

April 11, 1961

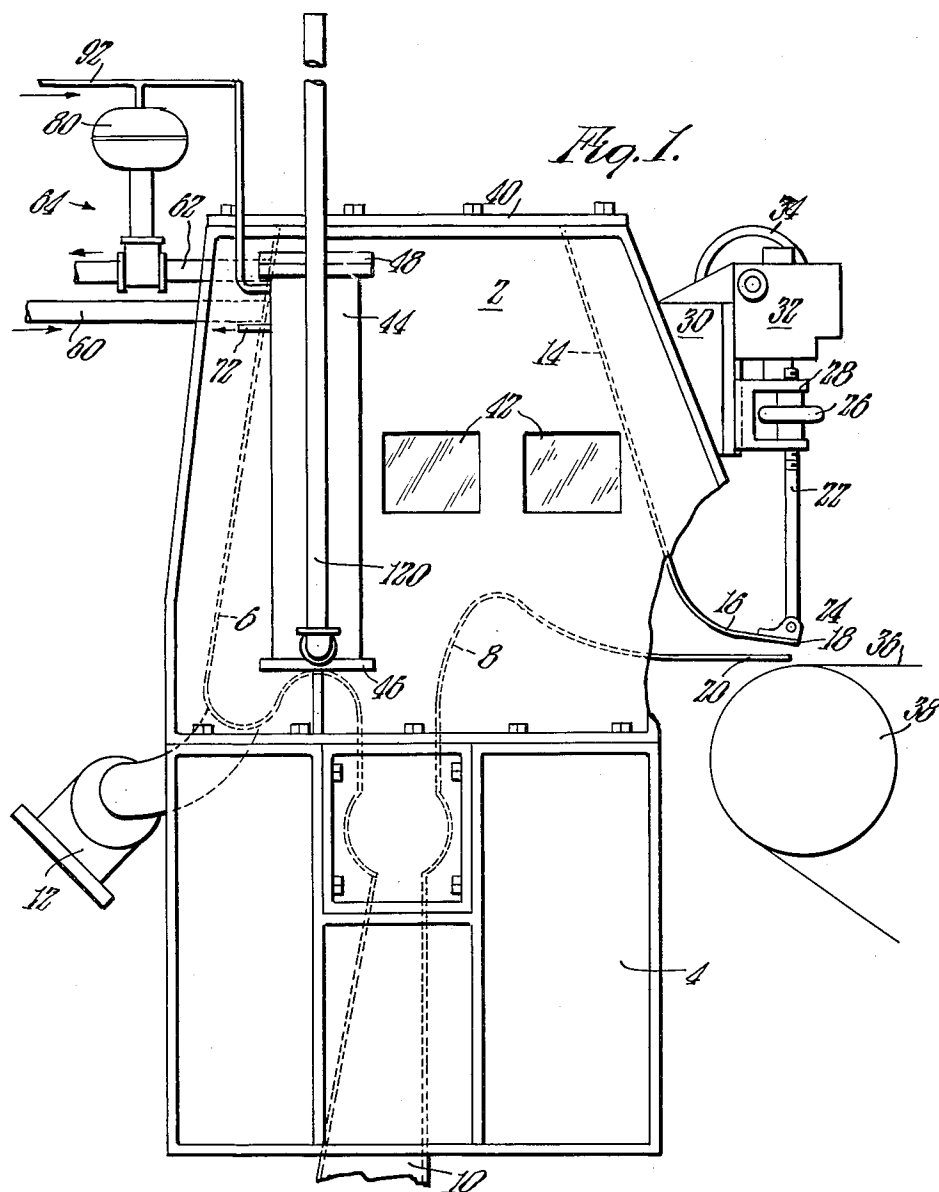
R. E. SMITH

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PAPER MAKING APPARATUS

Filed Oct. 16, 1958

2 Sheets-Sheet 1



INVENTOR.
Robert E. Smith.
BY *Robert E. Smith, Atty.*

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2 Sheets-Sheet 2

Fig. 2.

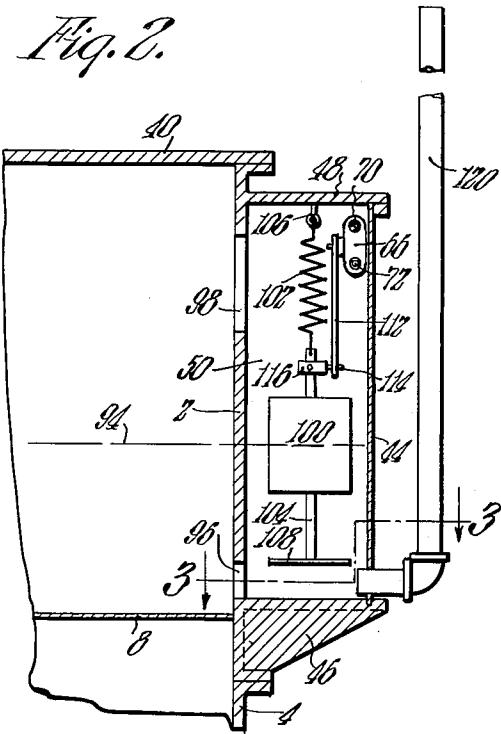


Fig. 4.

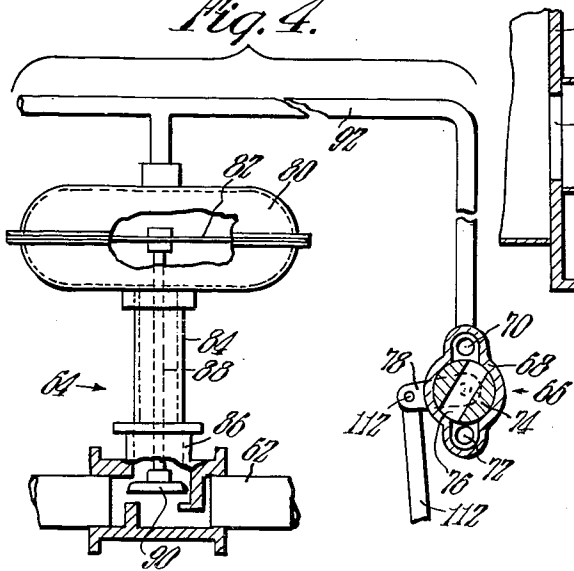
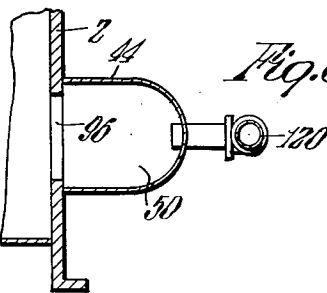


Fig. 3.



INVENTOR.
Robert E. Smith.
BY *Robert E. Smith, Atty.*

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Robert E. Smith, Hudson Falls, N.Y., assignor to The Sandy Hill Iron and Brass Works, Hudson Falls, N.Y., a corporation of New York

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1 Claim. (Cl. 162—340)

This invention relates to new and useful improvements in structural refinements in paper making apparatus and is directed more particularly to apparatus for controlling the flow of paper making stock onto a sheet forming element.

The invention resides in the particular arrangement, construction and relationship of the various elements of the control apparatus as exemplified in the detailed disclosure hereinafter set forth wherein the following objects of the invention will be apparent.

The principal object of the invention in a general way is directed to the provision in paper making apparatus of a closed head box having an adjustable outlet for the flow of stock therefrom in combination with a means for maintaining predetermined velocities of stock.

According to the prior art, it has been ordinary practice to employ open head boxes of considerable height in order to obtain the desired head for a predetermined discharge velocity of stock. Such has entailed expensive equipment occupying considerable space, and is objectionable for numerous reasons.

According to the novel features of this invention, a closed head box is provided to simultaneously receive a predetermined constant gallonage of paper making stock, and air of a desired pressure and at a constant rate of flow. Valve controlled air discharge means from the head box is provided, and sensing mechanism influenced by the level of stock controls the air discharge means so that pressure within the head box is regulated to result in a desired velocity of stock through the head box outlet.

Specifically, sensing mechanism is disposed in a chamber with the said chamber in communication with the head box so that it is not adversely affected by the surface turbulence of stock in the head box. The mechanism is such as to be operable by displacement as the level of stock in the head box increases or decreases, and said mechanism controls or operates means for the discharge of air from the head box.

More specifically, the sensing mechanism and air discharge means are so arranged and interconnected that, with a certain adjustment of the stock outlet from the head box and with stock of a certain gallonage and air at a certain pressure simultaneously supplied to the head box, the operation is generally as follows: As the level of stock in the head box increases from a predetermined stock level, the sensing mechanism is operated by displacement to actuate the air discharge means to restrict the discharge of air from the head box thereby resulting in an increase of pressure within the head box. As the level of stock decreases, the sensing mechanism actuates the air discharge means in such a way that it is opened to decrease air pressure. Thus, air pressure within the head box is substantially maintained during the operation of the apparatus. The sensing mechanism includes a sensing valve having an outlet to atmosphere and an inlet for air under pressure with a plug to restrict the

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flow of air to atmosphere. The inlet is connected to the pneumatically operated air discharge means. As the sensing valve is operated to restrict the outward flow of air, the inlet of said valve is so connected to the air discharge means and an air supply that the discharge means restricts the discharge of air from the head box.

Other objects and advantages will be in part obvious or in part pointed out hereinafter. All will become apparent as the description proceeds, as they reside in features of novelty and details of construction and operation as will be pointed out more fully hereinafter with particularity in the claims annexed to and forming part of this specification.

To the accomplishment of these ends, the invention intended to be protected by Letters Patent will be understood to comprise the features set forth in this description and annexed drawing illustrating in detail a certain physical embodiment of the invention showing parts combined and arranged in accordance with one mode which I have devised for the practical application of the principles of the invention. It will be understood however that this is only indicative of but one of the various ways in which the principles of the invention may be employed and in which the component parts may be combined and arranged. Changes and alterations are contemplated and may be made within the spirit and scope of the claims. No limitations therefore are to be implied from the following specific description.

In the drawing:

Fig. 1 is a side elevational view of head box apparatus embodying the novel features of the invention;

Fig. 2 is a vertical sectional elevational view through the sensing mechanism chamber, adjacent a side wall of the head box and showing the sensing apparatus;

Fig. 3 is a sectional plan view on the line 3—3 of Fig. 2; and

Fig. 4 is an elevational view more or less diagrammatic, and with parts in section, showing the sensing valve and valve means for controlling air discharge from the head box, and their connections.

In the following description and claim, various details will be identified by specific names for convenience. These names however are intended to be as generic in their application as the art will permit.

Referring now to the drawing forming a part of this specification more in detail, in which similar characteristics of reference indicate corresponding parts in the several views, and referring more particularly to the preferred form of my invention selected for illustrative purposes, I have shown a pair of vertically extending transversely spaced side walls such as 2. These are secured at lower edges to supports 4 which in turn may be supported by any suitable foundation means.

A vertically extending rear wall 6 extends transversely between the side walls 2, as does a bottom wall 8. These walls 8 and 6 are formed to provide a stock inlet 10. Means, indicated by 12, is provided for excess stock for recirculation, or other purposes, as maybe desired. Stock will be supplied the inlet at a desired constant gallonage.

A forward wall 14 extends between the side walls 2, and has a lower flexible slice portion 16 formed to provide a lip 18. The wall 8 extends forwardly to provide an apron portion 20, disposed below and adjacent said lip.

Rods 22 are pivoted to brackets 24 which are secured in spaced relation along the slice lip 18, and have upper threaded ends in engagement with hand wheels 26 which are rotatable relative to a transversely extending beam 28. The beam 28 is slidable up and down on brackets 30 which are secured to the walls 2, by mechanism enclosed in a housing indicated by 32, and operable by a hand wheel 34.

The slice arrangement shown is well known in the art. By adjusting the slice lip up and down, the stock outlet may be varied for the flow of stock onto a Fourdrinier wire 36 supported by a breast roll 38. Any well known form of slice may be employed for providing the adjustable stock outlet.

A top plate 40 is secured to upper portions of the side walls 2, and the walls 6 and 14 extend upwardly thereto so as to provide a closed head box. Such is in lieu of an open head box which must extend upwardly vertically for a considerable height in order to obtain such a head of stock as will provide the desired velocity of stock from the outlet. The top plate 40 may be provided with one or more covered access openings and the side walls may be provided with one or more windows, indicated by 42, so that stock in the head box may be observed.

A U shaped elongated outer wall member 44 is supported by a bracket 46 secured to one side wall 2, and its opposite vertical side edges are secured to said outer side wall 2. A cap 48 is secured to the upper end of the wall member. Thus, there is provided a vertically extending closed chamber, at a side of the wall 2.

The walls 6, 8 and 14, as well as the member 44, bracket 46 and cap 48, may be secured to the side walls by welding, or in any other desired manner.

An air supply pipe is connected to the head box as by a pipe 60, extending to the rear wall 6. Said pipe 60 may extend from an air compressor or pump or such apparatus as will supply air to the head box at a desired constant rate of flow and at a desired pressure.

An air discharge pipe 62 extends from the head box, and is connected to the wall 6. The air supply pipe 60, and air discharge pipe 62 may be related as desired and, for illustrative purposes, are connected to the rear wall 6, as shown.

The air discharge pipe has associated therewith pneumatically operated discharge valve means, indicated by 64, which is under the control of and is operated by sensing valve mechanism 66 disposed with the chamber 50.

The air discharge means and the sensing valve may take any form desired, but forms thereof, suitable for the practice of the invention, will be described for purposes of disclosure in connection with Fig. 4.

The sensing valve 66 in chamber 50 includes a body 68 having an inlet 70 and an outlet 72. A plug 74 oscillatable in the body is provided with a passageway 76, and an external operating arm 78 is fixed to the plug 74.

The discharge valve means 64 includes a housing 80 having a flexible diaphragm 82 therewithin. The casing is connected by a tube 84 to a body 86, and the diaphragm 82 is connected by a rod 88 to a plug 90 in said body.

An air supply line 92 is provided which is connected to the housing 80, and to the inlet 70 of the sensing valve 66. Air will be supplied at relatively low pressure, say from twelve to twenty pounds p.s.i.

For purposes of disclosure, the plug 74 of the sensing valve is shown in partially open position so that air flows through the valve and out the outlet 72 to the atmosphere. The air discharge means 64 is not operable by the pressure indicated, since air flows through the sensing valve.

When the plug 74 of valve 66 is turned clockwise so as to restrict the flow of air through said valve, the pressure in line 92 becomes such as to act on the diaphragm 82 and move the plug 90 towards its seat and restrict the discharge of air through pipe 62 and from the head box. The sensing valve in its operation controls the operation of the air discharge means which controls air discharge from the head box. In other words, the air discharge valve is under the control of and responsive to the sensing valve.

The line 94 of Fig. 2 may indicate a desired operating level of stock in the head box, and variations in said level

bring about operation of the sensing valve for actuating the air discharge means.

The wall 2 is provided with lower opening and upper openings 96 and 98 into the chamber 50, whereby stock will be of the same level in the chamber as in the head box.

A weight 100 in the chamber 50 is suspended by a spring 102 which is connected at its lower end to a rod 104 of the weight. The upper end of said spring is connected to an eye 106 of the cap 48. A disc 108 is secured to the lower end of the rod 104.

The parts are so arranged and related that, as the level of stock in the head box and chamber 50 raises and lowers, the weight 100 is accordingly moved up and down. The sensing mechanism, being disposed in the chamber, which is in communication with the head box, is not subjected to turbulence of the stock as may prevail in the head box. The disc 108 functions to dampen and stabilize the action of the mechanism.

The weight, which is operable by the level of stock, is preferable to a buoyant component, such as a float. A float would have a tendency to dance on slight stock tubulences, whereas the weight is more stable, and is operable by the changing stock level rather than by tubulences.

The arm 78 of the sensing valve 66 has the upper end of a connecting link 112 pivoted thereto at 112. The lower end of said link 112 is pivoted at 114 to a member 116 fixed to the weight rod 104.

As the level of stock in the head box increases from a predetermined desired normal, the sensing valve plug is moved in valve closing direction. As the stock level decreases, said plug is moved in valve opening direction. Thus are brought about closing and opening movements of the air discharge means.

In operation of the apparatus, paper making stock is supplied the inlet 10 of the head box at a predetermined constant gallonage by a fan pump, or the like. Simultaneously therewith, air, under predetermined pressure and at a constant rate of flow, is supplied the head box through pipe 60. The sensing valve is subjected to air pressure which is not sufficient at the air discharge means to operate it, under normal operating conditions.

The lip 18 of the slice is adjusted and gradually closed to restrict the flow of stock from the outlet, and unto the wire. Thereby, the level of stock in the head box rises with an increase of pressure within the box, and results in increasing velocity of stock from the outlet.

As the stock attains a predetermined level, the plug of the sensing valve assumes a closing position so that pressure in line 92 acts on the diaphragm of the air discharge means to throttle the discharge of air from the head box. There results an increase of air pressure within the head box.

As the plug of the sensing valve moves from a position where pressure flows therethrough to atmosphere, and in closing direction it restricts the flow of pressure. The pressure then increases in connection 92, and is sufficient to actuate diaphragm of the air discharge means and move the plug 90 in closing direction to restrict the discharge of air from the head box. As the level of stock in the head box decreases, the sensing valve operates the air discharge mechanism so that pressure within the head box is reduced.

A transparent tube 120 extends vertically and has its lower end connected to the lower portion of the chamber 50. Said tube may be calibrated in such a manner as a hydrostatic gauge to visually indicate pressure conditions within the head box.

The sensing valve is operated by displacement of the spring supported weight, and the parts are so arranged that changes in stock level are sensed by the sensing valve which controls the air discharge valve to the end that pressure on the stock in the head box is related to the

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level of stock whereby a predetermined level of stock and stock velocity at the outlet may be maintained for a certain speed of wire, stock characteristics and other variables.

The sensing mechanism being located within the chamber is not influenced by such surface turbulence of the stock as may exist in the headbox. The mechanism being subject to a displacement by stock in the chamber, the mechanism is more efficient in operation than would be the case were operation of the sensing device dependent upon a buoyant component.

Without further analysis, the foregoing is intended to so fully reveal the gist of my invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention, and therefore, such adaptations should and are intended to be comprehended within the meaning range of equivalence of the claim below.

Accordingly, limitation of this invention should be made only as determined by a proper interpretation of the terms used in the subjoined claim.

What it is desired to claim and secure by Letters Patent of the United States is:

Paper making apparatus comprising, opposite and adjacent walls forming a closed head box having an inlet for stock and an adjustable outlet for the flow of stock onto a forming element, air inlet means for a flow of air under pressure into said head box, discharge means for

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discharging air from said head box to the atmosphere including a pneumatically operated valve operable as air pressure is applied thereto to restrict the flow of air out said discharge means, a closed chamber in vertically disposed relation adjacent a wall of said head box and provided with openings into said closed chamber whereby the level of stock in said closed chamber corresponds to the level thereof in said head box, a sensing valve in said closed chamber having an air outlet to atmosphere and an inlet for air under pressure and provided with a movable plug to control the flow of air from said inlet to said outlet, connections for air under pressure to said pneumatically operated valve and sensing valve, actuating means in said closed chamber operably connected to said plug operable by the level of stock in said closed chamber and including a weight suspended by a spring from a part of said closed chamber and a rod connecting said weight and plug of said sensing valve whereby as the stock level increases the flow of air to atmosphere is restricted so that air pressure to said pneumatically operated valve is increased to restrict the discharge of air from said head box.

References Cited in the file of this patent

UNITED STATES PATENTS

2,736,246 Crittenden et al. ----- Feb. 28, 1956

FOREIGN PATENTS

762,242 Great Britain ----- Nov. 28, 1956