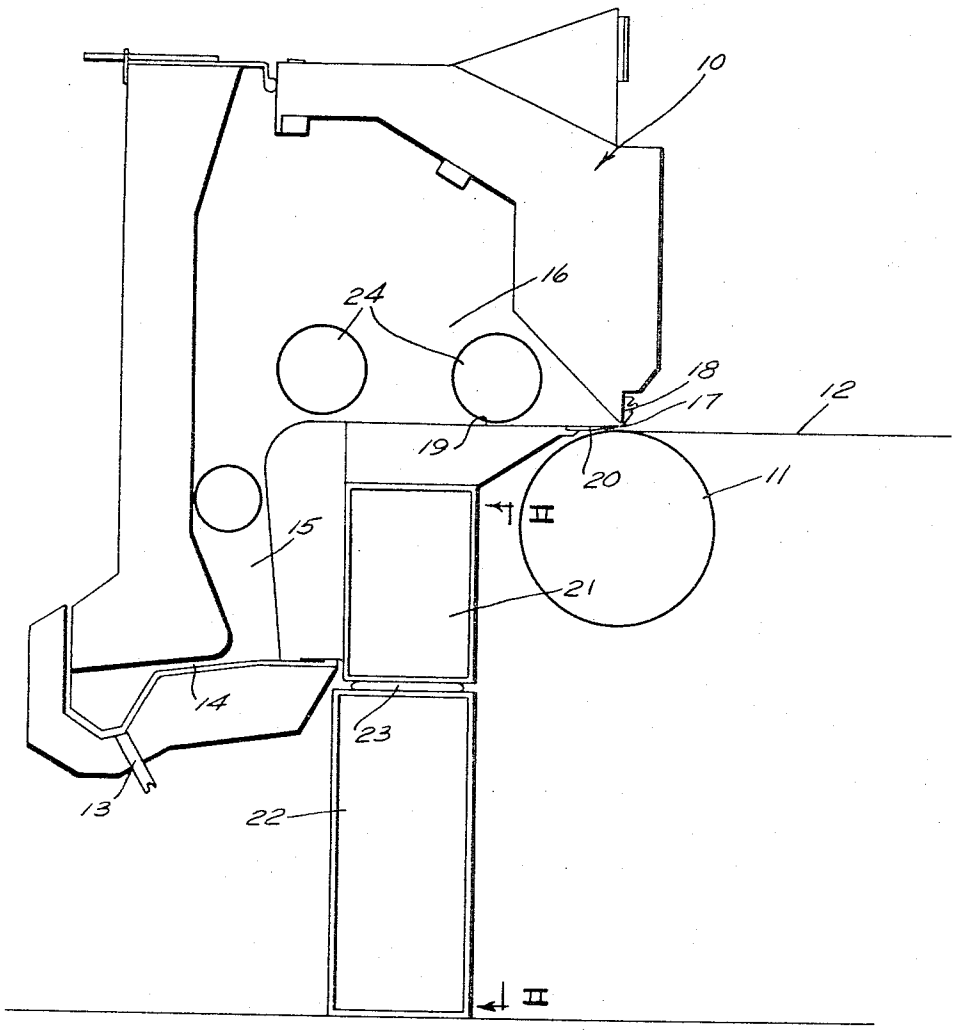
April 11, 1967 L. E. DENNIS ETAL 3,313,681

HEADBOX WITH BOTTOM WALL HAVING CONTROLLABLE DEFLECTION

Filed Aug. 27, 1964 5 Sheets-Sheet 1

FIG. 1



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HEADBOX WITH BOTTOM WALL HAVING CONTROLLABLE DEFLECTION

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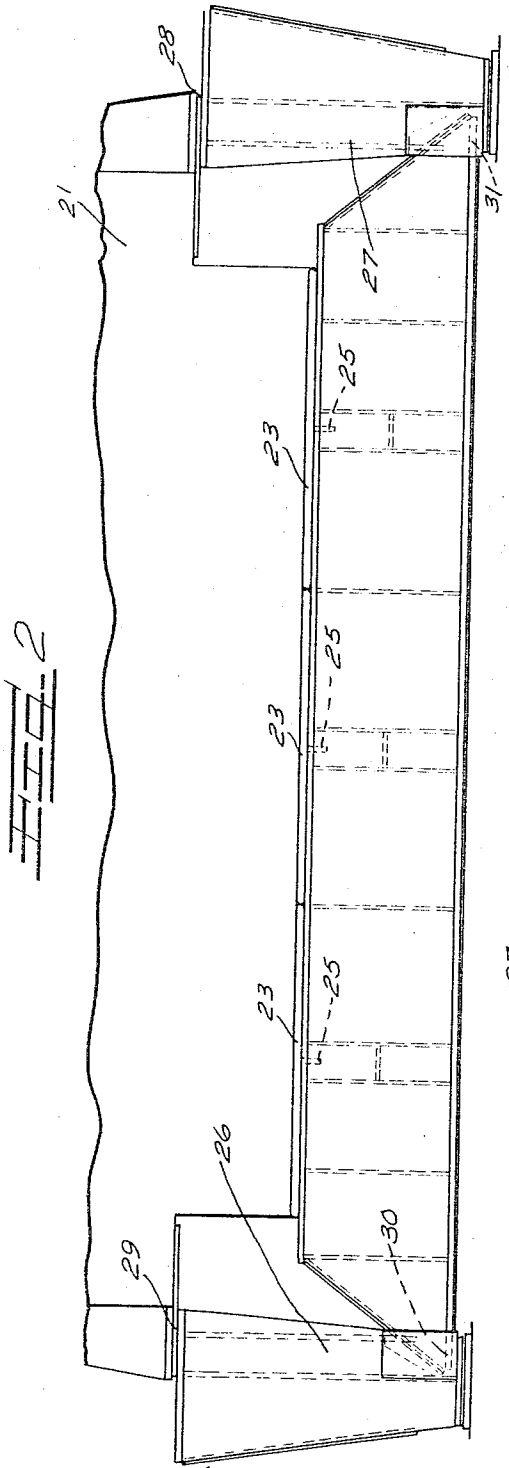

FIG. 2

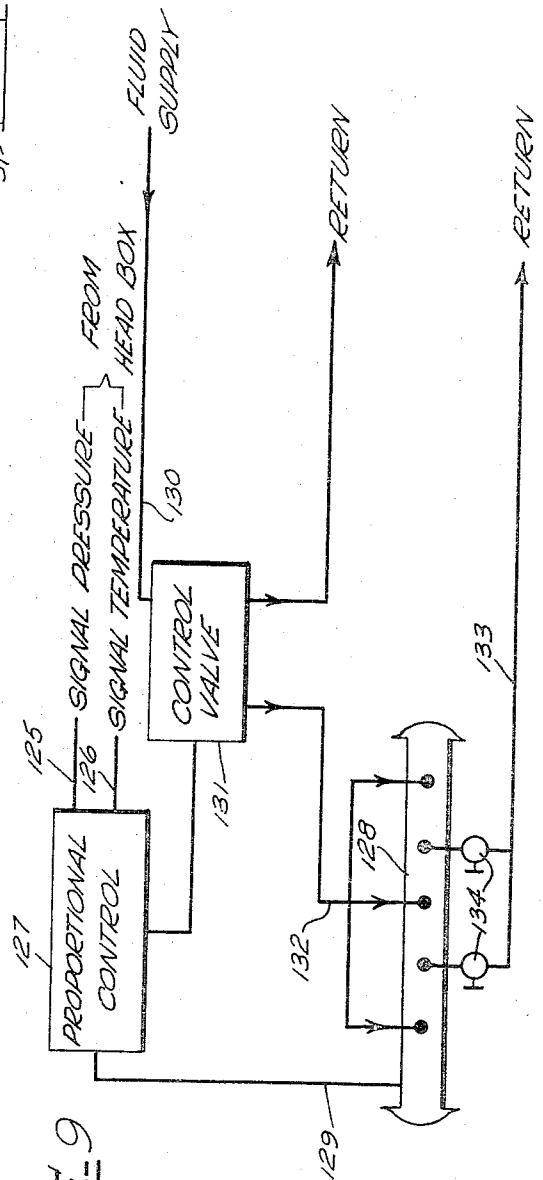

FIG. 9

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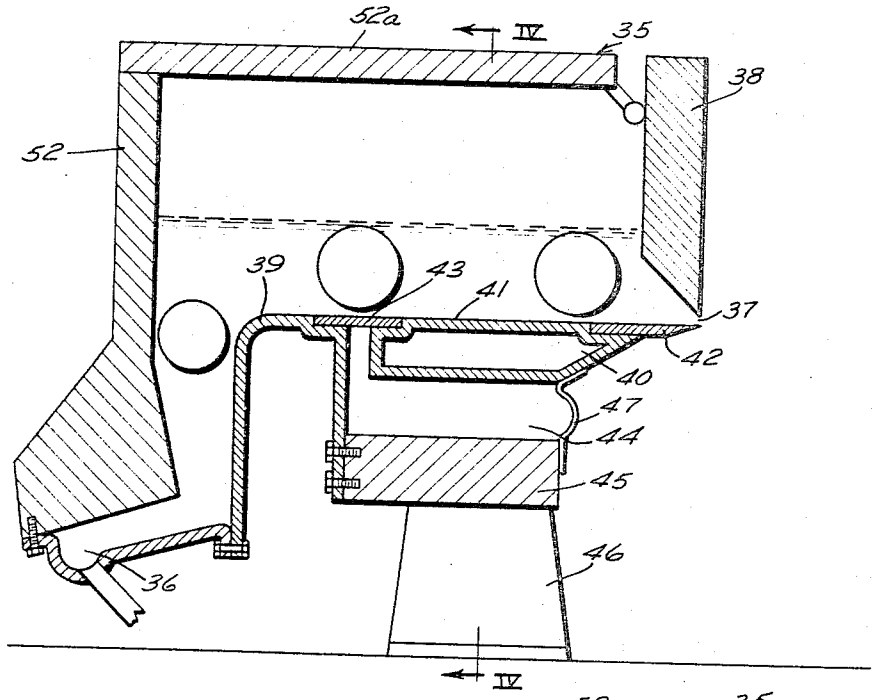
FIG. 3



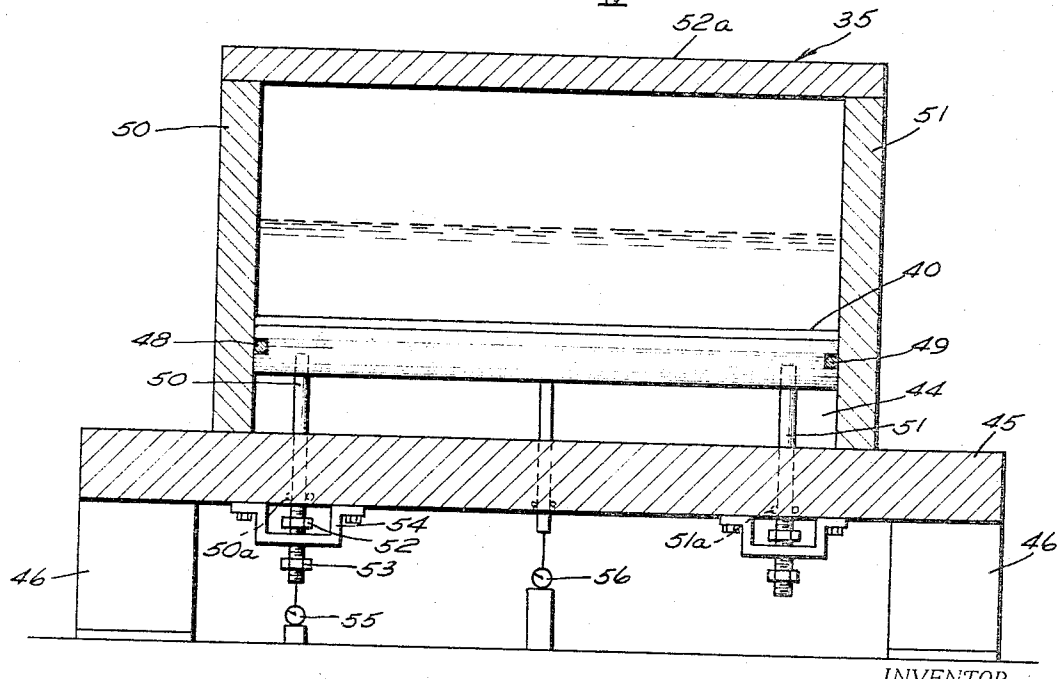


FIG. 4

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HEADBOX WITH BOTTOM WALL HAVING CONTROLLABLE DEFLECTION

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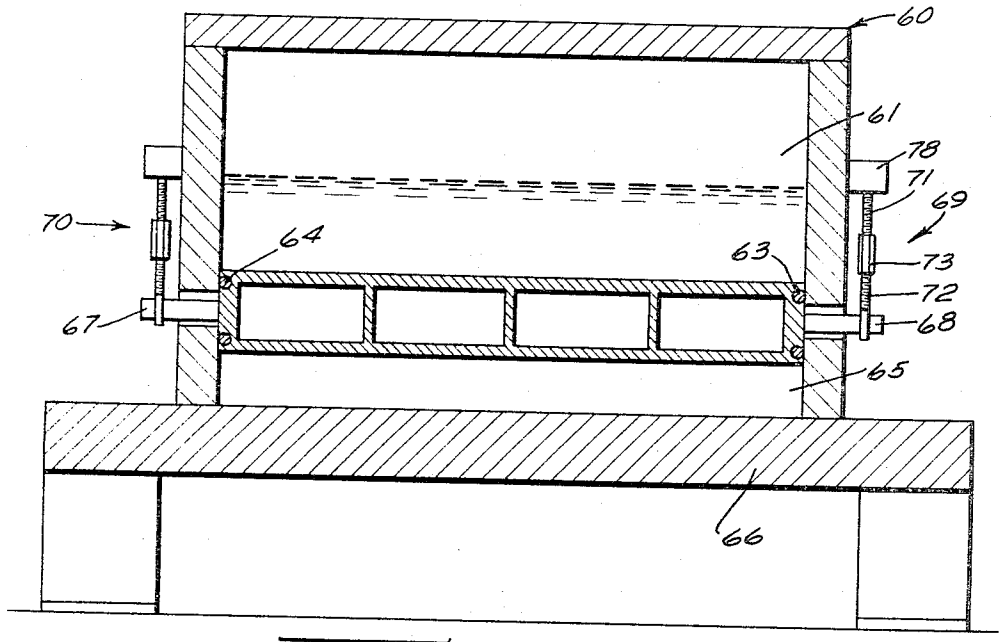

FIG. 5

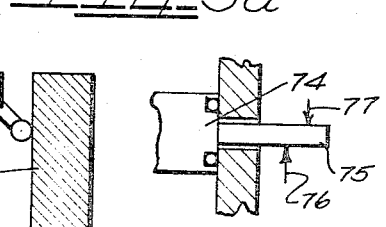

FIG. 5a

FIG. 6

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HEADBOX WITH BOTTOM WALL HAVING CONTROLLABLE DEFLECTION

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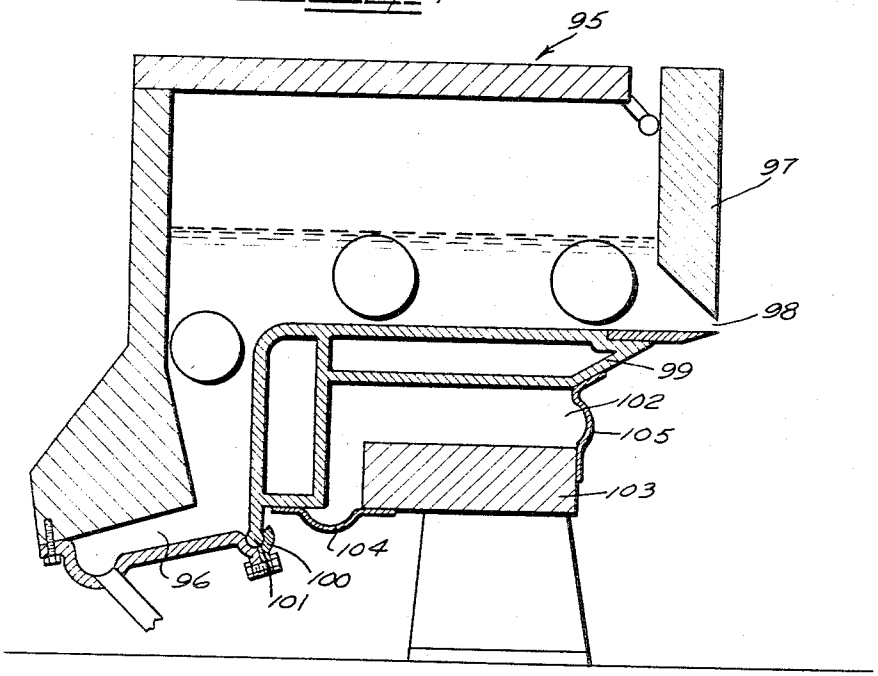
FIG. 7



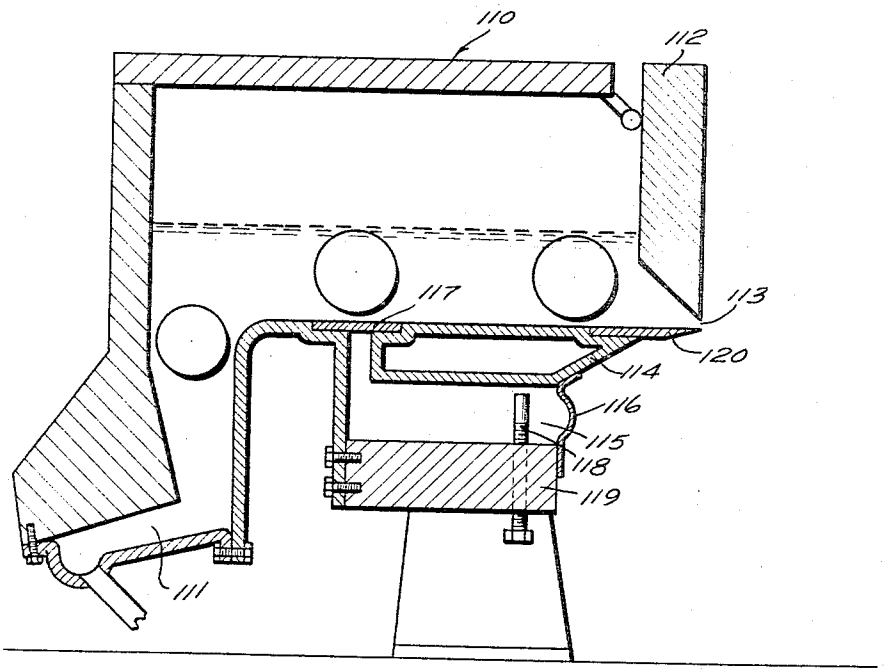


FIG. 8

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United States Patent Office 3,313,681
Patented Apr. 11, 1967

3,313,681

HEADBOX WITH BOTTOM WALL HAVING CONTROLLABLE DEFLECTION

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Filed Aug. 27, 1964, Ser. No. 392,460
10 Claims. (Cl. 162—252)

The present invention relates to improvements in paper machine headboxes and more particularly to a headbox having an improved apron board and support structure therefor.

In a paper machine headbox the apron board is positioned in the floor of the box ahead of the slice opening through which the paper stock slurry is discharged onto a traveling forming surface. At the edge of the apron board is mounted an apron lip which forms the lower edge of the slice opening. If deflections in the apron board occur due to the weight of the stock in the headbox and due to pressures in a closed headbox, the apron board and apron lip will deflect downwardly in the center to result in a non-uniform slice opening. This can be taken care of by adjustment of the upper slice lip but it is also important that the edge of the apron lip be parallel to the forming surface. In a Fourdrinier machine it is desirable to design the apron board to match breast roll deflection. The stock should be discharged on the Fourdrinier wire at an optimum location just in advance of the forming board (if a forming board is used) and any differences in deflection between the apron board and the breast roll will cause the stock to be distributed in a non-uniform lateral line across the Fourdrinier wire. Deflection of the breast roll can change with the load including stock pressure, roll weight and wire tension, and deflection control means can be used in some instances to control deflection of the breast roll.

In pressure headboxes and high speed papermaking machines substantial forces occur on the apron board and these forces will change with change in headbox pressures. As the speed of the machine is increased and the speed of travel of the forming wire increases, the headbox pressure is increased as a function of the square of the speed. In addition to changing headbox pressure, papermaking runs involve changing temperatures of the stock. This will change the temperature of the surface of the apron board within the headbox without necessarily changing the temperature of portions of the apron board support structure remote from the surface of the apron board exposed to the box, and thermal deflection will change the position of the apron board.

Headbox design practice conventionally attempts to compensate for various factors which would cause apron board distortion by making the apron board support heavy and deep to minimize mechanical and thermal deflection in operation. This of course involves expensive construction particularly with machines which are very wide. Such construction is expensive in the requirements of structural members and in shipping and setting up costs. It is also current practice to attempt to design the apron board to match breast roll deflection. This is usually done at an optimum or given Fourdrinier wire speed and corresponding pressure in the headbox. However, with changing operating conditions the design factors are no longer satisfactory. For example, the customer may change wire tension thereby changing breast roll deflection and causing an unmatch of deflections in the breast roll and apron lip. Obviously, changes in headbox pressure and changes in stock temperature will cause a different distortion of the apron board and hence a mismatch in the curvature of the apron lip and breast roll. An object of the present invention is to provide an improved headbox structure wherein it is unnecessary to provide expensive over-designed apron board supports which have heretofore been necessary to minimize mechanical and thermal deflection of the apron board and apron board lip during operation.

A further object of the invention is to provide an improved apron board construction wherein mismatch in the curvature of the breast roll and apron board lip is avoided and wherein changes in curvature of the breast roll can be compensated for by actually changing the curvature of the apron board lip and wherein changes in headbox pressures and changes in headbox temperatures need not cause changes in apron board deflection.

A further object of the invention is to provide an improved headbox structure having an apron board wherein the apron board lip can be adjusted in its height during operation so that the stock will discharge upon the traveling Fourdrinier wire at an optimum location to thereby improve formation of the paper web and to avoid the disadvantages in bad formation which occur with non-uniform discharge across the machine or with discharge at an improper location relative to the breast roll and forming board.

A general object of the invention is to provide an improved headbox design which will provide an improved quality of paper and improve the uniformity of the paper across the width of the Fourdrinier by making it possible to accurately match the apron board deflection with the breast roll deflection and by making it possible to easily adjust the apron board lip to the optimum height and accommodate changes in operating factors such as headbox pressure and temperature.

A feature of the present invention provides a headbox with an apron board designed to be incapable in itself of supporting the forces from the stock within the headbox and wherein a controllable adjustable force applying means is applied along the width of the apron board to control its deflection. Preferably this deflection control force is in the form of a fluid chamber wherein a uniform upward fluid pressure is applied beneath the apron board with the pressure being variable to accommodate changes in headbox pressure or temperature. The apron board is secured at its ends and the upwardly directed fluid chamber pressure will change the deflection or curvature of the apron board along its length. In one form, the apron board is in effect a floating member being hingedly attached at its rear edge and having flexible seals at its edges and being adjustably secured at its ends for controlling the elevation of the apron lip and for obtaining controlled curvature.

Other objects, advantages and features will become more apparent with the teaching of the principles of the present invention in connection with the disclosure of the preferred embodiments thereof in the specification, claims and drawings, in which:

FIGURE 1 is a somewhat schematic side elevational view of a pressure headbox constructed and operating in accordance with the principles of the present invention;

FIGURE 2 is a fragmentary vertical sectional view taken substantially aloong line II—II of FIGURE 1;

FIGURE 3 is a schematic side elevational view shown in section, of a headbox of a modified form and constructed and operating in accordance with the principles of the present invention;

FIGURE 4 is a schematic vertical sectional view taken substantially along line IV—IV of FIGURE 3;

FIGURE 5 is a sectional view similar to FIGURE 4 but showing another form of the invention;

FIGURE 5*a* is a fragmentary schematic view showing an arrangement for controlling deflection of the apron board;

FIGURE 6 is a vertical sectional view taken through a headbox showing another form of the invention;

FIGURE 7 is a side elevational view taken through a headbox showing a further form of the invention;

FIGURE 8 is a side elevation view of a headbox of substantially the construction of the arrangement of FIGURES 3 and 4 and showing the location of a stop arrangement; and

FIGURE 9 is a diagrammatic view of a control for the pressure arrangement for supporting the apron board.

On the drawings:

FIGURES 1 and 2 show a headbox structure incorporating a pressure headbox **10** for discharging paper stock slurry onto a traveling forming surface provided by a Fourdrinier wire **12** supported on a breast roll **11**.

The stock is supplied to the headbox **10** through pipes or tubes **13** and the stock flows through an upwardly inclined passage portion **14** and a vertical passage portion **15** into the headbox chamber **16** which has the usual rectifier rolls such as **24**. Stock in the headbox is maintained under a predetermined pressure and is emitted from a slice opening **17**, the size of which is controlled by an upper slice lip **18**.

The headbox floor is defined in advance of the slice opening by the upper surface **19** of an apron board **21**. At the front edge of the apron board **21** is a lower slice lip or apron lip **20** which defines the lower edge of the slice opening **17**. As above discussed, the breast roll **11** will tend to deflect or sag downwardly at its center and the slice opening **11** should have a contour parallel to the breast roll so that the stock is discharged at the same location, relative to the breast roll and to a forming board which may follow the breast roll, completely across the machine. This requires that the apron board **21** have a curvature or deflection so that the apron lip **20** is parallel to the breast roll **11**. For optimum web formation, the apron lip **20** should be the proper height above the wire to discharge the stock for engagement with the wire at the optimum location which should be just in advance of the forming board. With change in headbox pressures it will be apparent that the trajectory of the stock will change so that it is desirable that the vertical location of the apron lip **20** be changed. The slice opening should be controlled solely by adjustment of the vertical upper slice lip **18** and the lower apron lip be positioned at the optimum elevation and optimum curvature. These features are made possible for varying operating conditions by controlling the deflection of the apron board **21**.

The apron board is fabricated to be of a convenient size but need not be over-designed and can be of relatively light weight so as to be deflectable and incapable in itself of resisting the downward forces exerted from the pressure of the stock within the box. Positioned below the apron board **21** is a lower support member **22**. Between the support member and the apron board is a fluid pressure chamber illustrated in the form of rubber bladders **23**.

As illustrated in FIGURE 2 the rubber bladders **23** each are provided with inflation openings **25** to which a line is attached containing a controlled air pressure for controlling the pressure within the bladders which are preferably maintained at the same pressure and a convenient number of bladders is chosen in accordance with commercially available bladder structures. However, if the deflection of the breast roll is non-uniform or breast roll anti-deflection means are provided which do not obtain a uniform sag of the roll the bladders may be non-uniformly pressurized to obtain a deflection of the apron board to conform to the deflection of the breast roll.

In the arrangement of FIGURES 1 and 2, the ends of the apron board **21** are rigidly supported such as by being carried in the upper ends of columns **26** and **27**. These columns conveniently provide seats **30** and **31** for the ends of the lower support member **22** and shims may be inserted at the base of the seats to obtain a convenient

height for the support member **22**. In other forms, the support member **22** may rest on the floor or the floor itself may be used as the support member.

Shims **28** and **29** are similarly provided at the upper ends of the column to establish the height of the apron board **21**. This will determine the location of the ends of the apron lip **20** corresponding to the fixed location of the ends of the breast roll **11**. The deflection of the center of the apron board and of the apron lip **20** is determined by the air pressure within the air bags **23**. Mill air pressure is used for a source and conventional pressure control valves are used for maintaining a predetermined pressure in the bags **23**. The pressure is determined as a function of the pressure within the headbox and/or a function of the temperature of the stock as will be further described in connection with FIGURE 9.

In the arrangement of FIGURES 3 and 4 a free floating apron board is employed pivotally hinged at its back edge to the headbox. A headbox **35** is provided with a suitable pressure stock supply such as from a fan pump with the pressure being controlled by suitable manual or automatic control mechanism. The headbox is enclosed by a rear wall **52**, a top cover **52***a* and a front slice **38** with connected sides **50** and **51**. The inlet passage into the headbox has a back wall and rear floor **39** and the stock flows through the headbox to be ejected from a slice opening **37**. Within the box the floor is provided by an upper surface **41** of an apron board **40**. At the front edge the apron board carries an apron lip **42** and a bridging plate **43** secured along one edge to the apron board **40** and along the other edge to the headbox wall **39** forms a pivot support for the apron board.

The apron board is sealed at its sides by sliding seals **48** and **49** which prevent the paper stock from within the headbox chamber from passing down into the pressure chamber **44** beneath the apron board **40** and prevent the fluid in the pressure chamber from passing upwardly into the stock. Operation is contemplated in the form shown by permitting free floating movement of the apron board **40** supported solely by a hinge **43** at its rear edge, by end supports which determine the elevation of the ends of the apron lip, and by the pressure of the fluid within the pressure chamber **44** beneath the apron board. The side edges of the apron board **40** are anchored at a predetermined location, which may be adjustable and the pressure chamber determines the deflection of the apron board and provides the primary vertical support therefor. As will be noted, the apron board can be formed of a relatively light construction incapable in itself of resisting the forces from the pressure of the stock in the box with the pressures being carried by the fluid in the pressure chamber **44** beneath the apron board. This permits a saving in construction costs for the apron board since its deflection properties are not critical. The pressure chamber is closed at its lower surface by support member **45** which is of adequate strength to support the apron board but need not be of critical deflection properties. The lower support **45** may be carried from the floor by being supported on end columns such as shown at **46**.

End support means are provided to determine the position of the ends of apron board and of the apron lip **42**. These also act as stops to prevent damage to the machine in the event of loss of pressure within the headbox such as accidental stopping of the fan pump. They also prevent damage to the wire in the event of loss of pressure in the pressure chamber **44** or upon shut-down of the machine with the apron board **40** moving to its lowermost position.

The end support means are provided by end rods **50** and **51** secured to the apron board ends preferably near the front thereof, and passing down through the lower support member **45**. The support member is provided with suitable openings with seals such as **50***a* and **51***a*. At the lower end of the rods are stop nuts such as **52** and **53** which engage a stop bracket **54** and thread up or

down against the bracket. The nuts are shown spaced from the bracket but in operation at least the upper or lower nut will engage the bracket so that a bending force is applied to the apron board.

In order to indicate the position of the apron board indicators **55** and **56** are provided. A plurality of indicators may be provided along the length of the apron board to show a deflection or bending. Ordinary visual indicators may be provided as illustrated schematically in the drawings, or other automatic indicators may be provided to supply an output return signal where an automatic pressure control mechanism is used to control the pressure in the pressure chamber as a function of various machine operating factors. The fluid in the chamber may be air or other suitable hydraulic medium or the stock itself may be used for a pressure fluid in the chamber **44**.

FIGURE 5 shows a headbox **60** with a chamber therein. In this structure a pressure headbox may be employed or an atmospheric pressure box can be employed and each are subjected to changing forces on the apron board from the stop although the range of variation with the pressure headbox is obviously greater.

The floor of the headbox **60** in advance of the slice opening is provided by an apron board **62** and inasmuch as the side appearance of the structure of the headbox will be apparent from the previous descriptions an elevational view will suffice for the arrangement of FIGURE 5. Below the apron board is a fluid pressure chamber **65** with the fluid exposed on its upper surface to the apron board. Suitable upper and lower seals **63** and **64** are provided between the side walls of the headbox and the side edges of the apron board. The pressure chamber **65** is defined along its lower surface by a support member **66**.

At the edges of the apron board **62** are laterally extending projections which protrude through openings in the headbox side walls and are provided for determining the elevation of the sides of the apron board **62**. Attached to the projections **67** and **68** are vertical adjusting means **69** and **70**. Various suitable adjusting means may be employed which set the location of the ends of the apron board **62** and an upper threaded rod **71** is secured to a lug **78** on the side of the headbox and a lower threaded rod **72** is secured to the projection **68**. An adjustment turnbuckle **73** connects to the rods which are threaded in opposite directions and rotation of the turnbuckle at each end will determine the position of ends of the apron board. This position is adjusted to positively locate the elevation of the slice lip relative to the breast roll.

FIGURE *5a* illustrates an arrangement wherein deflection of the apron board is determined by anti-deflection means employing a deflecting force couple applied at each end of the apron board. Only one edge of the apron board need be shown since both edges are similarly provided.

An apron board **74** is shown with a projection **75** extending rigidly therefrom through an opening in a side wall of a headbox. A force couple is applied to the projection such as that including an upward force **76** applied close to the headbox and a downward force **77** applied spaced outwardly from the upward force **76**. Suitable force applying means such as inflatable bellows may be used and extension **75** is rigidly secured to the end of the board. As will be recognized this arrangement may be used for determining the elevation of the ends of the apron board as well as for applying a deflection force. This deflection force may be utilized in combination with pressure in a chamber of fluid beneath the apron board or without such a chamber. Also, the chamber may be employed merely to support the force of the stock in the headbox and control of deflection obtained wholly by the force couples applied at the ends of the apron board.

In the arrangement of FIGURE 6, a headbox **80** has a front vertically movable slice lip shown schematically at **82** with a slice opening **81**. Stock flows into the headbox through passages **83** at the rear of the headbox and up over a rigid rear wall **84**. The floor of the headbox in advance of the slice opening **81** is provided by an apron board **85** having a hinge member **86** at its rear edge. The hinge member is cylindrical in shape fitting into a cylindrical socket **87** provided at the upper edge of the wall **84**. A pressure chamber **88** is provided being wholly beneath the apron board **85** and confined by lateral flexible seals **91** and **92**. The pressure chamber has a lower support member **89** beneath it and an adjustable stop means **90** may be employed.

In FIGURE 7, a headbox **95** is provided with an adjustable slice lip **97** and a slice opening **98** therein. The stock is received through an inlet passage means **96**. In this structure the apron board is combined with the rear wall to provide an apron assembly **99** hinged at the base of the rear wall on a hinge member **100** which is cylindrical in shape and fits into a hinge socket **101**. In this arrangement, as the elevation of the floor of the headbox is changed, the width of the throat forming part of the inlet passage **96** is also changed. For supporting the apron board assembly **99** a fluid pressure chamber **102** is provided having an exposed surface engaging horizontal and vertical surfaces of the apron board. A lower support member **103** provides the support for the fluid in the chamber and flexible seals **104** and **105** extend between the support member **103** and the apron board assembly **99**.

In the arrangement of FIGURE 8 an adjustable stop is provided to limit the lower pivotal movement of the apron board and a headbox **110** has an adjustable vertical slice lip **112** controlling a slice opening **113**. An apron board **114** is supported on a hinge plate **117** at its rear edge and a chamber **115** filled with pressurized fluid extends beneath the apron board. In each of the fluid pressure chambers illustrated it will of course be understood that suitable inlet and outlet openings are provided and these are omitted for the sake of clarity of the drawings.

Beneath the chamber **115** is a support member **119** through which individual or a plurality of stop screws **118** are threaded. The upper ends of these stop screws are engaged by the apron board **114** in its lowermost position to prevent the apron lip **120** from engaging and damaging the wire and breast roll.

FIGURE 9 illustrates a pressure control system for the pressure chambers beneath the apron board. A control pressure signal indicative of pressure within the headbox is received through a line **125**. A control pressure signal indicative of pressure of the stock is received through a line **126**. These are fed into a proportional control **127** which is calibrated to control the pressure in a pressure chamber **128** for obtaining the proper support and proper deflection of the apron board in accordance with the factors of pressure and temperature. The temperature signal largely compensates for change in deflection due to increase or decrease of the temperature of the upper surface of the apron board which heretofore could not be controlled when the temperature of the paper stock slurry changed.

The proportional control supplies a signal to a valve mechanism **131** which controls a fluid pressure supply **130**. A feed-back signal is received from the chamber **128** through a line **129**, and supplied to the proportional control. For obtaining a controlled pressure within the chamber **128** a return recirculation line **133** is provided with controlled bleed valves **134**. As will be observed while the present arrangement regulates the flow of fluid into the chamber other arrangements may be employed such as wherein a uniform flow is supplied and the opening of return bleed valves is regulated by a control valve mechanism such as **131**.

In operation, with reference to the arrangement of FIGURES 1 and 2, the elevation of the apron lip **20**

above the breast roll is determined by setting the height of the ends of the apron board 21 such as by inserting shims 28 and 29 of the proper height. Mechanism which can be more easily adjusted during operation can also be employed. To support the forces on the apron board 21 from the stock within the headbox the inflatable bags 23 are inflated to a pressure which is determined as a function of headbox pressure and/or stock temperature and this pressure is modified to obtain a predetermined deflection of the apron board so that the apron lip will follow the exact deflection of the breast roll. With changes in breast roll deflection due to factors extraneous of the headbox, such as change in tension of the Fourdrinier wire, an external signal may be fed to the mechanism for controlling the pressure in the bags 23. With change in operating factors which require a change in elevation of the slice lip over its overall length relative to the breast roll and wire, such as a change in headbox pressure to accommodate change in speed of the wire, the elevation of the ends of the apron board are changed along with a change in pressure in the fluid pressure chamber beneath the apron board to thereby effect a change in elevation of the apron board without necessarily a change in deflection. Changes in deflection are obtained by a change in pressure in the pressure chamber without changing the location of the position at which the apron board ends are locked. Increase in temperature of the stock causes increasing deflection upwardly in the center of the apron board and is compensated by a reduction in the fluid pressure beneath the board. Increased or decreased headbox pressure is compensated for by corresponding increased or decreased chamber pressure.

Thus, it will be seen that we have provided a device which meets the objectives and advantages above set forth and obtains proper apron lip curvature with speed change and pressure change. The device effects advantages in economics in that a simple pressure chamber is used not only to control deflection of the apron board but also to sustain the forces of the pressures within the box so that the apron board no longer has to be designed deep and strong and now can be designed only for maximum stress and no longer need be designed for deflection. The device obtains a control over formation of the stock and it permits changing elevation of the apron lip with the characteristics of flow onto the wire and permits changing the location where the stock hits the wire. This avoids the formation of bubbles which occur if the stock hits too far forwardly relative to the breast roll and avoids stapling onto the wire if the stock hits too far back and permits the trajectory changes which occur as headbox pressures change, which must be provided for with wire speed change.

It is contemplated that other means may be provided for exerting force on the apron board such as individual diaphragms, levers, jacks, cams or wedges which are interposed between the apron board and the lower support members. These of course will not normally accomplish the upward change in force as uniformly as a continuous fluid chamber. The invention permits the operator for the first time to determine the true deflection of the apron board and control it to obtain optimum operational conditions.

The drawings and specification present a detailed disclosure of the preferred embodiments of the invention, and it is to be understood that the invention is not limited to the specific forms disclosed, but covers all modifications, changes and alternative constructions and methods falling within the scope of the principles taught by the invention.

We claim as our invention:

1. In a papermaking machine the combination comprising,

a closed pressure headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock onto a traveling forming surface,

means for delivering stock under pressure to the headbox inlet,

an apron board in the headbox in advance of the slice opening incapable in itself of supporting the internal forces from the stock pressure in the headbox,

pressure signal means for providing a signal corresponding to the pressure of stock in the headbox,

and force applying means applying a force to the apron board and being controllably connected to the signal means deflecting the board upwardly a predetermined amount as a function of the pressure in the headbox.

2. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a paper stock slurry and having a slice opening for discharging stock onto a traveling forming surface,

an apron board in said headbox in advance of the slice opening incapable in itself of withstanding the forces of the stock within the headbox,

means measuring the temperature of the stock within the headbox for detecting the temperature of the surface of the apron board within the headbox and providing a temperature signal,

and force applying means in force transmitting relation to said apron board for applying a deflecting force to the board counteracting forces of the stock within the headbox for obtaining a deflection of the board in a predetermined amount as a function of stock temperature.

3. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

an apron board in advance of the slice being incapable in itself of supporting the force of the stock,

fluid pressure means in force transmitting relation to the board for applying an upward supporting force to the board,

said fluid pressure means having a lower wall supported independently of the headbox,

and positive stop means for limiting the movement of the board in a vertical direction.

4. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

an apron board in the headbox in advance of the slice opening,

and means connected at each end of said apron board for applying a controllable force couple in a direction counteracting the downward force of the fluid within the box and bending the board upwardly against the deflection forces of the stock within the box.

5. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

an apron board means positioned ahead of the slice opening having an upper horizontal surface forming the floor of the headbox and a leading vertical surface ahead of the horizontal surface forming a portion of a passage leading into the headbox,

hinge means for the board means at the top of said vertical surface hingedly connecting the board means to the headbox,

means defining a fluid pressure chamber having a vertical portion below said hinge means and a horizontal portion with the fluid exerting horizontal and vertical forces on the board means toward the direction of

said surfaces against the pressure of stock in the headbox,

seals for the chamber permitting pivotal movement of the board,

said pressure chamber having a lower wall supported independently of the headbox,

and means for delivering fluid to the chamber controlling the pressure therein.

6. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

an apron board in the headbox in advance of the slice opening,

means pivotally attaching said board along its rear edge to the headbox,

and means defining a fluid pressure chamber beneath the apron board with the fluid in the chamber for applying an upward supporting force to the board,

means delivering fluid to the chamber for controlling the pressure therein,

and an adjustable fixed stop projecting into the chamber engageable by the board for limiting downward movement thereof.

7. In a papermaking machine the combination comprising,

a closed pressure headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock onto a traveling forming surface,

means for delivering stock under pressure to the headbox inlet,

an apron board in the headbox in advance of the slice opening incapable in itself of supporting the internal forces from the stock pressure in the headbox,

pressure signal means providing a signal corresponding to the pressure of stock in the headbox,

means measuring the temperature of the stock within the headbox for detecting the temperature of the surface of the apron board within the headbox and providing a signal corresponding to stock temperature,

and force applying means for applying a force to the apron board and connected to receive said temperature signal and said pressure signal for deflecting the board upwardly a predetermined amount as a combined function of the temperature and pressure in the headbox.

8. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

a bottom wall in the headbox in advance of the slice opening facing the entire pond of the stock in the headbox and incapable in itself of supporting the internal forces from the stock,

means defining a fluid pressure chamber having an upper movable wall in force transmitting relation with the bottom wall and extending completely across the headbox,

a lower wall for the chamber supported independently of the headbox, and

fluid delivery means connected to the chamber for controlling the pressure therein to control the vertical uniform force applied across the entire surface of said headbox bottom wall.

9. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

a bottom wall having an upper surface located in the headbox ahead of the slice opening and being freely vertically movable relative to said headbox,

fluid seals at the lateral side edges of the bottom wall between said wall and headbox permitting relative sliding movement therebetween eliminating bending stresses with change in vertical position of the bottom wall,

means defining a closed fluid chamber beneath the full width of the bottom wall with the wall supported on the upper surface of fluid in the chamber,

said chamber having a lower wall supported independently of the headbox,

and fluid supply means controlling the pressure of the fluid in the chamber so that the location of the upper surface of the headbox bottom wall may be controlled with change of forces on the headbox bottom wall from stock within the headbox.

10. In a papermaking machine the combination comprising,

a headbox having an inlet for receiving a flow of paper stock and having a slice opening for discharging the stock on a traveling forming surface,

an apron board in the headbox in advance of the slice opening,

means pivotally attaching said bottom wall along its rear edge to the headbox,

a support member beneath said bottom wall supported independently of the headbox,

means defining a fluid pressure chamber beneath the bottom wall and supported on the support member with the fluid in the chamber supporting said bottom wall, and flexible seals at the forward and rear edge and at the ends between said support member and said bottom wall.

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