April 10, 1973 J. H. DUPASQUIER 3,726,757

COMPOSITE MULTIPLE AND INCREMENTALLY CONTROLLED STEAM CHAMBER FOR APPLYING DRIED STEAM TO A PULP MAT

Filed June 28, 1971 2 Sheets-Sheet 1

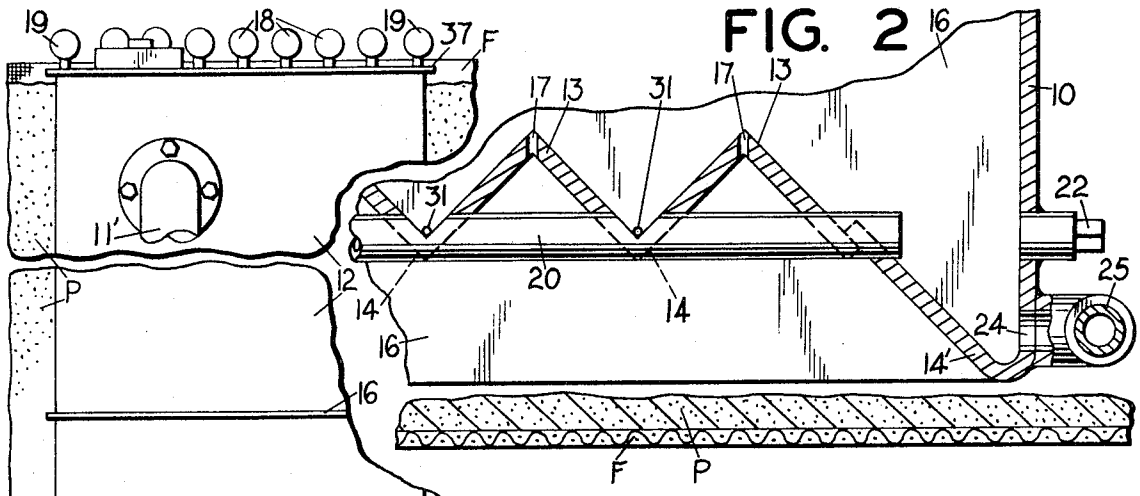


FIG. 2

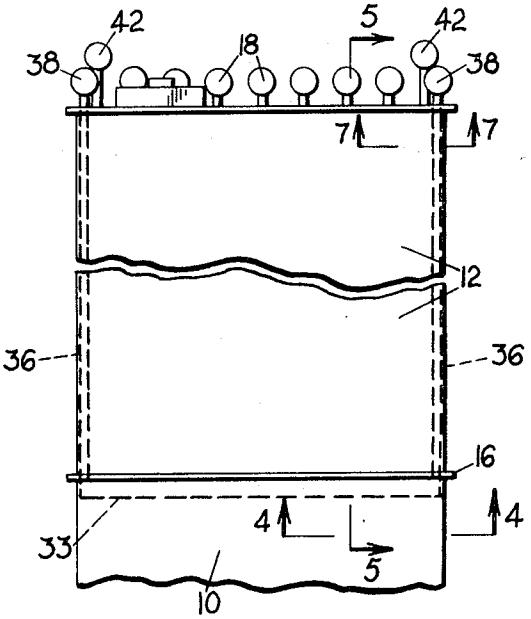


FIG. 3

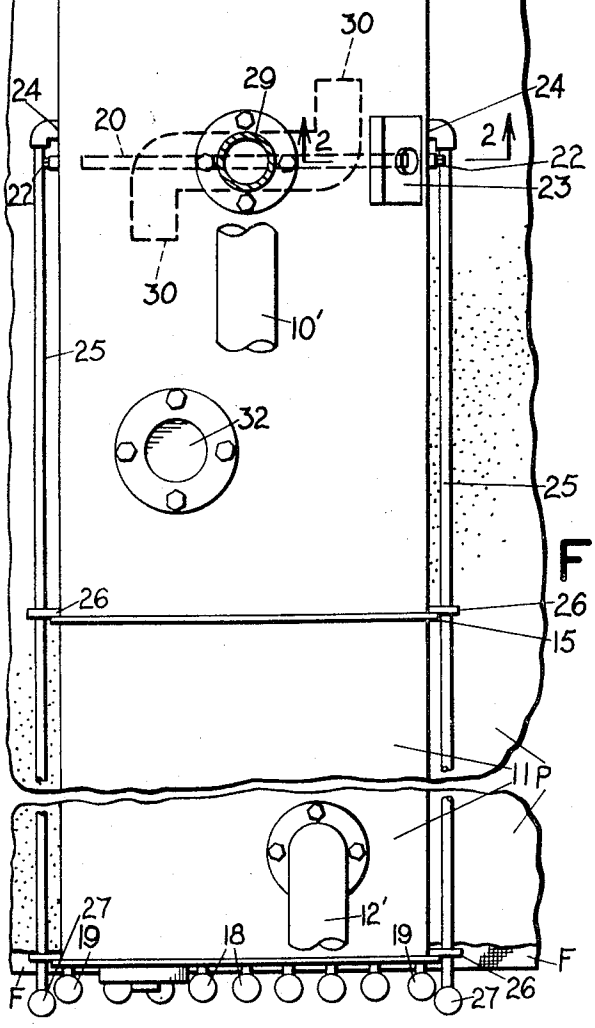


FIG. 1

JOSEPH H. DUPASQUIER
INVENTOR.

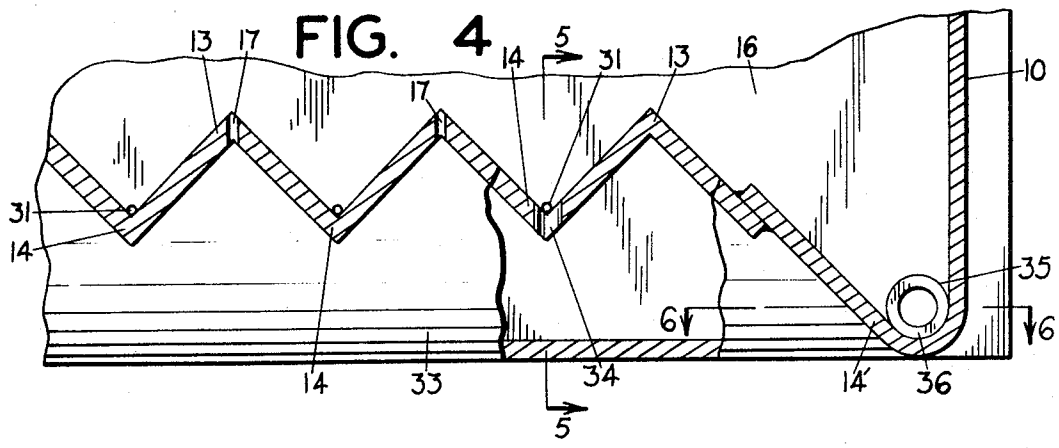
BY F. R. Geiler.
ATTY.

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FIG. 4



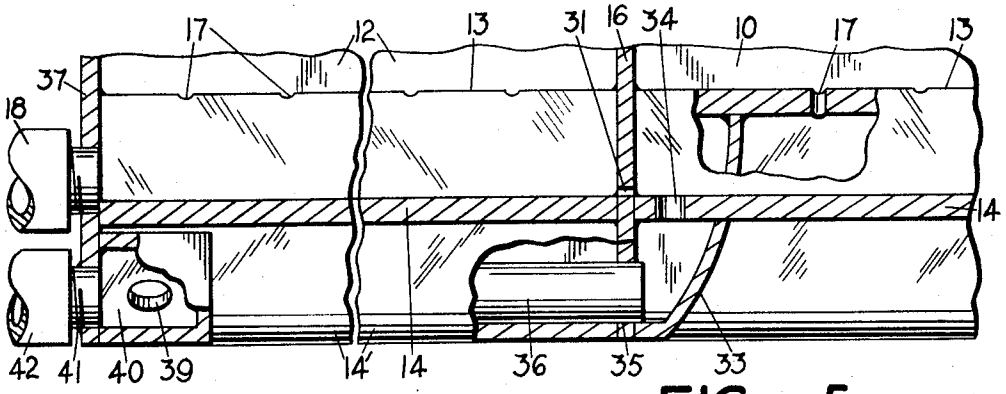


FIG. 5

FIG. 6

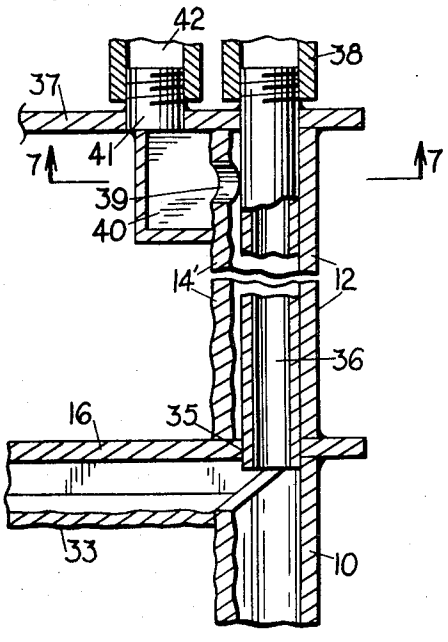
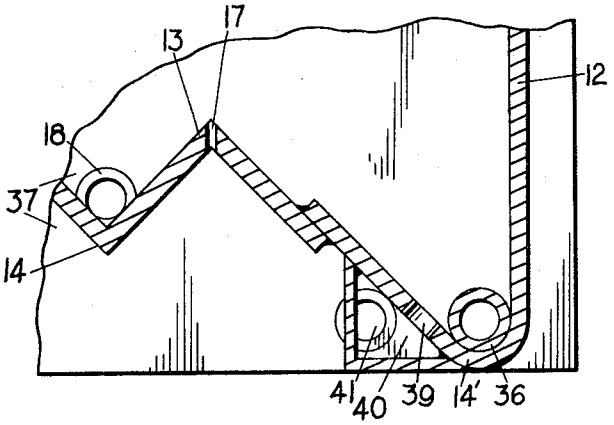


FIG. 7



JOSEPH H. DUPASQUIER
INVENTOR.

BY L. D. Geiler
ATTY.

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3,726,757

COMPOSITE MULTIPLE AND INCREMENTALLY CONTROLLED STEAM CHAMBER FOR APPLYING DRIED STEAM TO A PULP MAT

Joseph H. Dupasquier, 5855 NW. Skyline Drive, West Linn, Oreg. 97068

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Int. Cl. D21f 5/18
U.S. Cl. 162—290 1 Claim

ABSTRACT OF THE DISCLOSURE

A composite steam chamber extending transversely above a pulp mat for discharging steam down onto the mat; the composite chamber formed of separate individual chambers secured together including one or more central or inner chambers and an end chamber at each end of the composite structure; means for separately delivering steam into each individual chamber; each individual chamber having a bottom wall formed into ridges and valleys extending from one end wall of the chamber to the other, with steam jet orifices in the ridges; and means for drawing off moisture collecting in the valleys of each individual chamber.

BACKGROUND OF THE INVENTION

U.S. Pat. No. 2,838,982, issued June 17, 1958, describes an apparatus for applying dried steam down onto a traveling pulp mat in order to aid in the evaporating of water from the pulp mat. The device of the present invention is very similar to that of this earlier patent. However, particularly when a pulp mat is of considerable width, with the well-known tendency of the edge portions of the traveling pulp mat to lose moisture more rapidly than the center portion, it is most desirable to be able to control the application of the steam to the mat proportionately across the respective areas of the mat instead of applying the steam equally over the entire mat as provided in the device of Pat. No. 2,838,982. Accordingly, the object of the present invention is to provide an apparatus for discharging dry steam down onto the mat, which apparatus will be composed of separate steam chambers, each separately and independently controlled, and so arranged that a desired proportionately greater amount of steam can be applied to the center portions of the mat than to the edge portions.

SUMMARY OF THE INVENTION

The device is formed of a plurality of individual steam chambers, secured end-to-end so as to form a composite device extending transversely over the entire pulp mat passing beneath the device. The individual steam chambers are similar, being of the same width and transverse cross-section, with each chamber having a bottom wall formed into ridges and valleys, similar to the bottom wall in the device of the above mentioned U.S. Pat. No. 2,838,982, and thus with the steam from each chamber being discharged from orifices in the ridges in the bottom wall while the moisture from the steam in each chamber is collected in the valleys between the ridges. Means are provided for draining off the moisture collected in the valleys of the chambers separately, and the delivery of steam into the separate chambers is also separately controlled. The end chambers of the composite device are so arranged that the desired proportionately less steam can be discharged down on the edge portions of the pulp mat and a greater amount of steam discharged down on the center portion of the mat where most needed.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a foreshortened top plan view of a composite steam chamber built in accordance with the present invention, comprising an inner chamber and two end chambers, the composite device extending transversely above a traveling pulp mat;

FIG. 2 is a fragmentary sectional elevation taken on line 2—2 of FIG. 1, drawn to a considerably enlarged scale;

FIG. 3 is a foreshortened top plan view, similar in part to FIG. 1, of one of the end chambers of the composite device, but illustrating in part a modified construction of the device;

FIG. 4 is a fragmentary sectional elevation on line 4—4 of FIG. 3, drawn to the same scale as FIG. 2, with a portion of the transverse trough in the end of the inner chamber broken away for clarity;

FIG. 5 is a fragmentary and foreshortened longitudinal sectional elevation taken on line 5—5 of FIG. 3 and FIG. 4, drawn to the same scale as FIG. 4, with portions broken away for clarity;

FIG. 6 is a fragmentary section taken on line 6—6 of FIG. 4; and

FIG. 7 is a fragmentary section taken on line 7—7 of FIG. 6.

Referring first to FIG. 1, the composite steam-applying apparatus as illustrated consists of three separate closed chambers, namely an inner chamber **10** and two end chambers **11** and **12**, the end chambers secured to the ends of the inner chamber **10** respectively. All three chambers are identical in cross-sectional shape and size and together form a stationary composite apparatus extending entirely across the traveling pulp mat P, the apparatus being supported by suitable means (not shown) with the bottom of the apparatus spaced slightly above the pulp mat, which mat is carried along the Fourdrinier wire F of the paper-making machine in the customary manner.

The bottom wall of each of the chambers **10**, **11** and **12**, like the bottom wall of the steam-applying device of the above mentioned U.S. Pat. No. 2,838,982, is formed into a series of V-shaped sections forming alternate ridges **13** and valleys **14** (see FIG. 2) extending from one end of each chamber to the other, the ridges lying in a substantially horizontal plane parallel to the Fourdrinier wire and the valleys **14** similarly lying in a horizontal plane except that the valley **14'** at each side of each chamber is located below the level of the other valleys and extends to the plane of the bottom edge of the longitudinal side wall and the bottom edges of the end walls of the entire device. The ridges and valleys of all the chambers **10**, **11** and **12** preferably are in alignment respectively. The end chambers **11** and **12** are secured to the inner chamber **10**, preferably by having their inner end walls omitted and being welded instead to the respective end walls **15** and **16** of the inner chamber **10**.

Along each of the top ridges **13** of the bottom walls of the three chambers a plurality of spaced orifices **17** are provided through which steam jets are directed down onto the pulp mat. In the two end chambers **11** and **12** the valleys **14** have drain outlets in the outer end walls which are controlled by drain taps **18** (FIG. 1) on the outside of the end walls, and similarly the lower valleys **14'** in these two chambers are drained through drain taps **19**.

In the form of the device shown in FIGS. 1 and 2, the valleys **14** of the bottom wall of the inner chamber **10** are drained by a central transverse cut-away pipe or trough **20** which intercepts the valleys. The ends of this

cross pipe **20** terminate in and discharge into the lower valleys **14'** on the opposite sides of the chamber **10** respectively, one of these ends being shown in FIG. 2. A cleanout plug **22** (one of which is shown more clearly in FIG. 2) is provided in each of the sides of the chamber wall in axial alignment with the corresponding end of pipe **20** as a convenience in aiding in the cleaning of the pipe **20** if for any reason this should becomes necessary. A sealed and locked inspection plate **23** and vacuum breaker (FIG. 1) is located in the upper side wall of the chamber **10**. In order to drain off the water collected in the lower valleys **14'** along each side of the inner chamber **10** and any water discharged into these valleys from the cross pipe **20**, and therewith from the valleys **14** of the inner chamber **10**, an outlet **24** is provided at the bottom of each side wall of the chamber **10** in the location shown in FIGS. 1 and 2. Each of these outlets is connected to a pipe **25** which extends longitudinally along on the outside of the chamber and continues along the outside of an end chamber (in this case end chamber **11**, as shown in FIG. 1), to an outer end of the device, these pipes being supported by suitable brackets **26**. A drain tap **27** is located at the end of each of these outside pipes.

Steam under pressure from a suitable source (not shown) is delivered by a pipe **10'** through an inlet **29** (FIG. 1) preferably at the center of the top of the chamber **10** and is discharged throughout the interior of chamber **10**, preferably through the intermediary of a pair of oppositely-directed nozzles in the chamber (indicated by the broken lines **30** in FIG. 1). Also steam from the suitable source is delivered into the chambers **11** and **12** through the pipes **11'** and **12'**. Suitable controls (not shown) are provided on each of the pipes **10'**, **11'** and **12'**.

Preferably, but not necessarily, a small orifice **31** (FIG. 2) extends through each end wall of chamber **10** at the termination of each valley **14** to allow some moisture at that end of the valley and a small amount of steam to be discharged into the adjacent chamber. The chamber **10** is provided with a safety blowout disc **32** to serve in the event that steam pressure in chamber **10** should for any reason build up in excess of the desired safety range. A pressure gauge (not shown) is also mounted on each of the chambers **10**, **11** and **12**. The end chambers **11** and **12** are also similarly provided with inspection plates and blowout discs (not shown).

Thus the dried steam, discharged down on the pulp mat passing along beneath the device or composite steam chamber, may be delivered proportionately on the pulp mat as desired with the greater amount delivered on the central portion of the mat where it is most needed, and with predetermined lesser amounts delivered down onto the edge portions as circumstances may require in order to aid in causing more uniform drying of the traveling mat across its entire width.

While the device is described as composed of a single inner chamber and two end chambers, it would be possible to have two inner chambers, joined end-to-end, with the two end chambers connected respectively to the outer ends of these two inner chambers. However, for all practical purposes, even for wide pulp mats, it has been found sufficient and satisfactory to have a single inner chamber and two end chambers, substantially as shown, with the length of the device made according to the particular paper-making machine and width of the pulp mat on which the device is to be used, and with the individual chambers made of various lengths as required. Also, it would be possible to have the inner end walls left on the end chambers **11** and **12** and to have the extending flanges of these walls bolted to the extending flanges of the end walls of the inner chamber **10**, with suitable sealing gaskets therebetween, instead of having the end chambers welded to the end walls of the inner chamber **10**. However, it is considered preferable and more practical to have the end chambers welded to the end walls of the inner chamber as described since ordinarily the device will be manufactured specifically to suit a particular paper-making machine, and for permanent mounting thereon.

FIGS. 3 to 7 inclusive illustrate a modification in the construction of the device in which a transversely-extending trough at one end of the inner chamber **10** is used for disposing of the water collecting in the valleys **14** at the bottom of that chamber, in place of the cross pipe **20** previously described with reference to FIGS. 1 and 2. This transverse end trough (shown best in FIGS. 4 and 5) is formed by the end wall **16** of the chamber **10** and a downwardly sloping baffle wall **33** which slopes downwardly toward the end wall **16** and at the bottom is joined to the bottom of the end wall **16**. The top edge of this trough wall **33** conforms to the ridges **13** and valleys **14** forming the bottom of the chamber **10**.

A drain opening **34** (FIGS. 4 and 5) in each of the valleys **14** of the chamber **10** is located near the end wall **16** of the chamber within the trough wall **33** so that any water collecting in the valleys **14** in the chamber **10** will pass down into the bottom of the trough thus formed.

In this modified form the end wall **16** of the chamber **10** is provided with a bottom aperture **35** at the end of each of the two lower side valleys **14'**, one of these apertures **35** being shown in FIGS. 4, 5 and 6. A pair of drain pipes **36**, one of which is shown in the drawings, extending respectively along the corresponding lower side valleys **14'** in the end chamber **12**, have their inner ends extending through the corresponding bottom aperture **35** in the wall **16** of the chamber **10**, and, as apparent from FIG. 6, carry off the water collected in the transverse trough at the end wall **16** of the chamber and in the lower side valleys **14'** of the chamber **10**. Each of these pipes **36** extends out through an aperture formed in the outer end wall **37** of the end chamber **12** and is controlled by a suitable drain tap **38**. Thus, with this modified construction, all the water collected from the steam in the inner chamber **10** can be drawn off through the two pipes **36** which extend through the end chamber **12** and it is not necessary to have any external drain pipe for the inner chamber **10**.

As previously mentioned, each of the valleys **14** of the end chambers **11** and **12** is drained through a drain tap **18** on the outer end wall. In order to provide for drainage of the lower bottom side valleys **14'** in the end chamber **12** with this modified construction, without interfering with the drain pipes **36** from the inner chamber, an inside opening **39** near the outer end of each of the side valleys **14'** for the end chamber **12** leads into a small, closed compartment **40** which in turn discharges through an aperture **41** in the outer end wall **37** of the chamber **12** and is controlled by a drain tap **42**, as shown in FIGS. 7 and 3. Only one of these end drainage compartments **40** is shown in the figures, but it is to be understood that the drainage compartment for the other lower side valley **14'** for the chamber **12** is similarly arranged.

It will be possible, as previously mentioned, to have the device composed of two inner chambers, joined end-to-end with two end chambers connected to the respective outer ends of the two inner chambers. In such case, with the employment of the modified drainage means, each of the inner chambers would have a transverse drainage trough at its outer end which would discharge through a pair of pipes located in the lower side valleys **14'** of the adjacent end chamber. However, also as previously indicated, the forming of the composite steam chamber with a single inner chamber and a pair of independently controlled end chambers is considered adequate for any paper-making machine of present use.

In either case the incremental design and construction of the device makes it possible to apply the steam proportionately as needed and thereby constitutes a moisture profile control.

I claim:

1. In a paper-making machine in which a pulp mat is carried along on a Fourdrinier wire, a device positioned above the Fourdrinier wire and extending transversely

from one side of the wire to the other for discharging relatively dry steam down onto the pulp mat, said device comprising a plurality of separate steam chambers with means for delivering steam under desired pressures separately into each chamber, said chambers being of the same width and secured end-to-end, the bottom walls of said chambers being formed into a series of ridges and valleys extending from one end of each chamber to the other, said ridges and said valleys extending in planes parallel to said Fourdrinier wire, the ridges and valleys of said bottom walls of said chambers being in alignment respectively, the valleys at the side walls of said chambers lying in a plane slightly lower than the plane of the other valleys, each of said ridges in said bottom walls of said chambers having a row of steam jet openings discharging downwardly onto said pulp mat, said chambers at the two ends of said device being similar, drains for said valleys in said bottom walls of said two end chambers mounted in the respective outer end walls of said end chambers, an inner chamber in said device located inwardly of an end chamber, a transversely-extending trough in the end of said inner chamber, said trough formed by a downward, obliquely-sloping wall joining the bottom edge of an end wall of said inner chamber, the top edge of said downward, obliquely-sloping wall conforming to the ridges and valleys in the bottom of said inner chamber, said valleys in said inner chamber, with the exception of the two lower valleys at the sides of said inner chamber, having discharge outlets opening into said trough, means defining a pair of outlet apertures in said end wall of said inner chamber at the ends of the lower side valleys respectively of said inner chamber, and a pair of drain pipes extending along in the side valleys of an adjacent end chamber and leading from said outlet apertures respectively, the outer ends of said drain pipes extending through the outer end wall of said latter mentioned end chamber, and a drain tap at the outer end of each of said drain pipes.

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S. LEON BASHORE, Primary Examiner

R. V. FISHER, Assistant Examiner

U.S. Cl. X.R.

34—155; 162—308, 309; 165—111