United States Patent

DeNoyer

[15] **3,661,704**

[45] **May 9, 1972**

[54] AIR LOADED PAPERMAKING MACHINE HEADBOX WITH STOCK OVERFLOW CHANNELS AND VERTICALLY ALIGNED VANES THEREIN

[72] Inventor: **Donald B. DeNoyer,** Beloit, Wis.

[73] Assignee: **Allis-Chalmers Manufacturing Company,** Milwaukee, Wis.

[22] Filed: **Nov. 6, 1970**

[21] Appl. No.: **87,381**

[52] **U.S. Cl.** **162/337,** 162/340, 162/343

[51] **Int. Cl.** **D21f 1/06**

[58] **Field of Search** 162/343, 339, 340, 336, 347, 162/216, 345, 337

[56] **References Cited**

UNITED STATES PATENTS

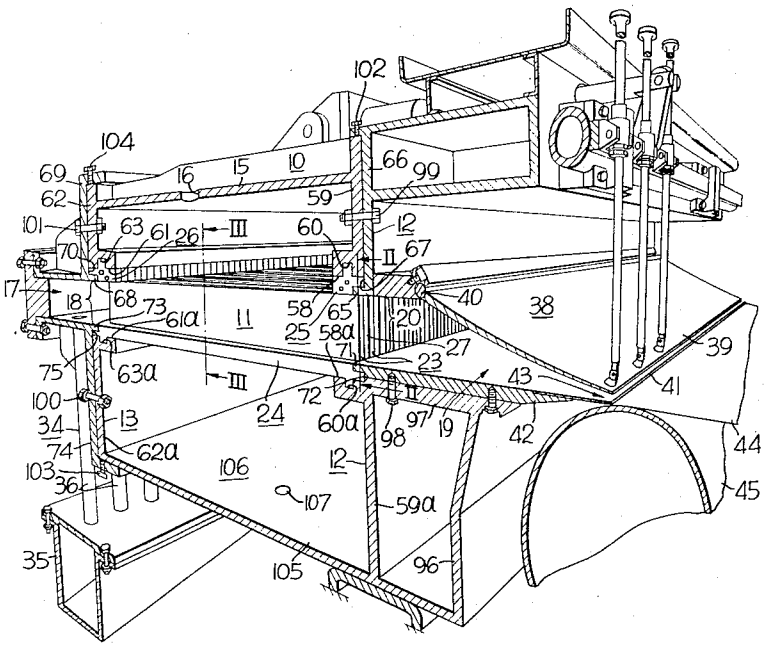
3,216,892	11/1965	Wahlström et al.	162/343
3,532,598	10/1970	Lee et al.	162/343 X
1,909,150	5/1933	Bell-Irving et al.	162/343 X
3,092,539	6/1963	Schmidt et al.	162/337 X
3,536,581	10/1970	Wolf	162/337
2,736,247	2/1956	Hornbostel	162/340

Primary Examiner—S. Leon Bashore
Assistant Examiner—Richard H. Tushin
Attorney—Arthur M. Streich, Robert B. Benson and John P. Hines

[57] **ABSTRACT**

An air loaded headbox for a papermaking machine having an air chamber above vertical rectangular guide vanes defining top open channels between adjacent vanes. The vanes define a first plurality of the channels with end portions open horizontally to provide for horizontal stock flow therethrough. The vanes define a second plurality of channels with bottom portions open in a vertically downward direction to provide for skimming the upper surface of stock in the headbox by providing for a vertically downward stock overflow from the tops of the open tops of the horizontal stock flow channels, downwardly through overflow channels to an overflow collection chamber beneath the vanes. The channels are arranged with alternate horizontal stock flow channels and stock overflow channels across the width of the headbox. A pair of spacers is arranged between vanes defining a stock overflow channel, with each overflow channel spacer being adjacent an end portion of adjacent vanes and extending vertically between top and bottom positions of the adjacent vanes. A group of three spacers is arranged between adjacent vanes defining a horizontal stock flow channel. A first spacer of the group of three, extends horizontally between front and rear wall assemblies of the headbox and provides a floor for the horizontal stock flow channel. The second and third spacers of the group of three are horizontally spaced apart with each adjacent an upper end of adjacent vanes.

12 Claims, 6 Drawing Figures



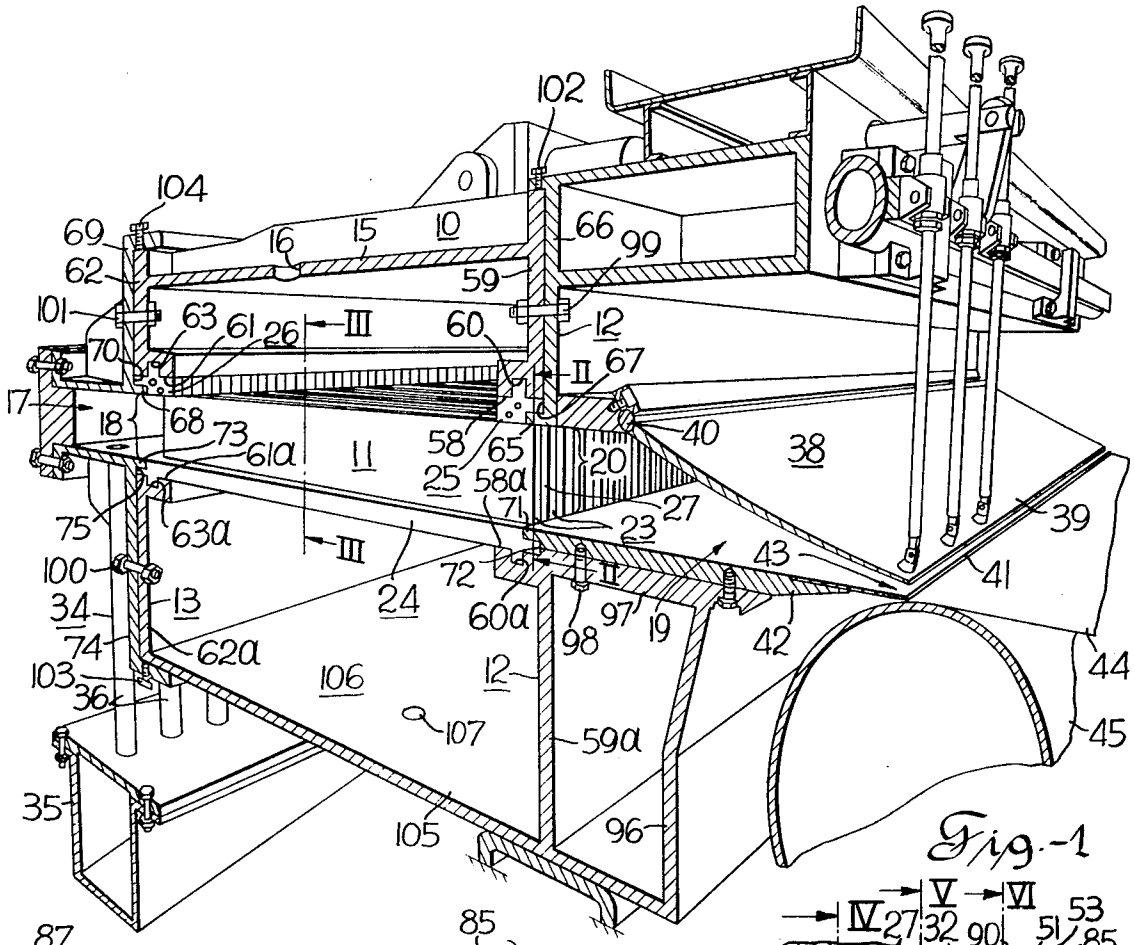


Fig.-1

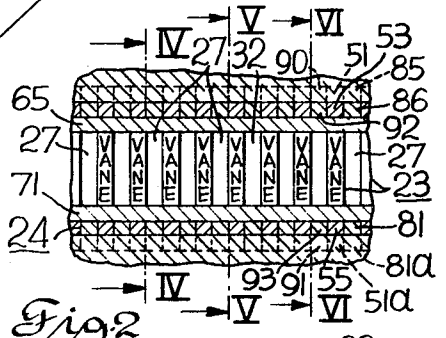


Fig.2

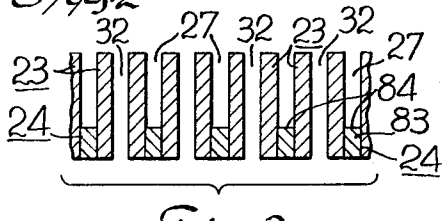


Fig.3

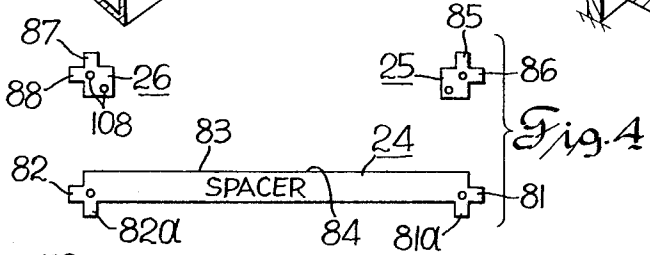


Fig.4

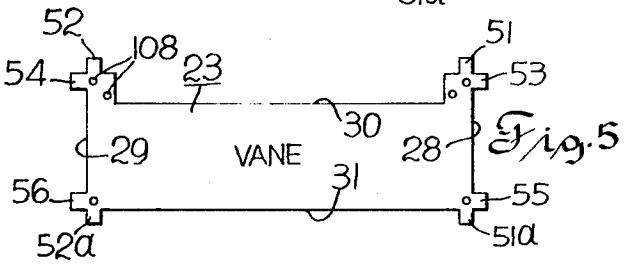


Fig.5

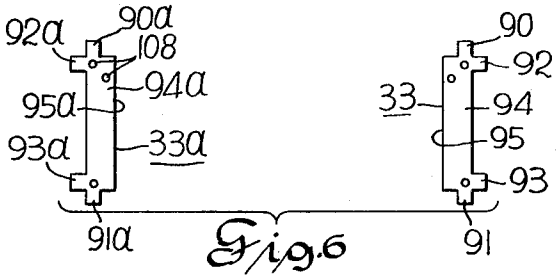


Fig.6

Inventor
Donald B. DeGroff
By Arthur M. Streich
Attorney

AIR LOADED PAPERMAKING MACHINE HEADBOX WITH STOCK OVERFLOW CHANNELS AND VERTICALLY ALIGNED VANES THEREIN

CROSS REFERENCE TO RELATED PATENT APPLICATION

This application discloses several keys and keyways, certain of which, but not all, are the subject of my copending U.S. patent applications entitled "Papermaking Machine Headbox Having Vertically Aligned Vanes Therein," Ser. No. 87,378 and "An Air Loaded Headbox for a Papermaking Machine Having Vertically Aligned Vanes Therein," Ser. No. 87,384, filed concurrently with this application.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the construction of a headbox for spreading dilute paper stock across the entire width of a paper web former and particularly to a construction that may be applied with particular advantage to a very wide headbox for high speed web formation, which may be air loaded, and which provides for skimming off the upper surface of stock in the headbox.

2. Description of the Prior Art

Foaming on the free surface of the stock occurs in headboxes of papermaking machines, in particular in the case of sized paper stock suspensions, and leads to accumulations of foam. These foam accumulations may increase in height at the front wall of the headbox due to stagnation in the flow of the suspension and thus form a heap of foam which causes an undesirable lump formation in the suspension immediately beneath the heap. From time to time these lumps will drop to the headbox discharge outlet thus carrying batches of the foam onto the wire, thereby bringing about irregularities in the formation of the web and breaks in the web.

Various methods have been suggested in the papermaking art with a view of eliminating this foam formation. Thus, water was to be sprayed onto the suspension in finely distributed jets by means of spray nozzles. Only fresh water can be used for this purpose, since white water from the white water pit of the machine would soon clog the narrow openings of the nozzles. However, in stock inlets operated with air loading and having a relatively low depth of the suspension, and wherein the flow of the stock extends over the whole width and depth of the latter, the use of fresh water leads to a variation in the stock consistency at the surface of the latter. The sprayed-on freshwater layer which thus tends to form, is carried along by the flow of the stock without properly mixing with the suspension on the short way to the headbox discharge outlet, and thus disturbs the web formation and leads to an unsatisfactory look-through of the paper.

It is furthermore known to provide an overflow in the headbox in the vicinity of the rear wall of the latter, close to the entrance for the suspension into the headbox. This overflow serves to control the stock level in the headbox but is not suitable for a withdrawal of appreciable foam accumulations from the headbox. Indeed, it would not be possible to remove foam in substantial amounts by means of this known overflow even when applying special foam dispersing means, since these foam accumulations tend to move with the stock in the main direction of flow of the latter toward the discharge outlet for the suspension from the headbox, and thus move away from the rear wall of the latter.

It is also known, as shown in U.S. Pat. No. 3,092,539 of 1963 to provide an overflow in the headbox in the vicinity of the headbox front wall. Such an overflow serves to skim off foam where it accumulates at the front wall but does nothing to reduce the tendency for the foam to accumulate at the front wall.

As will appear from the description to follow, the present invention involves generally rectangular stock flow channel defining vanes which are relatively thin, and arranged in a vertical position to present a greater horizontal length than vertical height. The vanes are parallel and closely spaced to define both horizontally extending stock flow channels between adjacent vanes and stock skimming overflow channels extending substantially the full length of the headbox between rear and front wall assemblies. Vanes, for other purposes and without certain novel features which will appear as the description of the present invention proceeds, are known and disclosed in U.S. Pat. Nos. 1,909,150 (see FIG. 4) and 3,216,892 (see FIG. 1).

SUMMARY OF THE INVENTION

The present invention applies to a headbox for a papermaking machine having a stock flow chamber between a vertical front wall assembly, and a vertical rear wall assembly. A structure defining a stock inlet chamber communicates through the rear wall assembly and a structure defining a stock outlet chamber with a slice opening communicates through the front wall assembly. A plurality of parallel and vertical guide vanes are arranged to define open top channels extending from the inlet chamber to the outlet chamber. Each of the vanes are generally rectangular.

It is an object of the present invention to provide a new and improved headbox of the aforesaid type with provision for skimming the surface of stock in the channeled headbox along substantially the full length of the headbox between rear and front wall assemblies.

It is another object of the present invention to provide a new and improved headbox of the aforesaid type with provisions for minimizing deflection of the front wall assembly and slice defining structure.

It is also an object of the present invention to provide a new and improved headbox of the aforesaid type in which transverse deflection, that is deflection across the span of the box width, is both minimized and independent of the dimension of the span of box width and/or machine speed.

It is another object of the present invention to provide a new and improved headbox adapted for changing open area of pulp stock flow channels and/or stock skimming overflow channels without a need to rebuild the walls and structures defining the box.

The improvement according to the present invention comprises providing the vanes which define a first plurality of the channels with end portions open horizontally to provide for horizontal stock flow therethrough and at least one overflow stock channel or preferably a plurality of second channels with bottom portions open in a vertically downward direction to provide for skimming the upper surface of stock in the headbox by providing for a vertically downward stock overflow from the open tops of the horizontal stock flow channels downwardly through overflow channels to an overflow collection chamber beneath the vanes. The channels are arranged with alternate horizontal stock flow channels and stock overflow channels across the width of the headbox. A pair of spacers is arranged between vanes defining a stock overflow channel with each overflow channel spacer being adjacent an end portion of adjacent vanes and extending vertically between top and bottom portions of the adjacent vanes. A group of three spacers is arranged between adjacent vanes defining a horizontal stock flow channel. A first spacer of the group of three, extends horizontally between front and rear wall assemblies of the headbox and provides a floor for the horizontal stock flow channel. The second and third spacers of the group of three are horizontally spaced apart and adjacent an end portion and the top portion of adjacent vanes.

A preferred embodiment may further provide horizontal structure spaced above the vanes to enclose the chamber above the channelized flow passages for air loading the stock in the open top channels with greater than atmospheric air pressure. The air pressure acts to apply outwardly directed forces upon the front and rear vertical wall assemblies but the vanes tie the front and rear walls together to resist deflection caused by such forces.

Other features and objects of the invention that have been attained will appear from the more detailed description to follow with reference to an embodiment of the present invention shown in the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 of the accompanying drawing is a view in perspective and in section, showing a papermaking machine headbox according to the present invention;

FIGS. 2 and 3 are views taken along lines II—II and III—III, respectively in FIG. 1 and viewing the structure in the direction indicated by arrows; and

FIGS. 4, 5 and 6 are views taken along lines IV—IV, V—V and VI—VI respectively in FIG. 2 and viewing the structures in the direction indicated by arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1, a headbox 10 is shown which comprises a stock flow chamber 11 defined by vertical front wall assembly 12 and a vertical rear wall assembly 13. If it is desired to air load the chamber 11 with above atmospheric air pressure, a horizontal structure defining a box top 15 is also provided having a port 16 for devices (not shown) such as are disclosed in U.S. Pat. Nos. 2,736,246 or 3,515,635. A structure defining a stock inlet chamber 17 communicates with chamber 11 through an opening 18 in the rear wall assembly 13, and a structure defining a stock outlet chamber 19 communicates with chamber 11 through an opening 20 in the front wall assembly 12. The stock flow chamber 11 is provided with a plurality of parallel and vertical guide vanes 23. The vanes 23 define a first plurality of channels 27 with end portions open through the openings 18 and 20 to provide for stock flow therethrough. The vanes 23 which define the channels 27 are spaced apart by a group of three spacers comprising a first spacer 24, a second spacer 25, and a third spacer 26, to define channels 27 with a top portion open to chamber 11. Each of the vanes 23 are generally rectangular and (see FIG. 5) have a pair of vertical edge portions 28 and 29, and a pair of horizontal edge portions 30 and 31. The vanes 23 also define a second plurality of channels 32 having a pair of spacers 33 and 33*a* between certain adjacent vanes 23 as will be more fully described later with reference to FIGS. 3 and 6.

With continued reference to FIG. 1, the headbox 10 is provided with a stock entrance assembly 34 which includes a manifold 35 with a plurality of tubes 36 connecting manifold 35 to the inlet chamber 17. The headbox 10 is also provided with a stock discharge assembly 38 which includes a top slice lip 39 connected to the front wall assembly 12 by a pivotal connection 40 at the level of the top of opening 20 in the front wall assembly 12, and a bottom slice lip 41 connected to a lower front wall member 42 which is part of the front wall assembly 12 at the level of the bottom of the opening 20. The top slice lip 39 and bottom slice lip 41 define a slice opening 43 for discharging dilute paper stock onto a Fourdrinier web forming wire 44 looped over a breast roll 45.

Referring to FIG. 5, each vane 23 is provided with a first key 51 projecting vertically upward from the upper horizontal edge portion 30 of vane 23 in a vertical plane adjacent edge portion 28. Each vane 23 is also provided with a second key 52 projecting vertically upward from the upper horizontal edge portion 30 of vane 23 in a vertical plane adjacent the other vertical edge portion 29. Each vane 23 is also provided with third and fourth keys 51*a*, 52*a* projecting downwardly in vertical alignment with the keys 51, 52. Each vane 23 is provided with a fifth key 53 projecting horizontally outward and away from the upper end of the vertical edge portion 28. Each vane 23 is further provided with a sixth key 54 projecting horizontally opposite key 53 and in the same horizontal plane with key 53. Each vane 23 is also provided with a seventh key 55 and an eighth key 56 projecting horizontally outward of vane 23 in opposite directions along the lower horizontal edge 31.

Referring again to FIG. 1, a first land 58 is connected to an upper member 59 of front wall assembly 12 on the same side of wall assembly 12 as the channels 27. The land 58 is spaced away from member 59 and projects downwardly a predetermined distance to define a first keyway 60 extending upwardly a predetermined distance away from the channels 27. A second land 61 is connected to an upper member 62 of the rear wall assembly 13, and on the same side of wall 13 as the channels 27. The land 61 is spaced away from member 62 and projects downwardly a predetermined distance to define a second keyway 63 extending upwardly a predetermined distance away from the channels 27. A third land 58*a* is connected to a lower member 59*a* of front wall assembly 12 on the same side of member 59*a* as the channels 27. The land 58*a* is spaced away from member 59*a* and projects upwardly a predetermined distance to define a third keyway 60*a*. A fourth land 61*a* is connected to a lower member 62*a* of the rear wall assembly 13 on the same side of the wall 13 as the channels 27. The land 61*a* is spaced away from the member 62*a* and projects upwardly to define a fourth keyway 63*a*. A first horizontal shelf 65 projects, from another upper member 66 of the front wall assembly 12, inwardly and below the member 59 and toward the chamber 11 and defines a fifth keyway 67. A second horizontal shelf 68 projects from another upper member 69 of the rear wall assembly 13 inwardly below the member 62 and toward the chamber 11 and defines a sixth keyway 70 facing and in register with the keyway 67. A third horizontal shelf 71 projects from the lower front wall member 42 inwardly above member 59*a* and toward chamber 11 and defines a seventh keyway 72. A fourth horizontal shelf 73 projects from a lower member 74 of rear wall assembly 13 inwardly above member 62*a* and toward chamber 11 and defines an eighth keyway 75.

As shown in FIG. 1, spacers 24, 25, and 26 are arranged against an adjacent vane 23 to space therefrom another vane which engages the spacers 24, 25, and 26 in a manner shown in FIG. 2, to define the channels 27.

Referring to FIG. 4, the first spacer 24 is shown as having horizontal and oppositely projecting keys 81, 82 for projecting into keyways 72 and 75 respectively and between vane keys 55, 56 respectively. The first spacer 24 also has keys 81*a*, 82*a* projecting downwardly for projecting into keyways 60*a*, 63*a* respectively and between vane keys 51*a*, 52*a* respectively. The first spacer 24 also has a midportion 83 between the keys 81, 82 that projects vertically upward a predetermined distance to define a floor 84 for a channel 27. The second spacer 25 is shown as having a vertical key 85 projecting upward into the keyway 60 between vane keys 51 and a key 86 for projecting horizontally into the keyway 67 between vane keys 53. The third spacer 26 has a vertical key 87 for projecting upward into the keyway 63 between vane keys 52, and a key 88 for projecting horizontally into the keyway 70 between vane keys 54.

Referring to FIG. 6, the pair of spacers 33, 33*a* are shown which cooperate with adjacent vanes 23 to define the overflow stock channels 32. The spacer 33 is shown as having vertical keys 90, 91, horizontal keys 92, 93 and a midportion 94 with an inwardly facing wall 95 that provides one end wall for an overflow channel 32. The spacer 33*a* has vertical keys 90*a*, 91*a*, horizontal keys 92*a*, 93*a* and midportion 94*a* with a surface 95*a* providing another end wall for an overflow channel 32. The spacer keys 90, 91, 92, 93 abut vane keys 51, 51*a*, 53 and 55 respectively in keyways 60, 60*a*, 67 and 72 respectively. The spacer keys 90*a*, 91*a*, 92*a*, 93*a* abut vane keys 52, 52*a*, 54 and 56 respectively in keyways 63, 63*a*, 70 and 75 respectively.

As shown in FIG. 2, the vanes 23 define alternating channels 27, 32 with alternating and side abutting downwardly projecting keys 81*a*, 51*a*, 91, lower horizontal keys 81, 55, 93, upper horizontal keys 86, 53, 92, and upwardly projecting keys 85, 51, 90, all projecting into their respective keyways. Since the second and third spacers 25, 26 (as shown in FIG. 1 and FIG. 4) do not extend the entire distance between the

front and rear walls 12, 13, the channels 27 are provided with open tops as shown in FIG. 3, and since the pair of overflow stock channel spacers 33, 33*a* are horizontally spaced apart as shown in FIG. 6 the overflow channels 32 are open at both the top and the bottom as shown in FIG. 3.

As shown in FIGS. 4, 5, and 6, the vanes 23, the group of three spacers 24, 25, 26, and pair of spacers 33, 33*a*, may be provided with holes 108 for aligning rods (not shown) which may be used to hold these elements in place during assembly and prior to securing them in the positions which have been described. All of the keys are tightly secured in keyways in a manner that will be described next.

Referring again to FIG. 1, the shelves 65 and 68 have been described as being connected to and part of the wall assemblies 12, 13 respectively. The lower shelf 71 is part of the front wall assembly 12 as has been described. The front wall assembly 12 also includes vertical member 96. Member 59*a* is connected on its upper end to a horizontal member 97 which is also connected to the upper end of member 96. The lower front wall member 42, from which the shelf 71 projects, is carried on top of the member 97. The member 42 is connected to the member 97 by screws 98 which also serve to pull the shelf 71 downwardly to clamp the vane keys 55 and spacer keys 81, 93, between the shelf 71 and the member 59*a*. The upper part of the front wall assembly 12 includes the vertical members 59, 66, with the member 59 carrying the box top 15 and defining the land 58 and the keyway 60. The shelf 65 is connected to the member 66 in a manner which has been described. Bolts 99 are provided to draw the members 59 and 66 together. The lower part of the rear wall assembly 13 includes a vertical member 62*a* and the vertical member 74 and as previously described the member 74 supports the shelf 73. Bolts 100 are provided to draw the members 62*a*, 74 together. The upper part of the rear wall assembly 13 includes the vertical member 62 which carries the rear end of the box top 15 and defines the land 61 and keyway 70, and the vertical member 69 which carries the shelf 68. Bolts 101 are provided to draw the members 62, 69 together. Jack screws 102, 103, and 104 are also provided to secure the assembly in a manner which will now be described. Jack screw 102 is threaded in a portion of the member 66 that projects over the top of the member 59. When the jack screw 102 is turned to move downwardly it engages the top of member 59 and the member 66 is drawn upwardly an amount permitted by a loose fit of bolt 99 through the members 59, 66 and as member 66 moves upwardly the shelf 65 is pulled up to clamp the vane keys 53 and spacer keys 86 and 92, in the keyway 67 and the vanes are placed in vertical tension between keys 53 and 55 when the headbox is pressurized. Jack screw 103 is threaded in a portion of the member 74 that projects under member 62*a*. When jack screw 103 is turned to move upwardly it engages the bottom of member 62*a* and the member 74 and the shelf 73 are pulled downwardly an amount permitted by a loose fit of bolts 100 through the members 74, 62*a* and as member 74 moves downwardly the shelf 73 is pulled downwardly against the vane keys 56 and spacer keys 82, 93*a* in the keyway 75. Jack screw 104 is threaded in a portion of the member 69 that projects over the top of the member 62. When jack screw 104 is turned to move downwardly it engages the top of member 62 and the member 69 is drawn upwardly an amount permitted by a loose fit of bolts 101 through the members 62, 69 and as member 69 moves upwardly the shelf 68 is pulled up to clamp the vane keys 54 and the spacer keys 88, 92*a* in the keyway 70 and the vanes are placed in vertical tension between keys 54 and 56 when the headbox is pressurized.

The members 59 and 62 below the box top 15 cooperate with end walls (not shown) and enclose the chamber 11 above the open top channels 27. Pressurized air may be admitted to the chamber 11 through port 16 to load the stock in the open top channels 27 with above atmospheric air pressure. The members 62*a* and 59*a* spaced below vanes 23 cooperate with end walls (not shown) and a box floor 105 to provide an enclosed chamber 106. A drain 107 may be provided for draining overflow stock from chamber 106 to a white water pit (not shown) beneath the machine.

In the operation of the described apparatus dilute paper stock enters through manifold 35 and flows upwardly through the tubes 36 to the inlet chamber 17. From the inlet chamber 17 the stock flows through the channels 27 defined within the flow chamber 11 and stock rises upwardly in channels 27 to a degree permitted by the pressure of air admitted through port 16. As the stock rises above vanes 23 the upper surface of the stock is skimmed off and overflows downwardly through the overflow stock channels 32 to chamber 106 and out drain 107. The weight and pressure of stock in such as the flow chamber 11, normally, in boxes constructed according to the prior art, exerts forces tending to cause a headbox floor to deflect downwardly across both the longitudinal and cross-machine spans of chamber 11. Furthermore, the pressure of the stock and air loading in such as the flow chamber 11 normally, in boxes constructed according to the prior art, tends to deflect the front wall 12 and stock discharge assembly 38 outwardly toward the slice opening 43. With the construction that has been described however, the vanes 23 are keyed and tensioned in keyways 67, 72, 70, 75 and the spacers 24 are keyed in keyways 72, 75 for support by the front and rear wall assemblies 12, 13 to divide the cross-machine span into a plurality of very narrow cross-machine spans that have much less tendency for cross-machine deflection as a result of the vanes being supported at each end and the resistance to deflection provided by vertical tension applied to the vanes when the headbox is pressurized. By providing the vertical vane keys 51, 51*a* and 52, 52*a* arranged as described, the vanes 23 tie together the front and rear wall assemblies 12, 13 and minimize outward deflection of the front wall 12 and stock discharge assembly 38 toward the slice opening 43 when the headbox is pressurized.

Thus it has been disclosed how vertical deflection of the structures defining channels 27 and outward deflection of the front wall 12 and slice defining assembly 38 has been limited and made independent of the width of the box 10 in a construction that provides for stock skimming and overflow along substantially the entire distance between the rear wall assembly 13 and front wall assembly 12. It should also be noted open area through the channels 27, 32 can be changed without rebuilding the box 10, by merely adding or taking away a number of vanes 23 and replacing the spacers 24, 25, 25*a*, 33, 33*a* with new spacers of narrower or wider widths.

From the foregoing detailed description of the present invention it has been shown how the objects of the present invention have been attained in a preferred manner. However, modification and equivalents of the disclosed concepts such as readily occur to those skilled in the art are intended to be included in the scope of this invention. Thus, the scope of the invention is intended to be limited only by the scope of the claims such as are or may hereafter be, appended hereto.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. In an air loaded headbox for a papermaking machine having means defining a stock flow chamber between a vertical front wall assembly and a vertical rear wall assembly; a structure defining a stock inlet chamber communicating through an opening defined in the rear wall assembly, structure defining a stock outlet chamber with a slice opening and communicating through an opening defined in the front wall assembly, and an assembly of a plurality of parallel and vertical guide vanes horizontally spaced apart and defining stock flow channels therebetween with each vane connected on one end thereof to the rear wall assembly above and beneath the opening therein and on the other end thereof to the front wall assembly above and beneath the opening therein, each said vanes being generally rectangular and having end portions defined by a pair of vertical edges and top and bottom portions defined by a pair of horizontal edges, with the upper horizontal edge of adjacent vanes providing the channels with top portions open upwardly thereof, the improvement comprising:

a. the vanes defining a first plurality of the channels with end portions open horizontally to provide for horizontal stock flow therethrough;

b. the vane assembly defining at least one overflow stock channel with a bottom portion open in a vertically downward direction to provide for vertically downward stock overflow therethrough;

c. a pair of spacers adjacent a vane defining an overflow stock channel with each of the overflow channel spacers being adjacent an end portion of the adjacent vane and extending vertically between the top and bottom portions of the adjacent vane to provide end walls for the stock overflow channel; and

d. a group of three spacers between adjacent vanes defining a horizontal stock flow channel, with a first of the group of spacers being adjacent the lower horizontal edges of the adjacent vanes and extending horizontally between the front and rear wall assemblies and upwardly a predetermined distance to provide a horizontal stock flow channel floor, and the second and third of the group of spacers being horizontally spaced apart with each adjacent an end portion and the top portion of adjacent vanes.

2. In a headbox according to claim 1, the vane assembly defining a plurality of the stock overflow channels with each stock overflow channel being between a pair of horizontal stock flow channels and providing alternate horizontal stock flow channels and stock overflow channels across the width of the headbox.

3. In a headbox according to claim 1, wherein said means defining the stock flow chamber includes a horizontal structure spaced above the open top horizontal stock flow channels and overflow channel, with the horizontal structure defining an enclosed chamber for containing pressurized air for loading paper stock flowing through the open top horizontal stock flow channels and downwardly through the overflow stock channel.

4. In a headbox according to claim 1,

a. each vane having a first key projecting vertically upward from each vane and adjacent the end of the vane at the front wall opening;

b. each vane having a second key projecting vertically upward from each vane and adjacent the end of the vane at the rear wall opening;

c. a first land connected to the front wall assembly and projecting vertically downward and spaced from the front wall assembly on the channel side thereof and defining a first vertically extending keyway in the front wall assembly above the opening therethrough;

d. a second land connected to the rear wall assembly and projecting vertically downward and spaced from the rear wall assembly on the channel side thereof and defining a second vertically extending keyway in the rear wall assembly above the opening therethrough; and

e. the first key projecting into the first keyway and the second key projecting into the second keyway to thereby utilize the vanes to tie together the front and rear vertical wall assemblies above the openings therethrough and minimize deflection of the front vertical wall assembly and slice defining structure.

5. In a headbox according to claim 4, the second and third spacers of the group of three spacers and the spacers of the pair of spacers each having a key projecting upwardly and into one of the first and second keyways in register therewith and between first vane keys in the first keyway and between second vane keys in the second keyway.

6. In a headbox according to claim 4,

a. each vane having a third key projecting vertically downward from each vane and adjacent the end of the vane at the front wall opening;

b. each vane having a fourth key projecting vertically downward from each vane and adjacent the end of the vane at the rear wall opening;

c. a third land connected to the front wall assembly and projecting vertically upward and spaced from the front wall assembly on the channel side thereof and defining a third vertically extending keyway in the front wall assembly below the opening therethrough;

d. a fourth land connected to the rear wall assembly and projecting vertically upward and spaced from the rear wall assembly on the channel side thereof and defining a fourth vertically extending keyway in the second vertical wall assembly below the opening therethrough; and

e. the third key projecting into the third keyway and the fourth key projecting into the fourth keyway to thereby utilize the vanes to tie together the front and rear vertical wall assemblies below the openings therethrough and minimize deflection of the front vertical wall assembly and slice defining structure.

7. In a headbox according to claim 6, the first spacer of the group of spacers and the spacers of the pair of spacers each having a key projecting downwardly and into one of the third and fourth keyways in register therewith and between third vane keys in the third keyway and between fourth vane keys in the fourth keyway.

8. In a headbox according to claim 6,

a. a fifth keyway defined by a first horizontal shelf connected to the front wall assembly above the front wall opening and projecting toward the stock flow channels to define the fifth keyway below the first keyway and on to stock outlet chamber side of the first keyway;

b. a sixth keyway defined by a second horizontal shelf connected to the rear wall assembly above the rear wall opening and projecting toward the first shelf to define the sixth keyway below the second keyway and on the stock inlet chamber side of the second keyway; and

c. each vane having a fifth key projecting into the fifth keyway and a sixth key projecting into the sixth keyway to support each of the vanes between the front and rear vertical wall assemblies.

9. In a headbox according to claim 8,

a. a seventh keyway defined by a third horizontal shelf connected to the front wall assembly below the front wall opening and projecting toward the stock flow channels to define the seventh keyway above the third keyway on the stock outlet chamber side of the third keyway; and

b. an eighth keyway defined by a fourth horizontal shelf connected to the rear wall assembly below the rear wall opening and projecting toward the stock floor channels to define the eighth keyway above the fourth keyway on the stock inlet chamber side of the fourth keyway; and

c. each vane having a seventh key projecting into the seventh keyway and an eighth key projecting into the eighth keyway to support each vane between the front and rear vertical wall assemblies.

10. In a headbox according to claim 9, the first shelf being connected to the front wall by an upper front wall member movable upwardly relative to the first land and first keyway, a screw operatively connected to the movable upper front wall member for raising the first shelf to lift the fifth vane keys in the fifth keyways and place the vanes in vertical tension between the fifth and seventh vane keys when the headbox is pressurized.

11. In a headbox according to claim 9, the second shelf being connected to the rear wall by an upper rear wall member movable upwardly relative to the second land and second keyway, a screw operatively connected to the movable rear wall member for raising the second shelf to lift the sixth vane keys in the sixth keyways and place the vanes in vertical tension between the sixth and eighth keys when the headbox is pressurized.

12. In a headbox according to claim 11 the third shelf being connected to the front wall by a lower front wall member movable downwardly relative to the third land and third keyway, a screw operatively connected to the movable lower front wall member for lowering the third shelf to pull the

seventh vane key in the seventh keyway to adjustably hold the vanes in vertical tension between the fifth and seventh vane keys, the fourth shelf being connected to the rear wall by a lower rear wall member movable downwardly relative to the fourth land and fourth keyway, and a screw operatively connected to the lower movable rear wall member for lowering the fourth shelf to pull the eighth vane key in the eighth keyway to adjustably hold the vanes in vertical tension between the sixth and eighth vane keys when the headbox is pressurized.

* * * * *