March 21, 1967 F. R. ERBACH 3,310,461

HEADBOX FOR A PAPERMAKING MACHINE

Filed April 20, 1964 2 Sheets-Sheet 1

Fig. 1

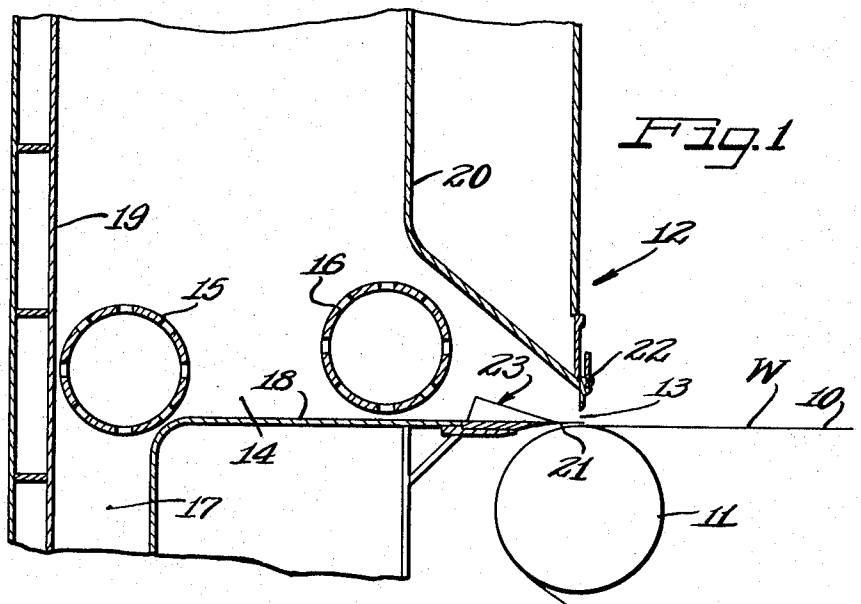
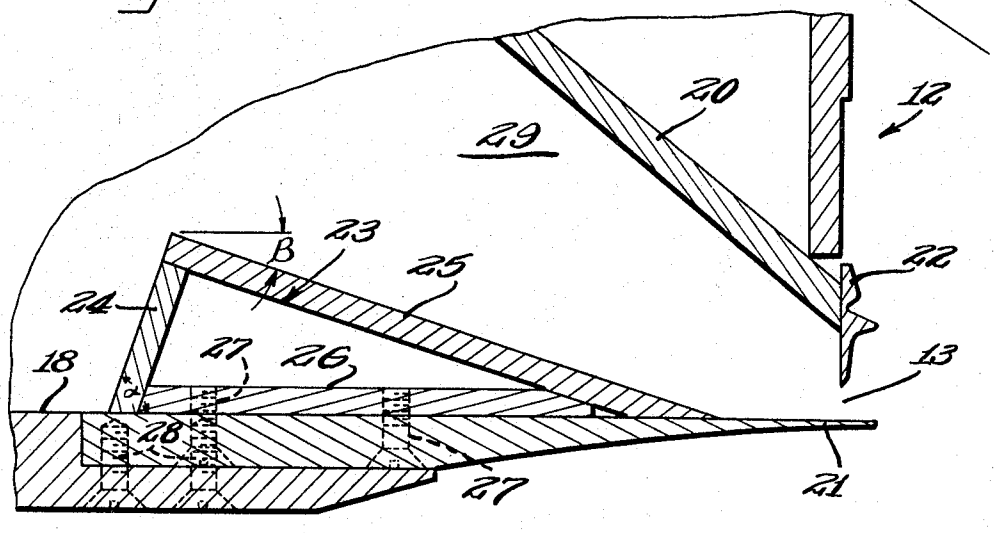


Fig. 2



INVENTOR.
Fred R. Erbach
BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

March 21, 1967 F. R. ERBACH 3,310,461

HEADBOX FOR A PAPERMAKING MACHINE

Filed April 20, 1964 2 Sheets-Sheet 2

Fig. 3

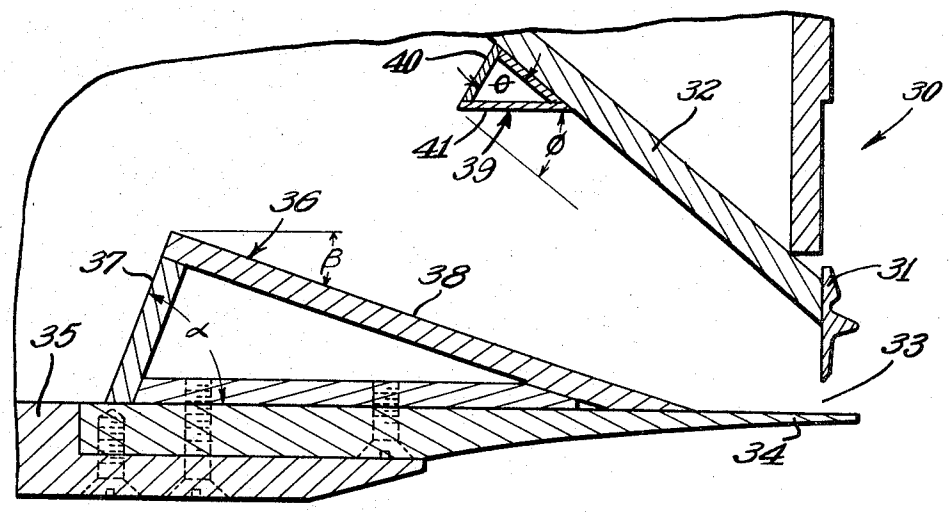
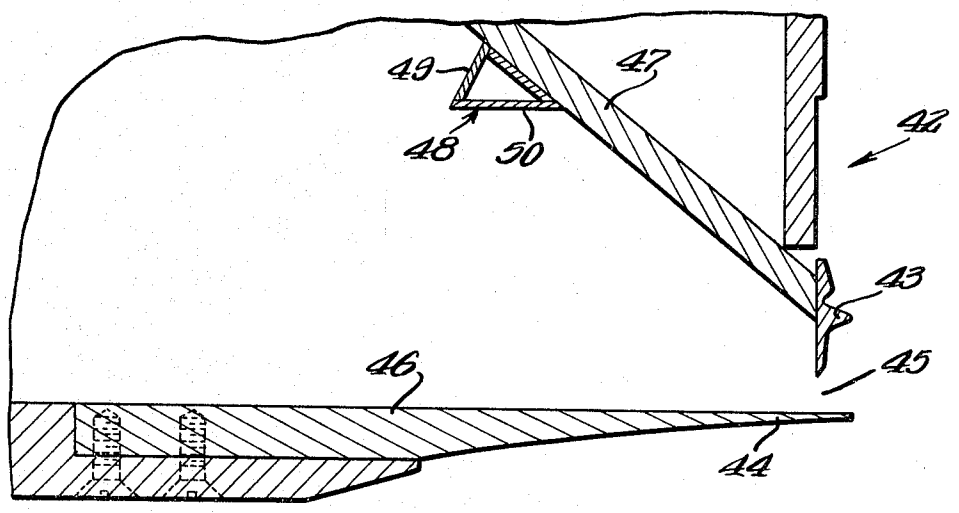


Fig. 4



INVENTOR.
Fred R. Erbach
BY
Hill, Sherman, Meroni, Gross & Simpson
ATTORNEYS

United States Patent Office 3,310,461
Patented Mar. 21, 1967

3,310,461

HEADBOX FOR A PAPERMAKING MACHINE

Fred R. Erbach, Beloit, Wis., assignor to Beloit Corporation, Beloit, Wis., a corporation of Wisconsin

Filed Apr. 20, 1964, Ser. No. 360,846
2 Claims. (Cl. 162—344)

The present invention relates to improvements in paper machine headboxes and more particularly to a headbox structure for influencing or controlling stock flow in a headbox in advance of the slice opening.

In a pressurized headbox particularly for a high speed papermaking machine, stock flow in advance of the slice opening is important to obtaining good formation and uniformity avoiding flocculation and other disadvantages of poor delivery from the slice. In order to obtain proper flow at the slice the stock must have good formation and a good vertical profile. One manner of obtaining this effect has been to place a foil in the throat area in advance of the slice. This foil spoiled the profile but provided good formation.

It is accordingly an object of the present invention to provide a headbox construction which obtains improved formation and a good profile of stock flow in advance of the slice opening in the headbox throat.

A further object of the invention is to eliminate the provision of a foil in a headbox throat thereby eliminating the spoiled profile caused by the foil, and yet obtain the improved formation offered by the foil but concurrently obtaining a good profile.

A more detailed object of the present invention is to provide an obstruction on the floor of the headbox which extends uniformly across the box with an inclined leading surface and a longer declined trailing surface.

The provision of a foil across the headbox to obtain improved formation and to prevent stagnation and large scale eddy formation has resulted, as above stated, in a spoiled vertical profile, which is also a desirable factor to obtaining proper flow to the slice. The theory of the function and operation of the structure provided in the headbox in accordance with the specific arrangements disclosed below is as follows but it is to be understood that I do not wish to be bound by this theory but believe that the flow phenomenon occurs because of the improved results obtained. It is theorized that the flow rate and stream center is irregular in a conventional headbox as the flow stream approaches the slice, and is not linear. Providing an obstruction on the floor of the headbox the pattern of flow is upset. In other words, the stream is deflected upwardly and probably this upward flow is caught by the main stream. The obstruction creates uniform flow across the machine at the very location where the obstruction is positioned, and the obstruction absorbs energy and generally slows the flow to equalize it. The portion of the flow which is deflected upwardly is engaged by the main stream above the obstruction to unify the profile in a vertical direction with the effect on the profile being the same entirely across the width of the box. The mixing of the flow stream portion which is deflected upwardly and the main stream upsets the irregular flow pattern and absorbs energy so that large eddy currents or cross-currents are destroyed and improved formation will result. The stream of improved formation and uniform profile will tend to remain constant as it follows down the declined slope of the obstruction and moves between the declined slope and the downwardly tapered front wall of the headbox. The stream profile is uniform in a vertical direction and in a direction vertically transverse to the flow stream which now moves in a downward direction toward the slice opening which is substantially parallel to or complementary to the direction of flow of the stock as it passes through the slice opening onto the wire.

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

FIGURE 1 is a fragmentary sectional view of a headbox, shown in somewhat schematic form, embodying the principles of the present invention;

FIGURE 2 is an enlarged detailed fragmentary view showing the headbox construction at the slice opening and immediately in advance of the slice;

FIGURE 3 is an enlarged detailed fragmentary view showing a headbox construction at the slice opening of modified form; and

FIGURE 4 is an enlarged detailed fragmentary view showing a headbox construction at the slice opening illustrating another form of the invention.

As shown on the drawings:

FIGURE 1 illustrates a portion of a papermaking machine wherein a forming surface is supplied by a traveling Fourdrinier wire **10** having a web W formed thereon with the Fourdrinier supported on a breast roll **11**. Stock is supplied to the wire **10** by a headbox **12** having a slice opening **13** through which the stock is emitted.

The headbox is of the closed pressure type having the stock chamber **14** therein defined by the headbox walls, and within the chamber are rectifier rolls **15** and **16**. Generally, the headbox may take various forms, and, for example, may be such as that shown in my co-pending patent application, U.S. Ser. No. 360,847, filed April 20, 1964.

The headbox has a rear wall **19** and a forward wall **20** which is declined downwardly toward an upper slice lip **22** which is vertically adjustable. A lower slice lip **21** is positioned beneath the slice opening **13**. The headbox has a horizontal floor **18** which extends toward the slice opening.

As shown in greater detail in FIGURE 2, a projection **23** extends upwardly from the floor **18** of the headbox. The projection **23** operates in accordance with the theory above expressed and has a first inclined lead surface **24** which extends upwardly from the floor **18** at an angle α. This angle is preferably in the range of 35° to 85° and faces the oncoming flow stream along the headbox floor to deflect it upwardly into the main stream.

Following the inclined surface **24** is a declined surface **25** which extends downwardly from the tip of the inclined surface **24** to again join the horizontal floor **18**. The declined surface is at an angle β with the floor in the range of 5° to 55°. A satisfactory angle for the declined surface is 18° and the declined surface joins the inclined surface **24** in angle of substantially 90° with the angle α of the inclined surface **24** being 72°.

The obstruction **23** can readily be formed of flat stainless steel plates having a highly polished outer surface with the plates of course extending uniformly across the entire width of the headbox. A lower attaching plate **26** may be secured such as by welding to the ends of the plates for the surfaces **24** and **25**, and a securing bolt **27** is slid up into the plate which forms the lower lip **21** to hold the obstruction in place. As illustrated, the lower lip is secured in place by bolts **28** which extend through openings in the floor **18**. The top edge of the obstruction **23** preferably extends above the lower edge of the upper slice lip **22**.

While the structure including the obstruction **23** may be used in headboxes of various designs, in a preferred arrangement the declined surface **25** faces a front wall **20** which declines downwardly toward the slice and the angle of the declined surface **25** is less than the angle of

the front wall **20** so that a slightly tapered throat **29** is provided leading toward the slice opening **13**.

FIGURE 3 shows a portion of a headbox **30** having an upper slice lip **31** which is vertically adjustable and a lower slice lip **34** defining a slice opening **33**. The headbox has a horizontal floor **35** which extends toward the slice opening **33**.

A projection **36** extends upwardly from the floor **18** of the headbox, being of a construction similar to the projection **23** of FIGURE 2. The projection **36** has a first inclined lead surface **37** which extends upwardly from the floor at an angle α with the horizontal planar headbox floor declined surface **38** which extends downwardly from the tip of the inclined surface **37** to again join the horizontal floor **35**. The angle of the decline of the surface **38** relative to the horizontal, or relative to the floor, is shown at β.

The headbox **30** has a forward wall **32** having a projection **39** mounted thereon. The projection **39** has a leading surface **40** which projects out into the flow stream flowing toward the slice opening **33**, and a trailing surface **41**. The leading surface **40** forms an angle θ with the forward headbox wall **32**. The trailing wall **41** forms an angle ϕ with the headbox forward wall **32**.

The projection **39** on the forward wall **32** is constructed to be smaller than the floor projection **36**. Also the angles of the leading and trailing surfaces **40** and **41** of the upper projection are constructed to have a relationship to the angles of the surfaces of the lower projection **36**, for improved flow characteristics. The angle α (which is the angle between the floor **35** and the leading surface **37** of the lower projection **36**) is substantially equal to the angle θ (which is the angle between the forward headbox wall **32** and the leading surface **40** of the upper projection **39**).

The angle β (which is the angle between the trailing surface **38** of the lower projection **36** and the horizontal floor) is substantially equal to the angle ϕ (which is the angle between the front wall **32** and the trailing surface **41** of the upper projection **39**).

In FIGURE 4 a headbox **42** has a vertically adjustable upper slice lip **43** and a lower slice lip **44** forming a slice opening **45** therebetween. The headbox has a horizontal floor **46** which is unobstructed.

The headbox has a front wall **47** which carries a projection **48** having a leading surface **49** extending downwardly from the wall **47**, and a trailing surface **50** which extends back to the wall **47** from the leading surface **49**. The projections **39** in FIGURE 3 and **48** in FIGURE 4 function somewhat the same as the projection on the floor of the headbox to deflect the flow stream outwardly to be caught by the main stream in the manner set forth above.

Thus, it will be seen that I have provided a headbox construction which obtains the objectives and features above set forth. The structure has been found to provide both good formation and good profile and to avoid disadvantages of structures heretofore obtainable such as with the use of a foil in the throat.

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 modification, changes and alternative constructions and methods falling within the scope of the principles taught by the invention.

I claim as my invention:

1. A paper machine stock headbox for discharging stock on a travelling forming surface comprising,

a closed headbox chamber with a planar floor and a downwardly inclined forward wall leading toward a slice opening,

a lower projection on the floor ahead of the slice opening extending into the flow stream absorbing energy of the stock flow and deflecting the stream upwardly to be intercepted by the flow stream moving toward the opening,

and an upper projection on the forward wall positioned downstream of the lower projection and being smaller than said lower projection.

2. A paper machine stock headbox for discharging stock on a travelling forming surface comprising:

a headbox chamber with a planar floor and a downwardly inclined forward wall leading toward a slice opening;

a lower projection on the floor ahead of the slice opening extending into the flow stream absorbing energy from the stock flow and deflecting the stream upwardly to be intercepted by the flow stream moving toward the opening, said lower projection having an inclined surface rising upwardly from the floor facing the flow of stock and having an angle in the range of 35° to 85° with the floor so as to create an improved flow formation in the stock;

and a declined trailing surface following the inclined surface and facing said forward wall of the headbox, said declining trailing surface having an angle with the floor which is less than said inclined surface so as to maintain the improved flow formation of the stock as the stock is delivered to the slice;

and an upper projection in the forward wall positioned downstream of the lower projection and being smaller than said lower projection and substantially similar thereto.

References Cited by the Examiner

UNITED STATES PATENTS

1,898,372	2/1933	Hyde	162—347
2,832,268	4/1958	Boone et al.	162—216

S. LEON BASHORE, *Primary Examiner.*

DONALL H. SYLVESTER, J. H. NEWSOME,

Assistant Examiners.