the mesh washed and clean.

The two-way stock flow vat by providing two stock weirs or making boards **35** and **63** greatly speeds up the forming of the sheet on the cylinder and thus increases the production capacity of the machine. The flowing of stock over the making boards **63** on the ascending side of the cylinder evens up the level of the sheet formed on the descending side and effects the production of a sheet having uniform thickness.

It should be understood that our apparatus is not limited for use as a paper machine only. The apparatus may be used to remove solid particles from liquid suspensions of any type.

We are aware that changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention and we, therefore, do not purpose limiting the patent granted hereon otherwise than is necessitated by the prior art.

We claim as our invention:

1. In a de-watering machine, in combination, a vat defining a receptacle for a pond of solids in aqueous suspension, a foraminous cylinder rotatable in said vat, feed boxes on both sides of said vat, a main supply of said aqueous suspension of solids connected with one of said feed boxes, and means in communication with the bottom of said vat for supplying part of the suspension to the other of said feed boxes.

2. In a cylinder type of paper machine, in combination, a vat for a pond of fibrous stock, a foraminous cylinder rotatably mounted therein, stock feed boxes on both sides of said vat, a main stock supply connected with one of said feed boxes, a pipe communicating with the bottom of said vat, and means for flowing stock through said pipe to the other of said feed boxes.

3. A vat for a cylinder type of paper machine comprising, in combination, a vat circle defining a stock pond, stock feed boxes on both sides of said circle, a pipe near the bottom of said circle having its interior in communication with said pond, a suction pump, means connecting said pipe with said suction pump, and means connecting said pump with one of said feed boxes for supplying stock withdrawn from the bottom of the pond thereto.

4. A double flow vat for cylinder type paper machines having front and side walls, a vat circle therein defining a stock pond area, feed boxes formed on both sides of the circle for supplying paper stock to the pond area, baffle plates in said stock feed boxes, a slotted pipe extending longitudinally across the bottom of said circle in communication with the pond area and means for flowing stock from the pond through said pipe to one of said feed boxes.

5. In a stock vat for cylinder types of de-watering machines having a pond area for liquid suspensions of solid particles and feed boxes on both sides of said pond area, means at the bottom of said pond area for flowing part of the liquid suspension therefrom to one of the feed boxes.

6. A stock vat for cylinder type paper machines comprising, in combination, a vat circle defining a receptacle for a pond of stock, feed boxes on both sides of said circle, means at the bottom of said circle for withdrawing part of the stock in the pond and means for transferring the withdrawn stock to one of said feed boxes.

7. In a cylinder type paper machine, in combination, a stock vat for receiving a quiescent pond of stock, a cylinder mold rotatably mounted therein, a feed box on each side of said pond, and means for re-circulating part of the stock from the bottom of said pond to said cylinder mold as it enters the pond during the course of its rotation therethrough.

8. In a cylinder type of paper machine, in combination, a stock vat, means for maintaining a pond of stock in said vat, a cylinder mold rotatable in said vat, means for sealing the ends of said cylinder mold from the pond of stock in said vat, means for removing air from the interior of said cylinder mold, and means operated by the stock in the pond for controlling the white water discharge from the cylinder mold.

9. In a stock vat for cylinder type paper machines, a white water discharge control comprising float means actuated by the level of the stock in said vat, a lever arm connected with said float means, a weir box for white water and a slice bar in said weir box actuated by said lever arm whereby the white water level is lowered when the level of the stock to the vat is raised.

10. The process of removing solids from liquid suspensions which comprises forming a pond of said suspension, advancing a foraminous surface through said pond for receiving said solid materials thereon, withdrawing the more dense solid particles in suspension from the bottom of the pond and forming an initial deposit of said dense particles on said surface as it enters into the pond.

11. The process of forming fibrous webs which comprises creating a quiescent pond of fibrous materials in aqueous suspension, advancing a foraminous surface through said pond for receiving the fibers thereon, maintaining a pressure differential between the outside and inside of said foraminous surface, removing the more dense fibers from the bottom of said pond and depositing said dense fibers on the foraminous surface as it enters said pond.

12. The process of forming fibrous webs which comprises creating a quiescent pond of fibers in aqueous suspension, advancing a foraminous cylinder through said pond, maintaining a pressure differential between the outside and interior of said cylinder, removing the more dense fibers from the bottom of said pond, forming an initial mass of said dense fibers on said foraminous cylinder as it enters into the pond and depositing additional fibers on the initial mass as the cylinder advances through the pond.

13. The process of forming a paper web which comprises forming a quiescent pond of paper stock, advancing a cylinder mold through said pond, re-circulating the dense fibers from the bottom of the pond to said cylinder mold as it enters the pond for deposit thereon, depositing additional fibers on the cylinder mold as it advances through the pond and drawing air through the fibers on the cylinder mold as they leave the pond to dry the same and hold them on the mold.

14. In a stock vat for dewatering machines having a pond area for receiving liquid suspensions of solid materials, and means for feeding liquid suspensions of solids to said pond, means at the bottom of said pond area for flowing part of the liquid suspensions therefrom to said feed means.

15. A suspensions level control device for dewatering machines having a pond area for said suspensions, a filter means rotatable therein, and a filtrate discharge means, comprising float means actuated by the level of the suspensions in the pond area of the machine, means for forming a hydrostatic head of the filtrate flowing from the filter means in said machine, and means operated by the float means for varying the height of said hydrostatic head whereby the filtrate discharge is increased when the level of suspension in the pond area rises.

16. In a de-watering machine, in combination, a vat defining a receptacle for a pond of solids in aqueous suspension, means feeding supplies of said solids in suspension to opposite sides of the pond, a foraminous cylinder rotatable in said pond, means including a drain opening in communication with the pond at a point remote from one of said feeding means and connected with the other feeding means for circulating the solids in suspension at that point in the vat against the cylinder as it enters the pond.

17. The process of removing solids from a liquid suspension which comprises forming a pond of said suspension, feeding supplies of said solids in suspension to opposite sides of said pond, advancing a foraminous surface through said pond to receive the solids thereon, withdrawing the solids not deposited on the foraminous surface from the pond at a point remote from one of the feeding points, circulating the withdrawn solids in suspension to the opposite feeding point and flowing said suspension against the foraminous surface as it enters the pond to form an initial deposit thereon.

18. The process of making paper which comprises flowing paper stock to a vat to form a pond therein, advancing a foraminous surface through said pond in a direction opposite to the direction of flow of the stock into the vat to receive the stock fibers thereon, withdrawing the fibers not deposited on the foraminous surface at a point remote from their entry into the vat and flowing the withdrawn fibers against the foraminous surface as it enters the pond to form an initial deposit of fibers thereon.

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