

May 11, 1971

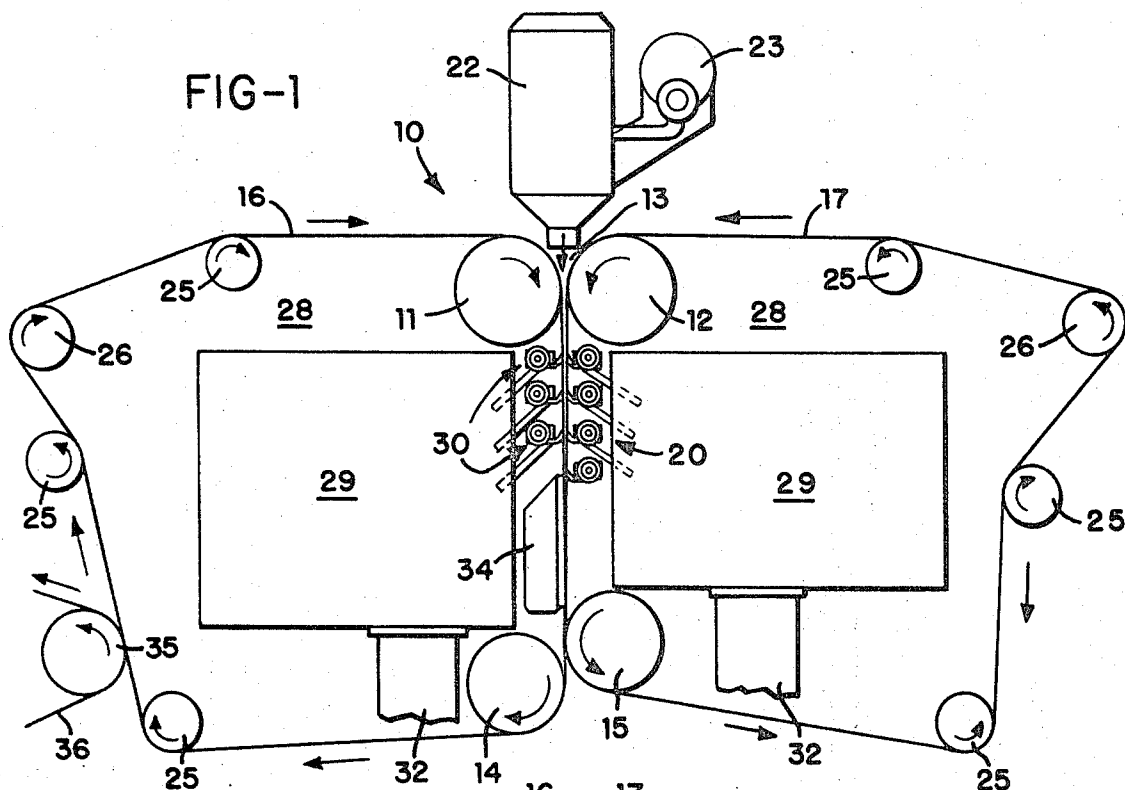
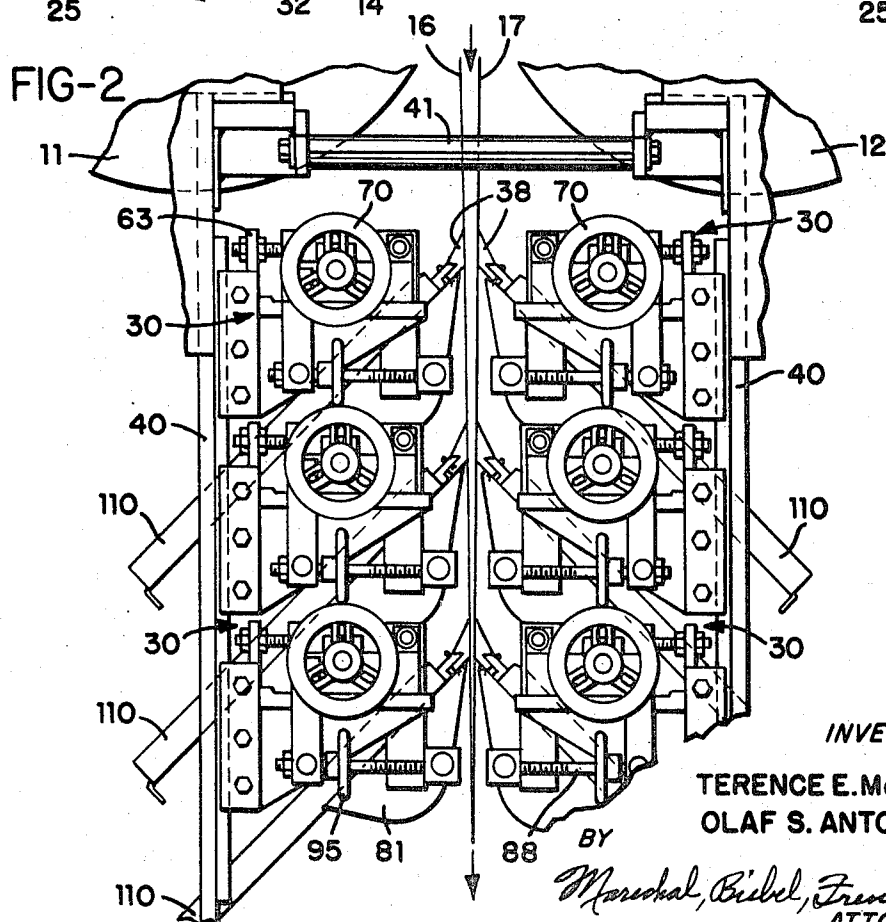
T. E. McCARRICK ET AL

3,578,561

PAPER FORMING APPARATUS

Filed March 8, 1968

3 Sheets-Sheet 1



May 11, 1971

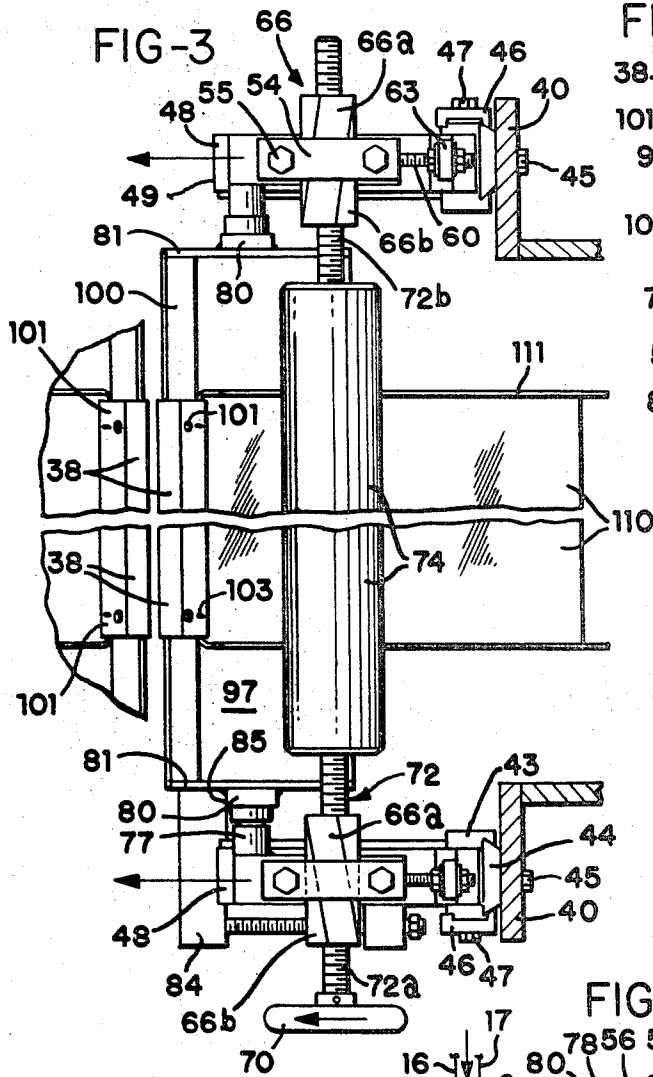
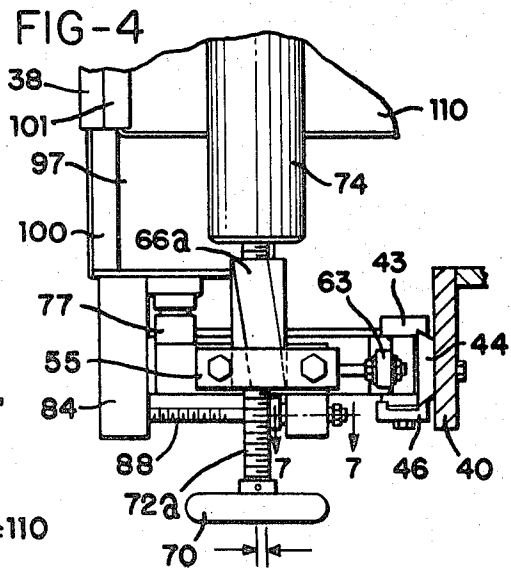
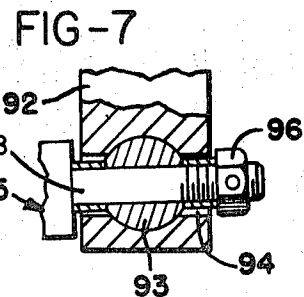
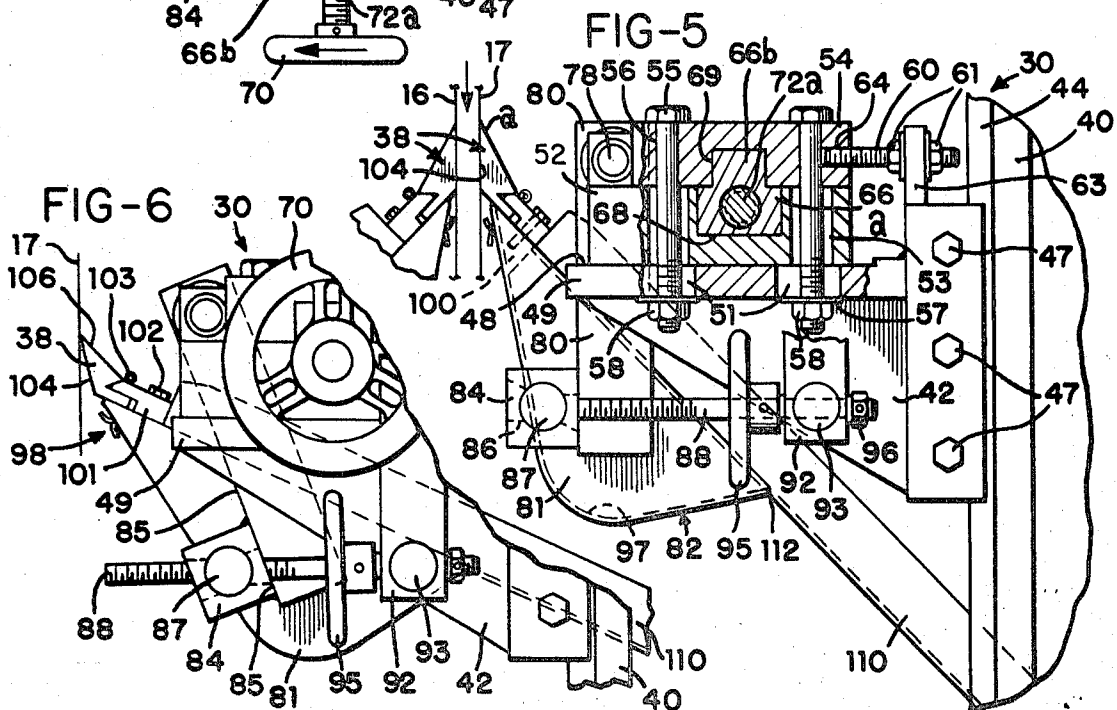
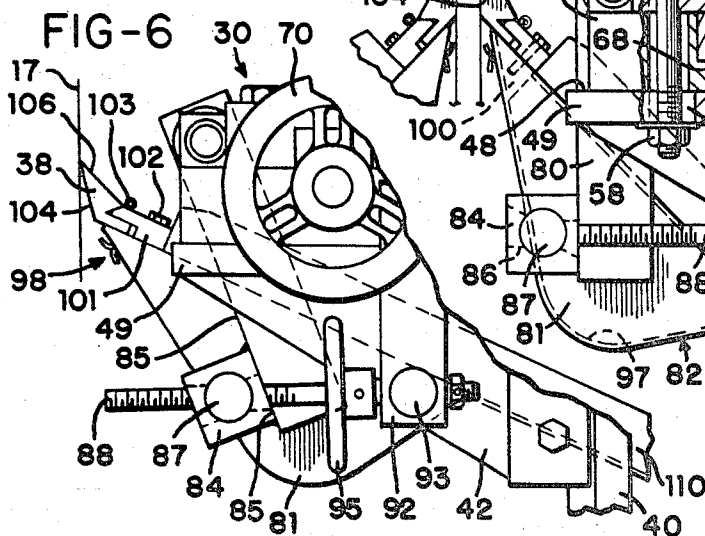
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3 Sheets-Sheet 2



May 11, 1971

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3,578,561

PAPER FORMING APPARATUS

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3 Sheets-Sheet 3

FIG-8

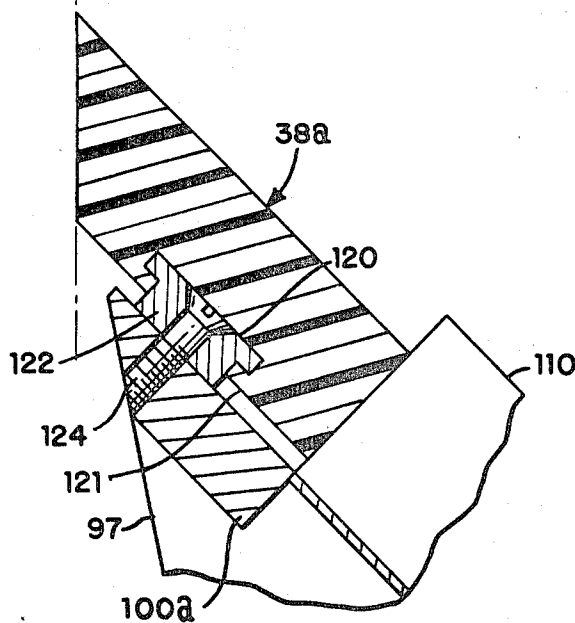
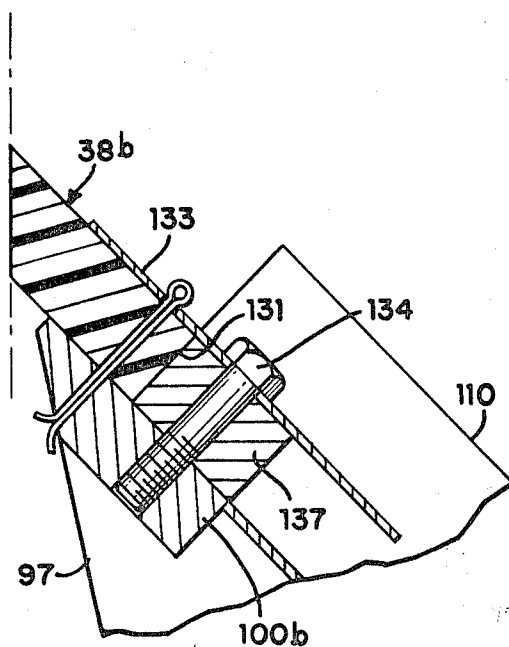


FIG-9



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PAPER FORMING APPARATUS

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Filed Mar. 8, 1968, Ser. No. 711,583

Int. Cl. D21g 9/00

U.S. Cl. 162—352

11 Claims

ABSTRACT OF THE DISCLOSURE

A machine for forming paper from stock between a pair of vertically traveling spaced forming wires which extend between upper breast rolls to lower couch rolls. The water is removed from the stock to a drainage system by deflectors mounted on opposite sides of the forming zone in contact with the wires which cause the wires to exert a squeezing action on the stock and which remove water from the rear side of the wires. The deflectors are individually adjustable so that the wire engaging surfaces move horizontally in a plane parallel to the wires without any vertical movement. Separate apparatus is also provided for adjusting the angular position of each wire engaging surface.

BACKGROUND OF THE INVENTION

This invention is related to paper machinery of the general types shown in Baxter Pat. No. Re. 25,333, and characterized by the incorporation of a pair of forming wires arranged to travel vertically in closely spaced relation defining a forming zone. Suction is applied to the opposite sides of the forming zones to remove water from the stock. More specifically, the invention has special relation to paper machinery of the type shown in Baxter et al. Pat. No. 3,215,594 wherein the wires in the forming zone are supported by deflectors which engage the rear surfaces of the wires and create the squeezing action which forces water from the fiber so that no suction is required to remove the water. Each of the deflectors shown in the Baxter et al. patent is adjustable about a single pivot point by loosening a single support bolt on each side of the machine and making the proper adjustment. Both of the aforesaid patents are assigned to the assignee of this invention.

In order to control precisely the dewatering action and to reduce wear on the forming wires and the deflectors, it has been found advantageous to control the angle of contact between the deflector and the wire. In addition, it is necessary to provide apparatus for insuring that this support surface remains parallel to the wire during adjustment in the width of the forming zone as required when the weight or type of the paper being made is changed, or when the deflectors are temporarily retracted. Moreover, it is very advantageous to be able to adjust each deflector from one side of the machine, rather than as in the Baxter et al. patent wherein it is necessary to perform the adjustment of each deflector by loosening the support bolt at each end of the deflector, making the adjustment, and then retightening the bolt which is both time consuming and difficult.

SUMMARY OF THE INVENTION

This invention provides improved support apparatus for each of the deflectors of a twin wire paper machine. The apparatus enables each deflector to be moved in a horizontal plane without any vertical movement to insure that the support surface of the deflector remains in the same plane as prior to making the adjustment. This permits adjustment in the width of the forming zone while maintaining complete contact between the support surface of

the deflector and the wire. This adjustment also allows the deflectors to be retracted for removal, repair, or maintenance of the wires or associated machinery. Additionally, a separate angular adjustment is provided for changing the angular position of the support surfaces of the deflector. Both these adjustments are made on each deflector by hand wheels on the tending side of the paper machine. Moreover, the entire deflector assembly can be adjusted vertically with respect to the forming zone during set-up.

BRIEF DESCRIPTION OF THE DRAWINGS

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

FIG. 2 is an enlarged fragmentary side view of the forming zone of the apparatus shown in FIG. 1;

FIG. 3 is an elevation view taken from the top of one of the deflector assemblies;

FIG. 4 is an elevation view of a portion of the mechanism of FIG. 3 shown in its alternate position;

FIG. 5 is a fragmentary side view showing the angular adjustment linkage;

FIG. 6 is a view similar to FIG. 5 illustrating the angular adjustment mechanism in an alternate position;

FIG. 7 is a sectional view taken along the line 7—7 of FIG. 4;

FIG. 8 is a fragmentary sectional view showing another form of the deflector blade support; and

FIG. 9 is also a fragmentary view of still another embodiment of the deflector blade supports.

DETAILED DESCRIPTION OF THE DRAWINGS

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 wires 16 and 17 are looped around the respective pairs of breasts and couch rolls 11—14 and 12—15, as shown in FIG. 1. The couch rolls 14 and 15 are preferably driven by suitable means (not shown) to cause the wires to travel downwardly through the nip 13 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. The headbox is preferably of the type described in the copending application Ser. No. 703,299, filed Feb. 6, 1968, also assigned to the assignee of this invention. However, headboxes of other construction may also be used without departing from the scope of this invention so long as they deliver a continuous stream of stock to the space between the wires 16 and 17 in the area of the breast rolls 11 and 12.

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 mounted on the machine frame (not shown).

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 interiors of the spaces 28 defined by the traveling wires are open to the atmosphere, and include the drainage containers 29 which receive water from the deflector assemblies 30 and conduct it through the conduits 32 to a position remote from the machine.

However, a small 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 transfer roll 35 which transfers it to the felt 36 for subsequent processing.

Each of the deflector assemblies 30 supports a deflector blade 38 which engages and supports the adjacent forming wire 16 or 17 and removes water from the rear surface thereof. Each assembly 30 supports its blade 38 for separate adjusting movements in a horizontal direction without any vertical movement, in an angular direction about a horizontal axis, and in both vertical and horizontal adjustments directions with respect to the forming zone for use primarily during set-up of the machine. Each of these assemblies 30 is mounted on vertical frame members 40 on each side of the machine which extend upwardly on opposite sides of the forming zone 20 generally between the breast and couch rolls and have the upper ends thereof interconnected by the removable cross bar 41 (FIG. 2). Each assembly 30 has two main support brackets 42 (FIG. 5), one on each side of the machine, secured to a frame member 40 by the clamp 43 which releasably engages the dovetail member 44 secured to the frame member 40 by the bolts 45. The side member 46 of the clamp 43 can be loosened by the screw 47 which permits the clamp 43 and the main bracket 42 to slide vertically with respect to the frame member 40 and thus the forming zone 20.

Each main bracket 42 extends inwardly toward the forming zone 20 and has a horizontal machined top surface 48 on the flange 49 which has the spaced elongated openings 51 therein. Mounted on this surface for limited horizontal movement is the elongated adjustment block 52 having elongated openings 53 therein aligned with the openings 51 in the flange 49. The block 52 is clamped in position by a top plate 54 and the elongated bolts 55 which extend downwardly through the openings 56, 53 and 51, and receive the washers 57 and nuts 58.

The adjustment block can move in a horizontal direction, as shown in FIG. 5, between the limits of the openings 53. The positioning of the top plate 54 with respect to the flange 49 may also be adjusted in a horizontal direction through use of the adjustment screw 60 which extends from the adjustable connection with the top of the upstanding bracket 63 secured on the main support bracket and into the threaded bore 64 in the top plate 54. When the lock nuts 61 on the screw 60 and nuts 58 on the bolts 55 or loosened, the top plate 54 and adjustment block 52 can be adjusted toward and away from the forming zone 20 between the limits of the elongated slots 51 in the top flange 49. This adjustment is used primarily during set-up of the machine.

The adjustment block 52 directly supports the associated deflector blade 38 so that adjustment of the position of this block 52 effects horizontal adjustment of the deflector blade 38. This adjustment is effected by the cam member 66 having lower portion 66a mounted in the slot 68 formed in the adjustment block 52 and integral angularly disposed cam 66b which is received in a complementary slot 69 in the top plate 54. The cam 66b is angularly disposed with respect to the deflector blade 38 so that longitudinal reciprocation thereof causes the adjustment block 52 to be shifted along the surface 48.

Reciprocation of the cam member 66 is effected by the hand wheel 70 (FIG. 3) having the elongated screw 72a thereon which extends axially through the cam member 66 and is connected by the cross shaft 74 to a similar screw 72b of the cam member of the deflector assembly on the opposite side of the machine. The screws 72 are threaded in opposite directions to enable rotation of the hand wheel 70 in one direction to move the cam members 66 in the opposite directions, i.e., toward one another or away from one another. Thus when the hand

wheel is rotated in one direction, the cam members 66 move along the screws 72a and 72b toward the cross shaft 74, and the camming action slides the adjustment blocks 52 inwardly toward the forming wires 16 and 17, as viewed in FIGS. 3 and 5. Turning the hand wheel 70 in the opposite direction moves the cam members 66 away from the cross shaft 74, and the adjustment blocks 52 are forced outwardly.

The structure for mounting the deflector blades 38 on the adjustment blocks 52 also provides for angular adjustment of the blade 38 itself and includes a block 77 (FIG. 3) secured to the inside of the adjusting block 52. Block 77 receives the short pivot shaft 78 (FIG. 5) mounted rigidly on the bar 80 which is secured on the side wall 81 of the deflector support bracket 82. The bar 80 extends substantially below the flange 49 on the main support bracket 42, and has a pivot block 84 rigidly secured on the inside surface 85 (FIGS. 5 and 6) of the lower end thereof.

The pivot block 84 extends away from the side wall 81 and has a bore 86 in the outermost end thereof having an internally threaded plug 87 therein adapted to receive one end of the angular adjusting screw 88. The other end of the screw 88 is supported against axial movement in the lower end of the elongated rear support bar 92 extending downwardly from a rigid connection with the rear portion of the adjustment block 32 to receive the spherical bearing 93 (FIG. 7) in the generally horizontal bore 94. The adjustment screw 88 is rotated manually by the hand wheel 95 secured rigidly to the screw 88 adjacent the rear bar 92. The rear portion of the screw 88 extends through the spherical bearing 93 therein to receive a lock nut 96 to lock this portion of the shaft against axial movement while permitting rotary and angular movement thereof. Rotation of the hand wheel 95 thus moves the ends of the bars 80 and 92 toward or away from one another and pivots the front bar 80 and the entire deflector support bracket 82 about the axis of the pivot shaft 78.

The side walls 81 on opposite sides of the machine are rigidly interconnected by the structural cross member 97. The upper end 98 of the cross member 97 supports a rigid bar 100 which has the deflector blade 38 suitably secured thereto by the coextensive retainer 101 secured by the screws 102 to the bar 100. Conventional fastening means 103, such as cotter pins, are used to secure the blade 38 to the bar 100 and retainer 101 for retention of the blade while permitting lateral expansion due to thermal expansion without warpage of the contact surface 104.

The individual deflector blades 38 are preferably constructed of a wear resistant material which presents a minimum abrasive effect to the forming wire. Satisfactory results have been obtained utilizing the plastic laminate sold under the trademark "Micarta," although other suitable materials may be used. The blades are carefully designed so that the contact surfaces 104 provide maximum support to the adjacent wire and the detector surfaces 106 are disposed at an angle α to the wire for maximum removal of water from the wires.

Each drain pan 110 is provided immediately behind the retainer 101 coextensive with the width of the wires and extending downwardly at about a 45° angle into the drain container 29 for optimum control of the wire convergence and water deflection from the back side of the wires. These pans 110 are secured in place on the cross members 97 by the retainer 101 at the inner end and by contact with the rear edge portion 112 (FIG. 5) of the cross member 97. The upstanding edges 111 on these drain pans prevent the water from flowing over the side edges of the pans.

In operation, the headbox 22 supplies a jet of stock between wires 16 and 17 which are moving downwardly at a controlled relative speed into the forming zone 20. The plurality of deflector assemblies 30 support the deflector blades 38 on opposite sides of the wires 16 and 17 to cause

5

the wires to move gradually closer together and thus to squeeze the water from the stock through the wires. The deflector surfaces 106 remove the water from the rear side of the wires, and this water flows into the pans 110 from where it flows into the containers 29 and is returned to the white water system. The suction box 34 loosens the newly formed paper web from the wire 17 so that when the wires separate, the newly formed paper web follows the wire 16 until it reaches the transfer roll 35 and is transferred to the felt 36 for subsequent treatment.

Should it be desired to change the configuration of the wires in the forming zone 20, for example, to space the wires 16 and 17 farther apart for making a paper of increased weight, it is merely necessary for the operator to turn each of the hand wheels 70 a preset distance to move the contact surfaces 108 in a horizontal plane away from one another until the precise distance between the wires 16 and 17 is created. Because each of the deflector assemblies 30 automatically adjusts the associated deflector blade 38 from both sides of the machine, there is no possibility of misalignment with respect to the wire. This adjustment can be also used to retract the deflector blades 38 when the wires 16 and 17 are being removed for replacement or repair or for any other reason requiring additional space in the forming zone. Because the movement is in a horizontal plane, it is easy to return the blades 38 to the same position after the maintenance is performed.

Should an angular adjustment of the supporting surfaces 104 of the blades 38 be required, it is easily effected by use of the hand wheels 95 on each of the deflector assemblies 30. Thus by rotating the hand wheel 95, the front bar 80 and the blades 38 can be pivoted about the axis of the pin 78 to change the angle of the surface 104. Rotating the hand wheel 95 in the opposite direction causes the surface 104 to be rotated in the opposite direction. While FIG. 6 shows a substantial adjustment of the deflector blade 38, in practice this adjustment is utilized to establish the gradual converging of the wires 16 and 17 in the forming zone 20, although it is possible in forming some types of paper to shape the wires passing through the forming zone in a slightly S-shaped path to achieve a desired result by staggering the vertical arrangement of opposing deflector assemblies.

The individual deflector assemblies 30 can be moved vertically with respect to the forming zone 20 by loosening the bolts 47 and sliding the main bracket 42 vertically on the frame member 40 and then retightening the bolts 47. Similarly, the adjustment block 52 and cover plate 54 can be moved toward and away from the forming wires 16 or 17 by adjusting the screw 60, as described above. These two adjustments are used primarily during set-up of the machine 10, although they also can be utilized in modifying the configuration of the forming zone.

Another embodiment of the support structure for the deflector blade 38a is shown in FIG. 8 wherein the blade 38a is provided with a T-shaped slot 120 in the bottom surface 121 thereof which receives the continuous T-shaped retainer 122 secured along the length of the support bar 100a and held in position on the bar 100a by the spaced machine screws 124. The blade 38a is mounted by sliding it lengthwise onto the spaced T-shaped retainer 122, and suitable retention means is provided to lock the blade against longitudinal movement. In order to provide a wear resistant relatively rigid blade, an ultra-high molecular polyethylene material may be utilized in the blade 38a.

A further embodiment of the support structure for the deflector blade 38a is shown in FIG. 9 and includes an elongated bar 137 which contacts and supports the rear surface 131 of the deflector blade 38b. A flat resilient metal plate 133, preferably of stainless steel, is held in place by the spaced cap screws 134 which extend through the clamp bar 137 and into the deflector bar 100b. This

6

plate engages the top surfaces of the bar 130 and blade 38b, thereby securing the blade 38b in position. This blade may be constructed of the aforesaid Micarta or can be a relatively rigid fiberglass material. The blades 38a and 38b are otherwise substantially identical in configuration and function to the blade 38 described hereinbefore.

Accordingly, the invention has provided improved deflector assemblies for controlling the convergence of the vertically moving wires in the forming zone 20. They provide for rapid removal of the extruded water from the back side of the wires, and transfer of this water to the white water return system. The deflector blades can be easily retracted in a horizontal plane by use of a simple hand wheel which simultaneously moves the support mechanism on both sides of the machine. A separate angular adjustment is provided should it be desired to change the angle of the support surface of the deflector blade with respect to a vertical plane. The entire deflector assembly can be adjusted vertically with respect to the supporting frame, as well as moved horizontally during set-up.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a papermaking machine including forming wire support means, a pair of endless forming wires looped about said support means to form a pair of laterally spaced, vertically extending reaches defining a forming zone, means for delivering stock to said forming zone and a plurality of deflectors positioned within the loop of each of said endless forming wires in contact therewith in the area of said forming zone, the improvement comprising:

- (a) a main support bracket having a substantially horizontally disposed surface,
- (b) an adjustment block mounted on said surface in slidable contact therewith,
- (c) means securing one of said deflectors to said adjustment block for movement therewith,
- (d) means for adjusting the position of said adjustment block on said surface, and
- (e) means for maintaining the angular disposition of said deflectors with respect to said forming zone during said movement thereof.

2. The apparatus of claim 1 wherein said adjustment block adjusting means comprises:

- (a) means defining a slot in said adjustment block,
- (b) a cam member slidably received in said slot,
- (c) means for moving said cam member axially thereof in said slot.

3. The apparatus of claim 2 wherein said cam member moving means comprises:

- (a) means defining a threaded opening extending through said cam member in parallel relationship to said slot in said adjustment block,
- (b) a screw threaded shaft threadedly received in said threaded opening,
- (c) means for rotating said shaft about its axis,
- (d) means for restraining movement of said shaft axially thereof.

4. The apparatus of claim 2 further comprising:

- (a) a cam mounted on said cam member, projecting outwardly of said slot and angularly disposed thereto,
- (b) a top plate receiving said cam in a complementary cam slot formed in said top plate, and
- (c) means for restraining movement of said top plate.

5. The apparatus of claim 4 further comprising:

- (a) means for adjustably positioning said top plate with respect to said main support bracket.

6. The apparatus of claim 1 further comprising:

7

- (a) means for positioning said deflectors along a vertical plane substantially parallel to said forming zone.
7. The apparatus of claim 6 wherein said last named means comprises:
- (a) a main support bracket carrying a deflector, and
- (b) means for releasably clamping said main support bracket to a vertically extending frame member.
8. The apparatus of claim 1 wherein:
- (a) said means for maintaining the angular disposition of said deflectors with respect to said forming zone includes means for adjusting said angular disposition of said deflectors with respect to said forming zone.
9. The apparatus of claim 8 wherein said last named means comprises:
- (a) a main support bracket,
- (b) a deflector support bracket,
- (c) a deflector blade mounted on said deflector support bracket,
- (d) means pivotally mounting said deflector support bracket to said main support bracket, and
- (e) means for pivoting said deflector support bracket about its pivotal connection to said main support bracket.
10. The apparatus of claim 9 wherein said pivoting means comprises:
- (a) an internally threaded plug mounted on said deflector support bracket,
- (b) a screw threaded bearing rotably mounted on said main support bracket, and
- (c) an adjustment screw extending between and threadedly received in said plug and said bearing.
11. A deflector assembly comprising:
- (a) a main support bracket having a substantially horizontally disposed surface,
- (b) means for adjusting the position of said main support bracket in a vertical plane and maintaining said main support bracket in an adjusted position,
- (c) an elongated adjustment block positioned on said surface in slidable contact therewith,

8

- (d) means defining a slot through said adjustment block,
- (e) a cam member slidably received in said slot and having an upwardly projecting cam angularly disposed with respect to said slot.
- (f) a top plate mounted over said adjustment block and receiving said cam in a complementary cam slot defined in said top plate,
- (g) means defining a threaded bore extending through said cam member in parallel relationship to said slot in said adjustment block,
- (h) a threaded shaft received in said threaded bore,
- (i) means for restraining movement of said shaft axially thereof,
- (j) means for adjusting the position of said top plate along a line normal to the axis of said shaft and maintaining said top plate in an adjusted position,
- (k) a deflector support bracket,
- (l) a deflector blade mounted on said deflector support bracket,
- (m) a link rigidly attached adjacent one end thereof to said deflector support bracket and pivotally attached adjacent the opposite end thereof to said adjustment block,
- (n) an internally threaded plug mounted on said link adjacent said one end thereof,
- (o) a screw threaded spherical bearing mounted on said adjustment block, and
- (p) an adjustment screw extending between and threadably engaging said plug and said bearing.

References Cited

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40 REUBEN FRIEDMAN, Primary Examiner
T. A. GRANGER, Assistant Examiner

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,578,561

Dated May 11, 1971

Inventor(s) Terence E. McCarrick and Olaf S. Antonsen

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 3, lines 14 and 15, "adjustments" should be deleted;
line 50, "or" should be --are--.
Column 4, line 27, "32" should be --52--;
line 58, "detector" should be --deflector--.
Column 5, line 26, "easiy" should be --easy--;
line 29, "suporting" should be --contact--;
line 70, "38a" should be --38b--.
Column 6, line 26, "he" should be --the--.

Signed and sealed this 28th day of December 1971.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents