

May 11, 1971

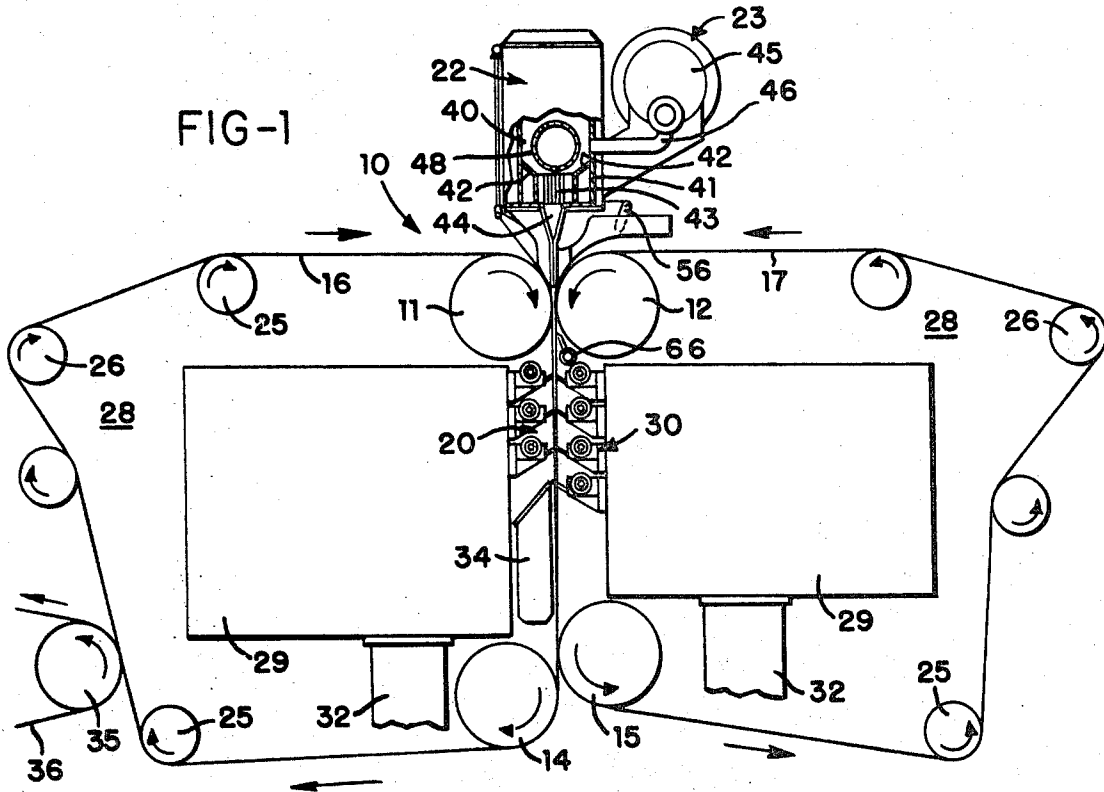
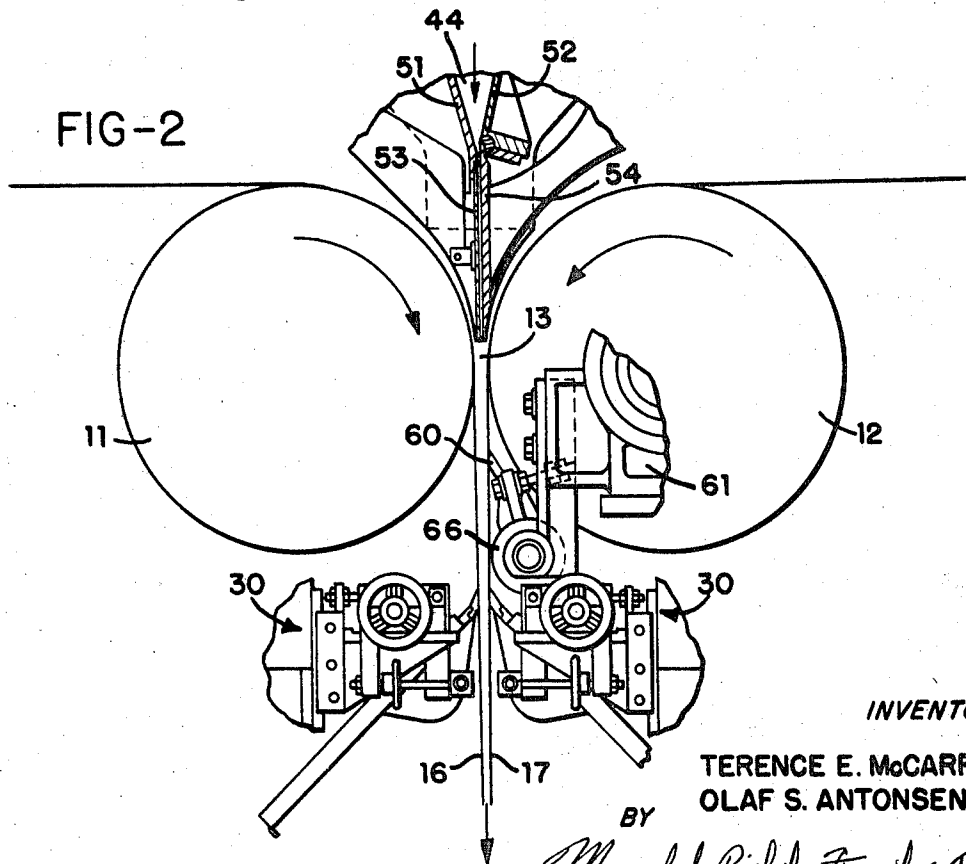
T. E. McCARRICK ET AL

3,578,558

TWIN WIRE PAPER MAKING ASSEMBLY

Filed Feb. 19, 1968

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

FIG-3

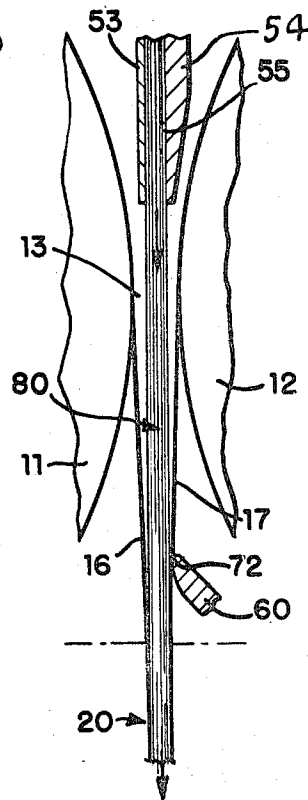


FIG-4

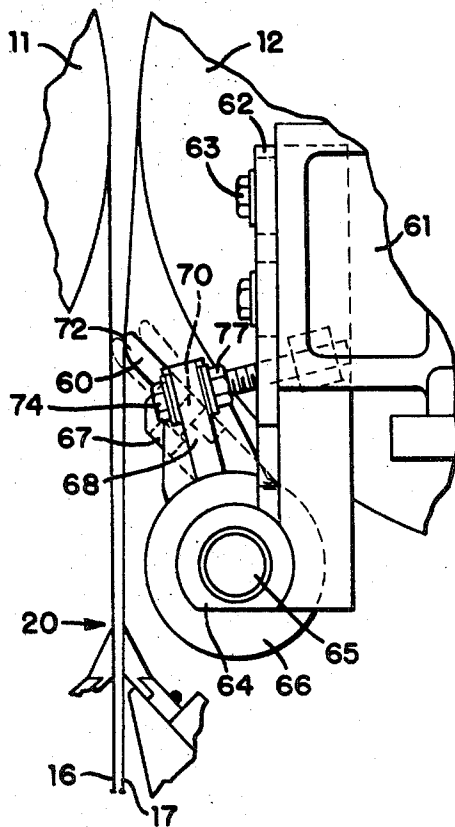
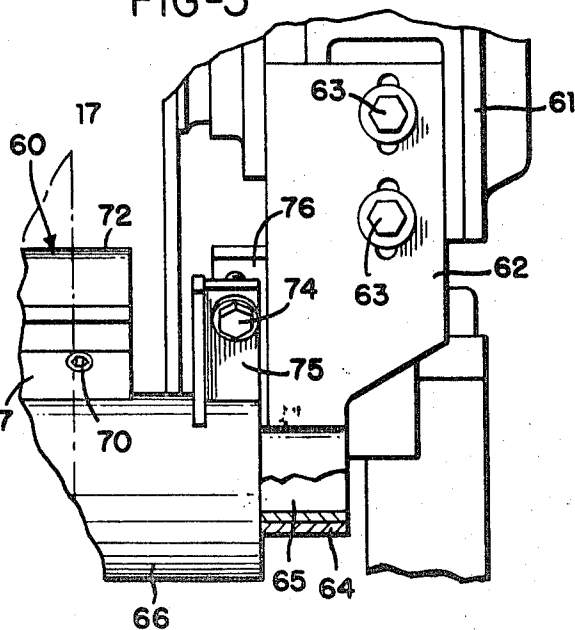


FIG-5



1

3,578,558

## TWIN WIRE PAPER MAKING ASSEMBLY

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Filed Feb. 19, 1968, Ser. No. 706,514

Int. Cl. D21f 1/00

U.S. Cl. 162—303

3 Claims

### ABSTRACT OF THE DISCLOSURE

Apparatus for making paper in a twin wire paper making machine. A pair of endless forming webs looped around a pair of spaced parallel breast rolls forms a nip of predetermined width. Deflector assemblies in contact with the forming webs downstream of the breast rolls guide the webs into gradually converging relation. An adjustable regulator bar, positioned in contact with one of the webs between the breast rolls and deflector assemblies, forces the one web into predetermined relation with the other web, thus establishing a preset distance therebetween.

### BACKGROUND OF THE INVENTION

This invention has particular relation to twin wire paper making machines wherein the wires move in a gradually converging path guided by spaced breast and couch rolls which define a forming zone therebetween. Machinery of this type is shown in the United States patent of Baxter No. Re 25,333, issued to the assignee of this invention.

The United States patent of Green et al. No. 3,215,593, also issued to the assignee of this invention, provides more pertinent background for the present invention. In Green, the paper stock is fed from the chest to a headbox which floods the space above the nip between the spaced breast rolls. This allows the forming wires to draw into the forming zone as much paper stock as the space between the wires will permit. It requires the use of baffles immediately below the nip and behind the wires to prevent the reduced pressure in this space from drawing water through the wires at this point. Moreover, at very high speeds it is difficult to obtain complete uniformity of the thickness of the sheet produced because of the manner in which the stock is transferred to the forming zone.

### SUMMARY OF THE INVENTION

This invention is directed to improvements in the method and apparatus for feeding paper stock to the forming zone of a high speed twin wire vertical paper making machine. The method and apparatus effect the forming of a controlled stream of stock of preset uniform thickness along its entire length which is equal to the width of the forming wires. The distance between the wires at the top of the forming zone is carefully regulated to be equal to or greater than the width of this preset thickness so that the stream passes between the breast rolls and into the upper portion of the forming zone before there is any substantial contact with the wires. In the preferred embodiment, a single regulating bar is provided on the rear side of one of the wires for establishing the distance between the wires at the entrance to the forming zone.

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation view illustrating diagrammatically one form of the paper making apparatus constructed in accordance with the invention;

FIG. 2 is an enlarged fragmentary side view of the slice outlet adjacent the breast rolls;

FIG. 3 is another enlarged fragmentary side view showing the controlled stream entering the forming zone;

2

FIG. 4 is another fragmentary side view showing the regulating bar; and

FIG. 5 is a front view of the regulating bar and support mechanism shown in FIG. 4.

### DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows the general construction of a paper machine 10 including a pair of breast rolls 11 and 12 supported in horizontally spaced relation to define a nip 13 therebetween. A pair of couch rolls 14 and 15 are mounted below the breast rolls 11 and 12, and a pair of forming webs or wires 16 and 17 are looped around the respective pairs of breast and couch rolls 11-14 and 12-15, as shown in FIG. 1. The couch rolls 14 and 15 may be driven by suitable means (not shown) to cause the wires to travel downwardly through the nip 13 at precisely regulated speeds toward and around the couch rolls 14 and 15.

With the breast rolls 11 and 12 and couch rolls 14 and 15 mounted in horizontally and vertically spaced relation as shown, the wires 16 and 17 define a forming zone 20 therebetween into which stock is continuously delivered from a headbox 22 mounted above the forming zone in position to deliver stock continuously from a supply pipe 23. Of course, it will be appreciated that although the present invention is described in the context of a vertically oriented twin-wire paper making machine, it has application in environments in which the forming zone defined by the opposed reaches of the forming wires is disposed other than vertically. Each of the forming wires 16 and 17 is guided through an endless path by guide means in the form of fixed guide rolls 25, and the movable guide rolls 26 are provided for tensioning each wire in accordance with conventional wire tensioning practice. Each of these rolls is carried by suitable bearing means (not shown) mounted on the machine frame.

Since suction is not utilized as a primary means of removing the water from the stock as it passes through the forming zone 20, the spaces 28 within the loops of the traveling wires 16 and 17 are open to the atmosphere, and include the drainage containers 29 for receiving water from the adjustable deflector assemblies 30 which flows through the conduits 32 to a position remote from the machine. These deflector assemblies are preferably of the type described in the copending application Ser. No. 711,583, filed Mar. 8, 1968, also assigned to the assignee of this invention, although they can take other forms or be eliminated without departing from the scope of this invention.

A suction box 34 is provided immediately above the left-hand couch roll 14 for loosening the newly formed paper web from the right-hand forming wire 17 and causing it to adhere to the left-hand wire 16 as it proceeds around the couch roll 14 to the roll 35, which transfers it to the felt 36 for subsequent processing.

The headbox 22 is supported on the machine frame and extends across the width of the frame above and coextensive in length with the nip 13 between the breast rolls 11 and 12. It includes a pressure chamber 40 having side walls 41 and sloping bottom walls 42 converging downwardly to a series of vertical tubes 43 which conduct the stock into a V-shaped chamber 44. Stock is supplied to the pressure chamber 40 from the inlet manifold 45 which extends along the right-hand side of the headbox 22 and has a series of connector pipes 46 closely spaced along the entire length thereof to connect the interior thereof to the pressure chamber 40. A perforated rectifier roll 48 is mounted for rotation in the pressure chamber 40 immediately above the entrance to the vertical tubes 43 for evenly distributing the flow into these tubes and creating eddy currents of relatively small magnitude immediately adjacent the upper ends of the tubes.

The V-shaped receiving chamber 44 is defined by tapering side walls 51 and 52 which have the parallel slice lips 53 and 54 mounted on their lower ends to provide a slice outlet passage 55 in which a controlled stream of stock is formed and directed into the nip 13 between the forming webs 16 and 17. Both walls 51 and 52 and the lips 53 and 54 extend across the entire width of the paper machine, and end walls (not shown) are provided on the opposite ends thereof to prevent leakage of the stock from the chamber 40.

The right-hand side wall 52 and slice lip 54 are movable with respect to the stationary left-hand wall 51 and lip 53 to permit changes in the width of the slice passage 55. Thus the movable slice wall 52 has horizontal pivot connections on its upper and lower edges to permit movement of the movable lip, and the links 56 complete a parallelogram which restricts movement of the lip 54 so that it always remains in a vertical plane. This structure is described in the copending application Ser. No. 703,299 filed Feb. 6, 1968, which is also assigned to the assignee of this invention. While other forms of headboxes may be used, it is important that the headbox form a continuous stream of stock having a uniform thickness, as will be further described.

The regulating bar 60 (FIG. 4) is mounted immediately below the nip 13 for regulating the distance between the forming wires 16 and 17 at the entrance to or top of the forming zone 20. This bar is mounted on the machine frame on a bracket 61 which supports the bearing for one end of the breast roll 12. A downwardly extending end member 62 is secured by the bolts 63 to this bracket 61, and it includes the annular bearing support 64 on the lower end thereof which receives the stub shaft 65 on the end of the cylindrical cross member 66. This cross member has the coextensive support bar 67 rigidly secured thereto which in turn receives and supports the regulator bar 60 in the cut out portion 68 thereof. The screws 70 secure the regulator bar 60 in place so that it can be removed and replaced with ease.

For reasons of compactness, the support bracket 67 is positioned on the upper portion of the cross member 66 to enable the bar 60 to extend upwardly and have contact with the wire 17 at a point close to the point at which this wire separates from the breast roll 12. Moreover, the regulator bar 60 has a round nose 72 against which the wire 17 rides, and which does not remove any substantial amount of water from the rear side of the adjacent wire because there is little or no stock in contact with the wire at this point, and the round nose of the bar tends to force liquids back through the wire. Thus the bar 60 performs primarily the purpose of regulating the distance between the wires 16 and 17 at the entrance to the forming zone 20.

The regulating bar 60 is pivoted about the axis of the cross member 66 to change the position of the web 17 and thus to alter the width of the forming zone. This adjustment is accomplished by rotating the screw 74 which extends through the arm 75 on the right-hand end of the cross member 66 and into contact with a flanged member 76 mounted on the machine frame 50. Thus by loosening the lock nut 77 and rotating the adjustment screw 74, the cross bar can be rotated to effect a change in the position of the regulator bar and the wire 17.

In operation, the headbox 22 supplies stock to the V-shaped chamber 44 under pressure which forces the stock downwardly between the inner surfaces of the parallel lips 53 and 54 to create a controlled jet or stream 80 (FIG. 3) of stock having a uniform thickness and extending across the entire width of the machine. The thickness is uniform at every point when measured in a horizontal plane, and the rate of movement thereof is carefully controlled by the pressure in the headbox 22 and the consistency of the stock.

The controlled stream 80 is ejected at high speeds from the slice outlet and moves downwardly between the

gradually converging forming webs 16 and 17 toward the forming zone 20. The entrance to the forming zone 20 is created at the regulator bar 60 which is precisely positioned to determine the distance between the forming wires 16 and 17. This width is carefully controlled so that it is at least equal or slightly greater than the width of the controlled stream 80, and as a result, the controlled stream 80 does not have any substantial contact with the forming webs 16 and 17 until it enters the forming zone.

The initial point of contact is between the webs 16 and 17 and the controlled stream 80 preferably slightly below the regulator bar 60 so that there is no water flow through the wires 16 and 17 until the stock enters the forming zone. This eliminates the requirements for seals in the area where the wires leave the breast rolls 11 and 12 and where a pressure reduction normally occurs. The removal of the water from the stock is effected by the gradually converging wires 16 and 17 preferably supported by the deflectors 30 which remove the water from the rear side of the wires 16 and 17 in accordance with the aforesaid copending application No. 703,299, filed Feb. 6, 1968.

It is also preferred that the wires 16 and 17 be moving at a speed substantially equal to the controlled stream 80 so that there is little or no relative movement therebetween. In addition, it has been found that much higher speeds of operation can be attained by this method since there are always preset controlled amounts of stock being fed to the forming zone independently of any factor other than the width of the slice passage 55, the pressure in the headbox 22, and the rate of movement of the forming wires 16 and 17, all of which can be easily and precisely regulated to produce consistently a high quality sheet of paper.

The regulator bar 60 is shown as being manually adjustable to move the position of only one of the wires, but it is within the scope of this invention to provide regulating bars for positioning both of the forming wires at the entrance to the forming zone and it is also possible to eliminate completely the regulating bars and to permit the breast rolls and deflectors to determine the width of the forming zone at the entrance thereto. It is, however, an important consideration that the width of the forming zone at the entrance thereto be wider than the thickness of the controlled stream and that the entrance to the forming zone be spaced below the point at which the wires leave the surface of the breast rolls to eliminate the need for a seal in this area. It is also contemplated that the regulating bar can be adjusted automatically or by other manual means, and it is possible to control automatically the speed of the wires to correlate the same with the speed of the stream of stock so that the relative movement therebetween remains constant. In this connection, other types of headboxes can be utilized so long as the controlled stream of uniform thickness is forced downwardly into the forming zone midway between the forming webs or wires.

While preferred results for many purposes have been obtained with the speed of the jet matching the speed of the forming wires in their areas of initial contact, it is within the scope of the invention to control the speeds of the jet and the wires to establish and maintain a precisely determined difference in such relative speeds. For example, preferred results with some stock furnishes have been obtained with ratios of the jet speed to the wire speed throughout the range of 0.5:1 to 1.3:1. Such changes can be readily accomplished by, among other things, increasing or decreasing the wire speed throughout the drives of the couch rolls 14 and 15, or by changing the rate of supplying the stock to the slice, or both.

The invention has accordingly provided an improved method and apparatus for making paper in a twin wire vertical paper making machine by creating and forcing a controlled stream of stock having a uniform thickness downwardly into the forming zone. The entrance to the forming zone is controlled precisely so that it is greater than the thickness of the slice to eliminate any substantial

5

contact between the stock and the forming webs above the forming zone. Moreover, in the preferred embodiment, the relative rate of movement of the controlled stream and the forming wires can be precisely regulated to vary the relative movement therebetween at the point of contact therebetween.

While the method herein described, and the form of apparatus for carrying this method into effect, constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to this precise method and form of apparatus, and that changes may be made in either without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. A multi-wire papermaking machine comprising a pair of endless forming webs each constituting a closed loop, support means including a pair of spaced parallel breast rolls forming a nip of predetermined width and positioned within each of said loops to support said webs in opposed runs defining a forming zone having an upstream end and a downstream end, said breast rolls positioned at said upstream end means for depositing papermaking stock in said forming zone at a point adjacent said upstream end thereof, means positioned within each of said loops and in contact with said runs of said webs guiding said runs into gradually converging relation toward said downstream end of said forming zone, and a regulator bar positioned within one of said loops in engagement with one of said webs at a point intermediate said breast roll and said guide means associated therewith in forcing relation with said one of said webs toward the other of said webs estab-

6

lishing a preset distance therebetween less than said width of said nip.

2. A paper making machine as defined in claim 1 comprising adjustment means for moving said regulator bar in a direction perpendicular to said one web.

3. A paper making machine as defined in claim 2 wherein said regulator bar has a rounded nose which engages said one web, and said adjustment means includes a pivotably mounted support bar extending across the width of the machine for receiving and supporting said regulator bar for pivotal adjustment.

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