

Jan. 12, 1954

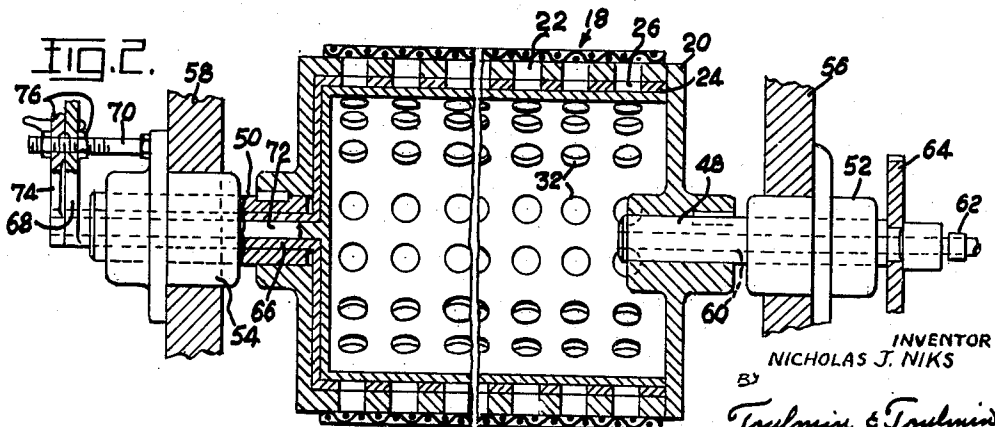
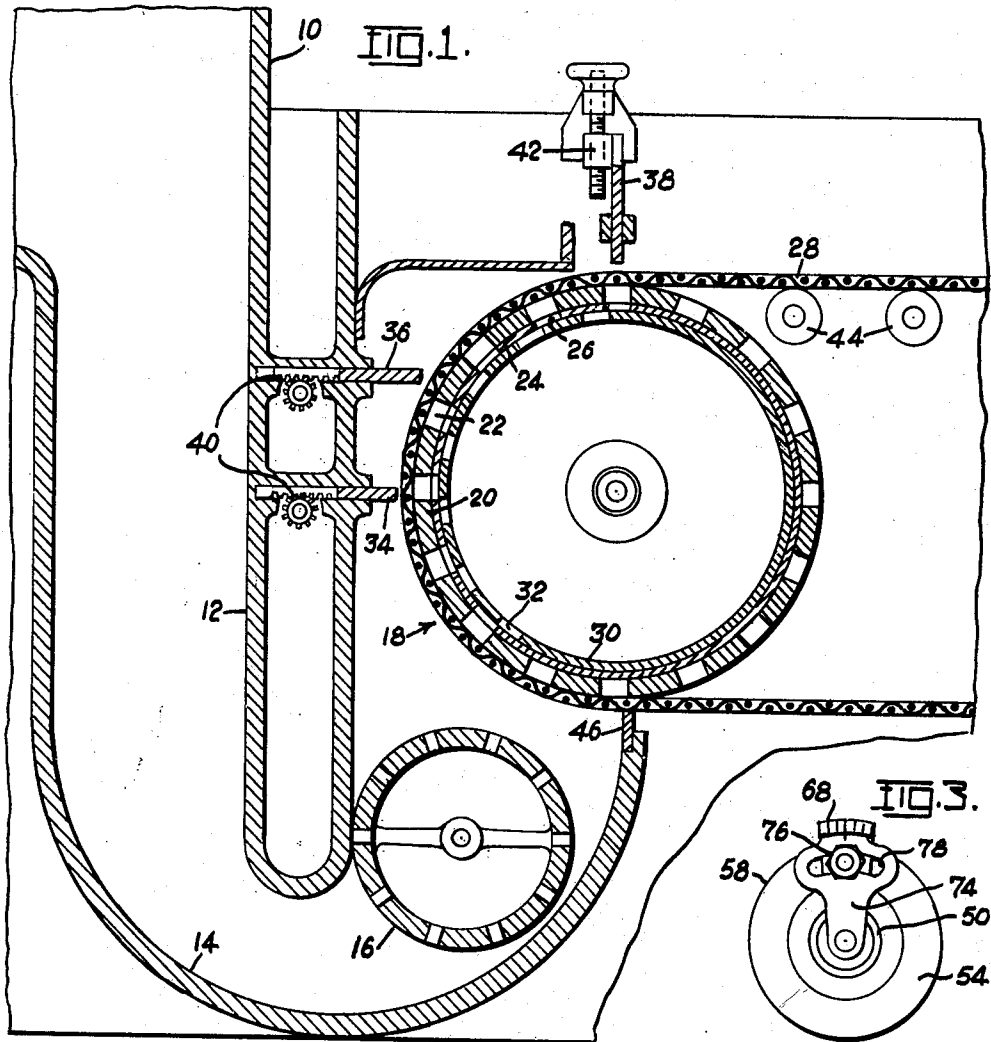
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APPARATUS FOR MANUFACTURE OF PAPER

Filed Jan. 12, 1949

3 Sheets-Sheet 1



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FIG. 4

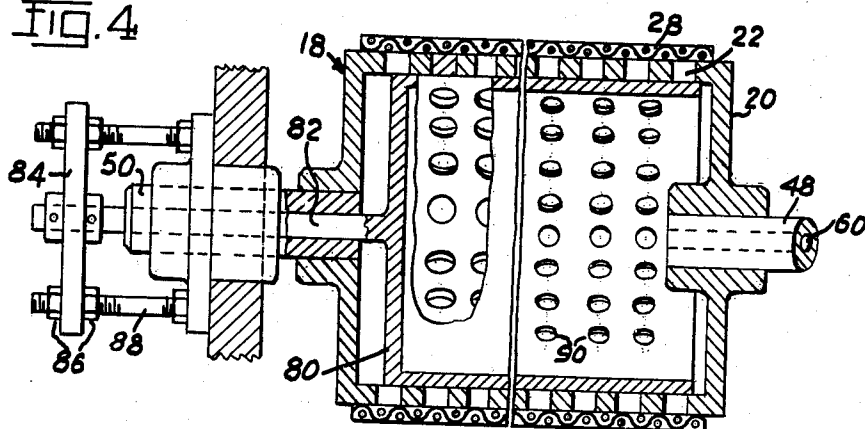


FIG. 5

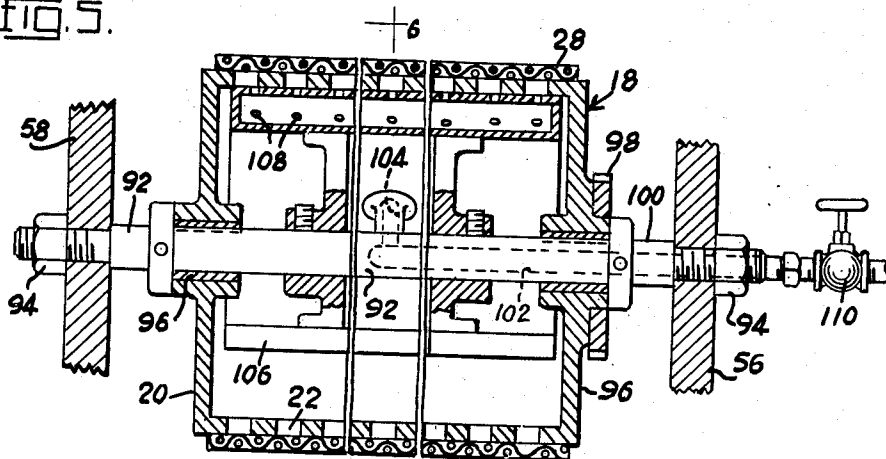


FIG. 6

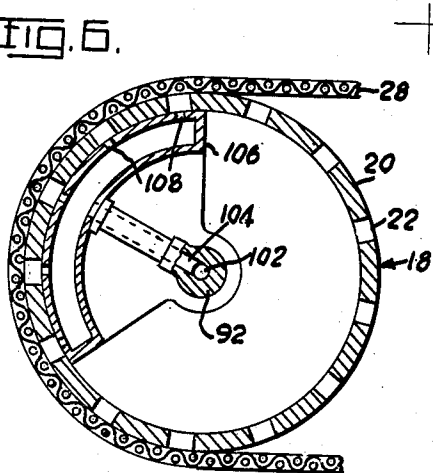
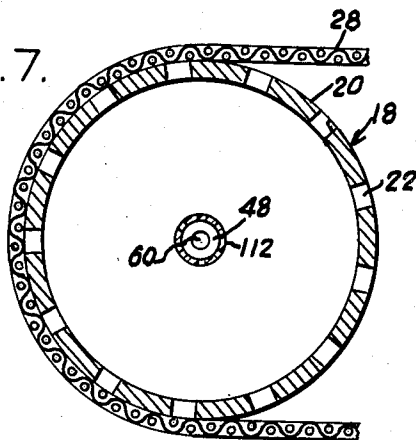


FIG. 7



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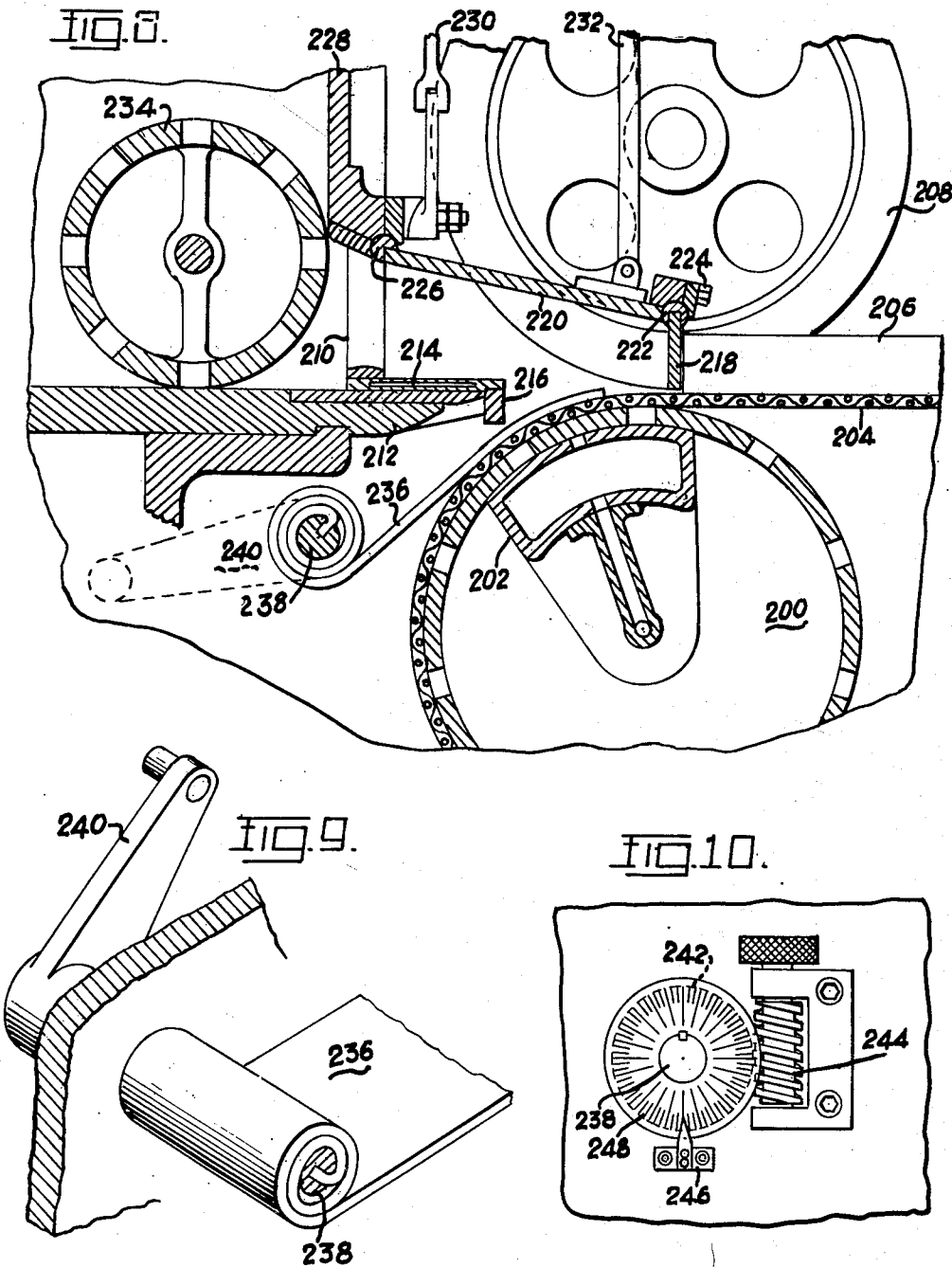
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3 Sheets-Sheet 3



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APPARATUS FOR MANUFACTURE OF PAPER

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Application January 12, 1949, Serial No. 70,510

3 Claims. (Cl. 92-44)

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This invention relates to Fourdrinier type paper machines, and, particularly to an improved method and apparatus for manufacturing paper, including the step of, and devices for, controlling the quality of the paper through the breast roll of the machine.

This application is a continuation in part of my copending application, Serial No. 590,627, filed April 27, 1945, and entitled "Method and Apparatus for Manufacture of Paper," now issued as Patent No. 2,473,069, dated June 14, 1949.

In the making of paper in the case of the Fourdrinier machine, the web of paper is first formed on the traveling wire, is subsequently de-watered by the press section of the machine, is dried out by the driers, and is finally finished or smoothed out by the calenders.

The stock which is delivered to the machine comprises an aqueous mixture containing about one-half of one percent ($\frac{1}{2}\%$) fiber, fillers, and sizing. The fibers mat together when the stock is de-watered and form the body of the paper sheet. The sizing is added for the purpose of controlling fluid absorption of the finished paper while the fillers are added to give the finished sheet the proper bulk and feel.

The particular proportions of water, sizing and filler is of the utmost importance in producing paper of the desired quality and it is with the control of these factors that my invention is primarily concerned.

Particularly, my invention proposes the control of the water, filler and sizing content of the stock as it is delivered to the wire in a Fourdrinier machine. By the method of my invention, water, sizing and filler may be added to or subtracted from the stock as it is laid on the traveling wire at the breast roll of the machine. This provides for an accurate control of these variable factors in the stock and insures that the final product will be of high quality. Also, according to this invention, the rate of modifying the above mentioned variable factors, as well as the extent of the zone over which they are so modified, is under the selective control of the machine operator at all times.

Accordingly, the principal object of this invention is to provide for the control of the moisture, filler, and sizing content of the paper web which is delivered to the wire passing around the breast roll.

It is another object to control the quality of the paper made in the machine by controlling the addition thereto of moisture, fillers, etc., as the

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paper pulp is delivered to the screen at the breast roll.

It is another object to provide adjustable means for controlling the quality of the paper pulp which is delivered to the breast roll.

It is still another object to provide a method and apparatus for controlling the color of the stock as it is delivered to the wire.

Still another object is the provision of means for varying the extent of the breast roll which is effective for controlling the quality of the stock delivered to the wire.

These and other objects and advantages will become more apparent upon reference to the following description taken in connection with the accompanying drawings in which:

Figure 1 is a vertical section through one end of a paper making machine constructed according to my invention;

Figure 2 is a transverse section through the breast roll of Figure 1;

Figure 3 is an elevational view of an adjusting means associated with the breast roll of Figure 1;

Figure 4 is a view similar to Figure 2 but showing a modified arrangement of the water supply control means;

Figure 5 is a view similar to Figures 2 and 4 but showing still another modified arrangement;

Figure 6 is a section on the line 6-6 of Figure 5;

Figure 7 is a view similar to Figure 6 but showing a spray head positioned within the breast roll for supplying water thereto;

Figure 8 is a fragmentary view of a paper machine constructed according to this invention and showing a movable apron for varying the area of the breast roll which exerts control over the paper stock.

Figure 9 is a perspective view showing the movable apron which overlies part of the breast roll of Figure 8; and

Figure 10 shows an arrangement for indicating the position of the movable apron and for locking it in any of its adjusted positions.

Referring to the drawings, 10 indicates a head box or flow box which receives stock from a stock box, not shown. The stock is a thin mixture of fibers, fillers, sizing and water. The flow box 10 comprises a tortuous passage defined by the central wall 12 and the outer wall 14. There is located in this passage beneath the breast roll a perforated drum 16 which is driven so that the stock is thoroughly mixed and agitated im-

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mediately prior to being received by the breast roll 18.

The breast roll 18 according to my invention comprises a drum 20 having perforations 22. Slidably received within the drum 20 is a second drum 24 which has the perforations 26 therein which extend around an arc equal to or less than the arc of contact of the wire 28 with the drum 20. Slidably received within the drum 24 is a third drum 30 having the perforations 32 therein extending over an arc substantially identical with the arc of the perforations in the drum 24. The purpose of the aforementioned perforations will become more apparent hereinafter.

Arranged around the breast roll 18 are a plurality of slices arranged horizontally and vertically, the former being indicated at 34 and 36 and the latter at 38. There are provided means comprising the gears and racks at 40 for adjusting the slices 34 and 36 relative to the breast roll 18 for controlling the thickness of the stock film applied thereto. The slice 38 is adjustable by means of the nut and screw at 42 so that a final control of the film thickness is to be had.

The wire or screen 28 extends rightwardly from the breast roll 18 over a plurality of table rolls 44 and thence to the other stations in the paper making machine where the film is finally dried, pressed and calendered.

The wall 14 adjacent the lowermost part of the breast roll has a sealing strip 46 so that the head box 10 may maintain a predetermined pressure of the stock against the breast roll and slices thereby providing for a continuous supply of stock to the screen 28.

The construction of the breast roll 18 is more particularly shown in Figure 2 wherein it will be seen that the drum 20 has affixed to the right end thereof a shaft 48 and, to the left end thereof, a shaft 50. These shafts are journaled, respectively, in the bearings 52 and 54 carried in the side walls 56 and 58 of the machine.

The shaft 48 comprises an axial bore 60 which is connected with a conduit 62 externally of the wall 56. The shaft 48, likewise, comprises the drive gear 64 which is actuated by a means, not shown, so that the breast roll is driven at the proper speed.

The shaft 50 on the left end of the drum 20 is hollow and receives a sleeve 66 which is attached to or is integral with the drum 24. The sleeve 66 extends leftwardly through the shaft 50 and terminates in an arm 68 which is retained in position by a stud 70 attached to the wall 58 or bearing 54. The position of the drum 24 is thus made rigid with respect to the stationary parts of the machine so that the drum 20 revolves therearound.

The drum 30 which is slidably received within the drum 24 has a shaft 72 thereon which extends through the sleeve 66 and terminates in an arm 74 which is clamped to the arm 68 by the nuts 76 on the stud 70.

Reference to Figure 3 will reveal that the arm 74 is slotted as at 78 so that the angularity of the drums 30 and 24 may be adjusted. This is effective to adjust the size of the opening from the inside of the inner drum to the apertures 22 in the outer drum so that the flow of fluid between the interior of the breast roll and the wire 28 may be controlled.

Referring to Figure 4, a similar arrangement is shown except that the inside drum has been eliminated and a single apertured drum or sleeve

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80 is provided which is effective to control the fluid communication between the inside and the outside of the breast roll 18. The drum 80 has a shaft 82 thereon which extends through the shaft 50 and has attached thereto a crosshead 84 which may be adjusted inwardly or outwardly by the nuts 86 on the studs 88. The drum 80 being axially shorter than the breast roll 18, the apertures 90 in the drum 80 may be adjusted relative to the apertures 22 in the drum 20 of the breast roll so that the fluid communication between the interior of the breast roll and the wire 28 is controlled. As in the case of the construction shown in Figure 2, fluid is supplied to or taken from the breast roll 18 by the passage 60 in the right hand supporting shaft 48.

Referring to Figures 5 and 6, there is shown still another method of controlling the supply of fluid to the wire 28. In these figures the breast roll 18 is carried on a shaft 92 which extends completely through the machine and is attached to the walls 56 and 58 by the nuts 94. The drum 20 of the roll 18 is journaled on the bearings 96 and is adapted to be driven by the gear 98 attached thereto.

The shaft 92 is bored from the right end thereof with a passage 100 which is in communication with a conduit 102 and terminates centrally of the roll in a passage 104 which extends into a shell 106 which engages the interior surface of the drum 20 over at least a portion of the arc of contact thereof with the wire 28. The shell 106 is provided with a plurality of relatively small apertures 108 which register with the apertures 22 in the drum 20 and thereby provide for fluid communication between the shell 106 and the wire 28. Control of the fluid communication is had by a valve 110 in the conduit 102.

In Figure 7 is illustrated a modification wherein a spray head 112 is located within the drum 20 of the breast roll 18 and is especially adapted for supplying fluid to the wire 28. In the operation of the device of Figure 7 fluid is supplied to the shaft 48 by means of the bore 60 and the pressure thereof causes a spray to be directed against the interior of the drum 20. The portion of the spray which impinges upon the drum over the arc of contact therewith with the wire 28 supplies fluid thereto while the remainder is collected and recirculated.

In the practice of my invention fluid may be supplied or taken from the stock which is delivered to the wire 28 in accordance with the various factors which influence the quality of the finished product. Fillers and sizing may also be supplied in the fluid in order to make up for loss of the same from the stock or in order to supply an excess to the stock in order to compensate for loss as the film is drained or dried in passing through the machine.

Also, it will be apparent that the method of my invention is adapted for close control of the color of the paper. Dyes or pigments may be added to the stock with the water in order to correct for inaccuracies in the original mixing of the stock. Thus, it will be seen that the method and apparatus of my invention provides for the complete control of the quality and color of paper, and that, furthermore, this control is exercised at the final point in the paper making machine where it is possible to do so without influencing the orientation of the fibers of the paper stock as they settle out on the wire of the machine.

Figures 8, 9, and 10 show a modification of my invention wherein an auxiliary apron is em-

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played for controlling the extent of the breast roll through which the paper is influenced by the pressure or suction being applied through the said breast roll. The machine illustrated in Figure 8 is similar to that shown in my issued Patent No. 1,818,267.

In Figure 8 the perforated breast roll is indicated at 209, and the box therein through which pressure or suction is applied to the roll is indicated at 202. This construction is substantially identical with that shown in Figures 5 and 6.

The wire which passes over the breast roll is shown at 204, and at the sides thereof are the deckle stops 206 and the guide wheels therefor 208. The head box or stuff box is generally indicated at 210, and it comprises an apron plate 212 having mounted thereon a flexible plate 214 that terminates in a depending resilient scraper member 216 that bears against the wire and forms a seal to prevent the paper stock from leaking backward around the said wire.

The discharge end of the head box is closed by a flexible strip 218 which is adjustable on the slice plate 220 as by means of the shaft 222 and clamping bolts 224. The slice plate 220 is pivotally mounted as by the shaft 226 on a gate 228. The gate is adjustable vertically for regulating the opening for stock to pass through by the rod 230, while the slice plate is similarly adjustable by the rod 232.

As in the arrangement shown in Figure 1, there is a perforated roll 234 for maintaining the paper stock mixed as it passes through the stuff box to the wire. As mentioned before, an adjustable apron is provided for regulating the amount of the periphery of the breast roll over which the pressure or suction within the box 202 is effective. This apron is shown at 236, and it comprises a flexible member of dense or rubberized fabric. The apron passes around a shaft 238, and this shaft has a crank 240 on the outside of the machine for adjusting the length of the apron extending over the breast roll.

It will be evident that by turning the crank in one direction the apron 236 can be withdrawn from the breast roll, and that by turning the crank in the other direction, the apron can be caused to extend over a greater part of the breast roll. This affords an adjustment whereby the pressure or influence of the box 202 on the paper stock can be regulated. This, in turn, will influence the final orientation of the fibers of the paper stock and thus control the nature of the final product.

Should it be desired to provide an indicator for indicating the adjusted position of the apron 236, the arrangement shown in Figure 10 may be employed. In this view there is mounted on the end of the shaft 238 a worm wheel 242, and this is adapted for being driven by the worm gear 244 for effecting adjustment of the position of the apron. A pointer 246 is mounted in position to overlie the face of the worm wheel, and the worm then has inscribed thereon or affixed thereto in any suitable manner, the indicia 248, forming a scale that indicates the exact position of the worm wheel 242.

While the apron 236 is shown here as applied to a machine which delivers the paper stock to a relatively small part of the breast roll, it will be evident that a machine such as is illustrated in Figure 1 is equally well adapted for use with this type of apron construction. When applied to the machine shown in Figure 1, the apron would extend over the sealing strip 46 and lay around

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the periphery of the drum and covering the wire. Since this part of the drum and wire is facing generally downwardly, it would be preferable, in adapting the control apron to the Figure 1 construction, to place spaced guide wires which would retain the apron in engagement with the face of the drum and wire.

It will be understood that this invention is susceptible to modification in order to adapt it to different usages and conditions, and, accordingly, it is desired to comprehend such modifications within this invention as may fall within the scope of the appended claims.

I claim:

1. The combination in a paper making machine, a hollow foraminous breast roll, a wire conveyor belt passing around said roll, means for applying a layer of paper stock to said belt on said roll comprising a head box having an opening against the belt and terminating in a slice where the belt leaves the head box opening, said slice being located where the belt leaves the roll, means within said roll for supplying fluid to said stock under pressure through said roll substantially simultaneously with delivery of the stock onto the belt on the roll and throughout the application of stock to said belt on said roll and prior to the stock passing said slice, and an apron within said head box opening having its end parallel with said slice and spaced therefrom and movable over the surface of said belt to mask off a portion of the belt from the influence of the fluid supply means.

2. The combination in a paper making machine, a hollow breast roll, a conveyor belt passing around said roll, means for applying a layer of paper stock to said belt at said roll comprising a head box having an opening against the belt and terminating in a slice where the belt leaves the head box opening, said slice being located where the belt leaves the roll, and means for supplying fluid to said stock through said roll prior to the stock passing said slice comprising a plurality of circumferentially spaced perforations in said roll, fluid supply means within said roll supplying fluid under pressure to the portion of the said perforations over the arc of contact of said belt across the opening of said head box, and an apron within said head box opening having its end parallel with said slice and spaced therefrom and movable over the surface of said belt to mask off a part of the belt from the influence of said fluid supply means.

3. The combination in a paper making machine of a frame, a hollow breast roll mounted in said frame, a wire belt supported by said roll and extending horizontally therefrom, a head box adjacent said roll, a resilient sealing strip mounted on said head box and bearing on said wire, slice means spaced from said sealing strip for regulating the thickness of the layer of stock applied on said wire, said sealing strip and said slice being positioned adjacent said roll above the horizontal center thereof to provide an over the roll feed of paper stock onto the roll, said slice being located where the belt leaves the roll, a stationary cylindrical member within said roll of substantially the same arcuate extent as the distance between said strip and said slice means, said roll being foraminous throughout its entire periphery and said member being foraminous where it engages said roll to provide fluid communication therethrough for supply of modifiers to the stock from the interior of said roll simultaneously with the stock being picked up by the

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wire on the roll, a shaft adjacent said sealing strip externally of said head box, and a flexible apron having one end secured to said shaft and extending into said head box between said sealing strip and wire with the end thereof positioned between the said sealing strip and said slice to mask off a part of the head box opening between said strip and slice from direct fluid communication with the interior of said roll.

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