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STOCK INLET FOR PAPERMAKING MACHINE

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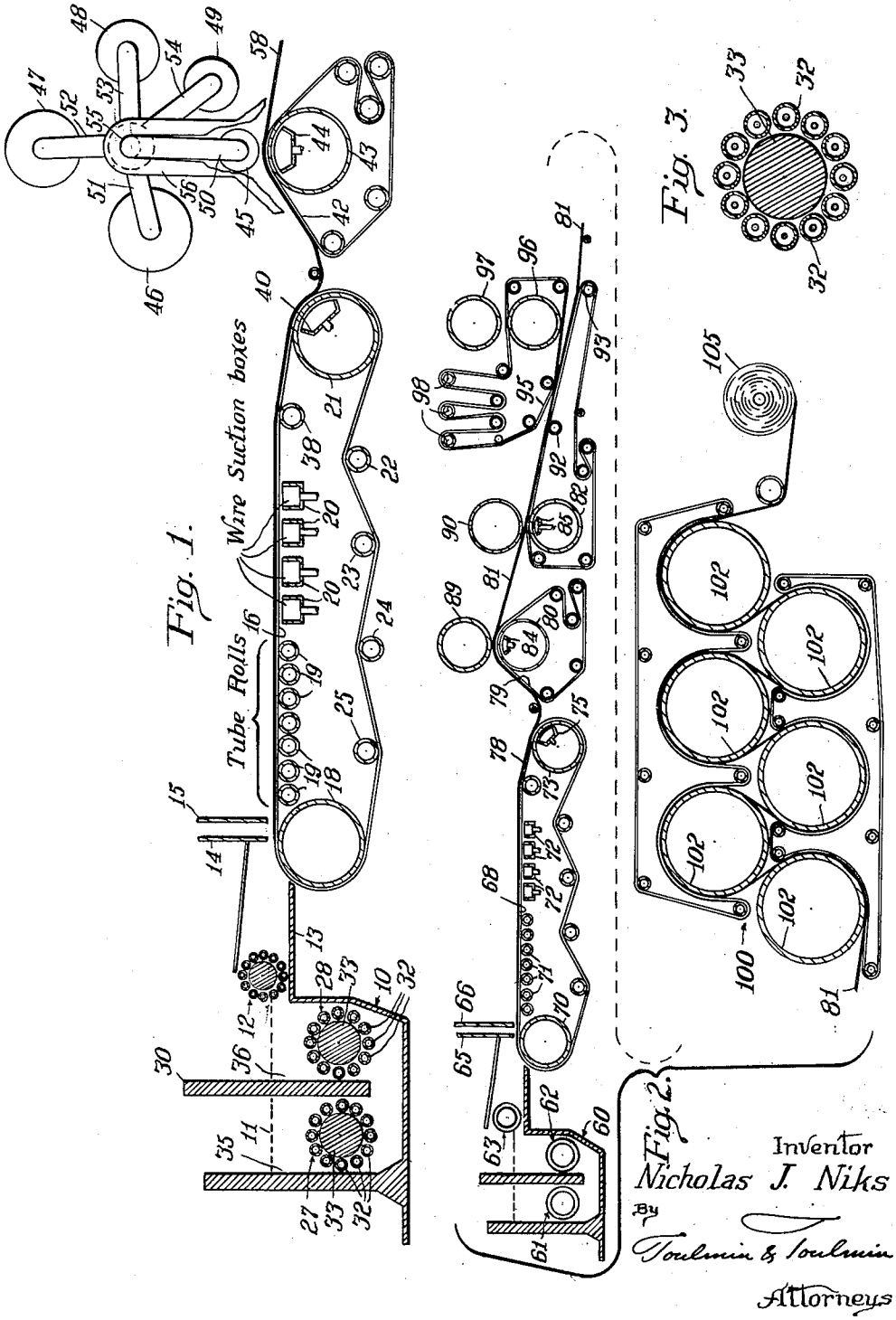


Fig. 1.

Fig. 3.

Fig. 2.

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STOCK INLET FOR PAPERMAKING MACHINE

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6 Claims. (Cl. 92—44)

This invention relates to improvements in apparatus and methods of manufacturing paper.

The present invention comprises an improved apparatus and method for manufacturing paper in accordance with a modified Fourdrinier process. The invention enables paper to be manufactured utilizing less complicated and more economical equipment and methods than have commonly been used in manufacturing paper.

It is an object of the invention to provide an improved apparatus for making paper wherein the pulp fibers are smoothed out uniformly before the stock is fed to the wire conveyer.

Another object of the invention is to provide an apparatus and method for producing different grades of paper by utilizing a series of press rolls of different diameters and weights and wherein a press roll of the desired weight and diameter may be swung into position from an assembly of press rolls for roll pressing more or less water out of the paper web so as to form a particular grade of paper, as desired.

It is another object of the invention to provide an apparatus and method for manufacturing paper wherein the paper web is arranged to pass over a plurality of suction boxes while supported on the wire screen and wherein press rolls are also provided with suction boxes for treating the web of paper stock after it has been transferred from the wire screen on to an endless felt. By thus subjecting the web to suction while concurrently pressing the same, the paper web requires less drying treatment and the process can be speeded up.

Other objects and advantages will be apparent from the following description taken in connection with the drawings which illustrate in a somewhat diagrammatical manner an apparatus embodying the invention. It will be understood, however, that the invention illustrated thereby is not specifically limited thereto.

In the accompanying drawings:

Figure 1 illustrates in elevation, with certain parts being in section, one form of the modified Fourdrinier apparatus for making paper.

Figure 2 is a similar view in elevation, illustrating diagrammatically a modified arrangement of the apparatus illustrated in Figure 1.

Figure 3 is an enlarged sectional view of the rod rolls shown in Figures 1 and 2 and illustrating diagrammatically the arrangement of the small diameter rod rolls about a central shaft.

In the several figures, like reference characters indicate similar parts throughout the several views.

The invention is illustrated and described as applied to a paper-making machine of the Fourdrinier type. Stock for forming paper is pumped or otherwise delivered to the head box so that the same is kept filled to the desired height as generally indicated by the dotted line **11**. The stock flows from the head box under the flow-evener roll **12** and thence over an apron **13** and beneath the vertically adjustable slice members **14** and **15** and on to the traveling endless wire screen **16**. The forming wire **16** is arranged

over and travels around a breast roll **18** horizontally over tube rolls **19**, suction boxes **20** and over a couch roll **21**, the wire being returned to the breast roll over the spaced guide and tension rolls **22**, **23**, **24** and **25**.

Arranged in the head box **10** are two rectifier rolls **27** and **28** between which is arranged a baffle **30**. The rectifier roll **27** is preferably rotated counterclockwise, as viewed on the drawings, and roll **28** is rotated in the opposite direction. The rectifier rolls **27** and **28** and rectifier or flow-evener roll **12** are of identical construction, the roll **12** being of smaller diameter than the other rectifier rolls and mounted so as to smooth the fibers out as the stock passes on to the apron **13**.

The rectifier and flow-evener rolls are preferably constructed, as illustrated in Figure 3, and comprise build-up rod rolls. The rods **32** are built around a central shaft **33** to the desired diameter of the roll. The rods **32** may be of any size but preferably about five-eighths of an inch in diameter and are spaced circumferentially around the shaft **33**, being spaced approximately one-fourth inch apart. The rolls do not have a casing and when the roll is rotated function to smooth out the fibers uniformly before the stock is moved through the flow-evener roll **12** on to the travelling wire **16**.

The rolls **27**, **28** and **12** have close running clearances with the adjoining baffle and walls of the head box so that the stock flowing from the compartment **35** in the head box through compartment **36** and to the flow-evener roll **12** must move by the rotating rolls and thereby the fibers of the stock are uniformly distributed throughout the stock flowing on to the apron.

By the use of the three rod rolls any tendency for the forming of lumps and piling up of the fibers of the stock passing from the head box is prevented and a more uniformly flowing stock having evenly distributed fibers is passed on to the upper run of the wire **16** passed over the breast roll **18**.

The web of stock delivered on to the travelling wire **16** is passed over the tube rolls **19** which are provided for supporting the wet paper web on the travelling wire **16** while the same is moved therealong and excess water drawn away from the web. Thereafter the web of paper stock on the wire is carried over the suction boxes **20**, a sufficient number being provided to withdraw a greater part of the water and air from the wet paper web as the wire carrying the paper web passes thereover. The paper web is carried along over the suction boxes over the guide roll **38** and downwardly over the couch roll **21**, as illustrated in Figure 1. The couch roll is provided with an additional suction box **40** for pulling further water from the paper web as the same passes over and partially around the couch roll and is removed therefrom and guided therealong by the travelling felt member **42**. The travelling felt **42** is guided over a lower press roll **43**. This press roll is preferably provided with a suction box **44**, although the same may be omitted or run without operating the suction box when desired. In the preparation of certain types of paper the suction box may be omitted in the press roll.

The upper press roll which cooperates with the lower press roll **43** comprises a series of press rolls **45**, **46**, **47**, **48** and **49**, which are carried on the outer ends of the arms **50**, **51**, **52**, **53** and **54** respectively. The inner ends of each of these arms are mounted on a common shaft **55** supported by the mounting bracket **56**. The series of press rolls are of different diameters and weights and the desired size and weight used may be selected, depending upon the grade and specification of the paper being manufactured. The paper web **58**, after leaving the press roll **43**, passes on to the dryer rolls (not shown).

The breast roll **18** is perforated, preferably using holes three-sixteenths of an inch in diameter.

The suction boxes 20, 40 and 44 operate to pull the water and air bubbles out of the paper web but do not take away any of the characteristics of the paper for impregnating; nor do they harden the paper. A vacuum of from 6 to 10 inches of mercury may be used for this purpose.

In the modification shown in Figure 2, the head box 60 contains rectifier rolls 61 and 62 and flow-evener roll 63 which are constructed in the form of rod rolls as rolls 27 and 28. Vertically adjustable slicers 65 and 66 are provided similarly as 14 and 15 in the apparatus illustrated in Figure 1. The wet paper stock is fed on to the wire 68 which travels over the breast roll 70, rod rolls 71, suction boxes 72 and couch roll 73. The breast roll 70 is perforated and the couch roll is equipped with a suction box 75.

After the paper web 78 travels over the couch roll 73 it is carried onto the first endless moving felt 79 guided over a press roll 80 and thence to a second endless felt 81 which passes over a press roll 82. Press rolls 80 and 82 are preferably equipped with suction boxes 84 and 85 respectively. Utilizing suction boxes in both press rolls makes it possible to produce a drier paper web than otherwise would be obtained, and thus requires less time and equipment for finish drying of the paper web. A saving in drying machinery is thus effected and the process is speeded up.

Top press rolls 89 and 90 cooperate with the lower press rolls 80 and 82 respectively. As a novel feature of my invention, these top press rolls are maintained raised out of operating position when producing certain grades of paper and wherein an ultra high degree of absorption characteristic property of the finished paper is desired. This treatment of a paper web using suction boxes on lower press rolls, as shown at 84 and 85, and without utilizing the top press rolls to produce such highly absorptive paper is believed to be new in the art of making paper.

After passing the suction box equipped press rolls 80 and 82 the paper web is guided therealong over the guide rolls 92 and 93 while contacted by a top felt 95. Felt 95 is guided between the rolls 96 and 97 and around the train of rolls 98 whereby to treat the surface of the paper web as desired. Thereafter the paper web is passed to a dryer section 100, comprising heated rolls 102 of conventional construction and operation, and finally is rolled up on the reel 105.

In the operation of the machine illustrated in Figures 1 and 2, stock is pumped into the forward compartment of the head box through a suitable conduit, not shown, to maintain a desired level within the head box. The stock flows around the first rectifier rod roll and beneath the baffle into the second compartment and finally beneath the flow-evener or rectifier roll and onto the wire. By varying the rotational speed and direction of rotation of the rectifier rolls, the movement and level of the stock in the head box may be controlled. Further, by employing rectifier rolls constructed as described, and wherein a plurality of rod rolls are disposed around the periphery of a shaft, a more even and uniform distribution of the stock is obtained, and the fibers are prevented from ganging together and forming hard spots.

An important advantage is also gained through the use of a series of press rolls mounted on a common holder and arranged so that a press roll of a desired weight and diameter can be quickly swung into operative position, in accordance with the paper making machine of this invention. Employing the series mounted press rolls, paper of different texture and absorptive capacity may be readily made without stopping the machine.

While the invention has been described as carried out by the use of an apparatus, as illustrated and described, it will be understood, of course, that the various details of construction of the apparatus may be varied and substitutions made therein without departing from the principles and scope of this invention, as set forth in the following claims.

What is claimed is:

1. In a paper making machine, having a head box, and a plurality of rectifier rolls mounted in said head box, an apron on said head box, rectifier roll mounted adjacent said head box for receiving stock therefrom and delivering the same on to said apron, each of said rolls comprising a shaft of relatively large diameter with a plurality of relatively small diameter rolls fixedly mounted around the circumference of said shaft and independently rotatable with respect thereto, means comprising a breast roll and couch roll, and an endless wire passing around said breast and couch rolls for receiving stock delivered from said apron.

2. In a paper making machine, a head box, and means comprising a plurality of rectifier rolls disposed in said head box, baffle means positioned in said head box above and spaced from the bottom of said head box, an apron extending from said head box, a rectifier roll arranged above and cooperating with said apron and arranged to receive stock delivered from the head box, each of said rolls comprising a shaft of relatively large diameter with a plurality of relatively small diameter rolls fixedly mounted around the circumference of said shaft and independently rotatable with respect thereto, means comprising a traveling wire engaging over a breast roll and couch roll for receiving stock delivered from said head box apron, and suction box means disposed beneath said wire for removing water and air from the stock as the same is conveyed by said traveling wire.

3. In a paper making machine comprising a head box, an endless wire screen passing over breast and couch rolls, a pair of rectifier rolls disposed in said head box, an apron extending from said head box, a rectifier roll arranged over and adjacent to said apron for smoothing out the fibers uniformly as the stock is delivered thereto from said head box, each of said rolls comprising a shaft of relatively large diameter with a plurality of relatively smaller diameter rolls fixedly mounted around the circumference of said shaft and independently rotatable with respect thereto, and roll means of predetermined size and weight arranged to press said stock after removal of the same from the endless wire.

4. In a paper making machine having an endless wire screen passing over breast and couch rolls, a head box arranged adjacent to said breast roll, and a pair of rectifier roll means arranged in said head box, an apron extending from said head box and adjacent said breast roll, rectifier roll means of smaller diameter than said first-mentioned rectifier rolls mounted above said apron which is operable for smoothing out and providing an even flow of stock onto said apron and to said endless wire, each of said rectifier rolls comprising a plurality of rod rolls spaced circumferentially around a central shaft and being independently rotatable with respect to said last-mentioned shaft.

5. A paper making machine comprising a head box having a stock inlet and stock outlet, a plurality of longitudinally spaced rectifier rolls mounted in said head box for rotation therein, vertical baffle means arranged inside said head box and between said rectifier rolls, said baffle means being positioned in said head box so as to divide the same into a plurality of intercommunicating compartments, said rectifier rolls having a relatively close running clearance with said baffle and the walls of said head box whereby the stock is agitated and the fibers uniformly distributed throughout the stock an independent rectifier roll arranged adjacent to the outlet of said head box for providing a uniformly flowing stock from said head box, each of said rectifier rolls comprising a shaft of relatively large diameter with a plurality of relatively small diameter rolls fixedly mounted around the circumference of said shaft and independently rotatable with respect thereto.

6. In a paper making machine including a head box adapted for the flow of stock therethrough and an endless wire trained about a breast roll for receiving stock flowing from said head box, the improvement comprising a plurality of rotatable rectifier rolls arranged in said head box, baffle means positioned in said head box and separating said rectifier rolls for evenly distributing the fibers in said stock and smoothing out the fibers of the stock as the same flows from the head box, each of said rectifier rolls comprising a shaft of relatively large diameter with a plurality of relatively small diameter rod rolls spaced circumferentially around a central shaft and independently rotatable with respect thereto.

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