Feb. 18, 1969 J. A. VILLALOBOS 3,427,727

VENTILATING APPARATUS FOR PAPER MACHINE POCKET

Filed Jan. 3, 1966 Sheet 1 of 2

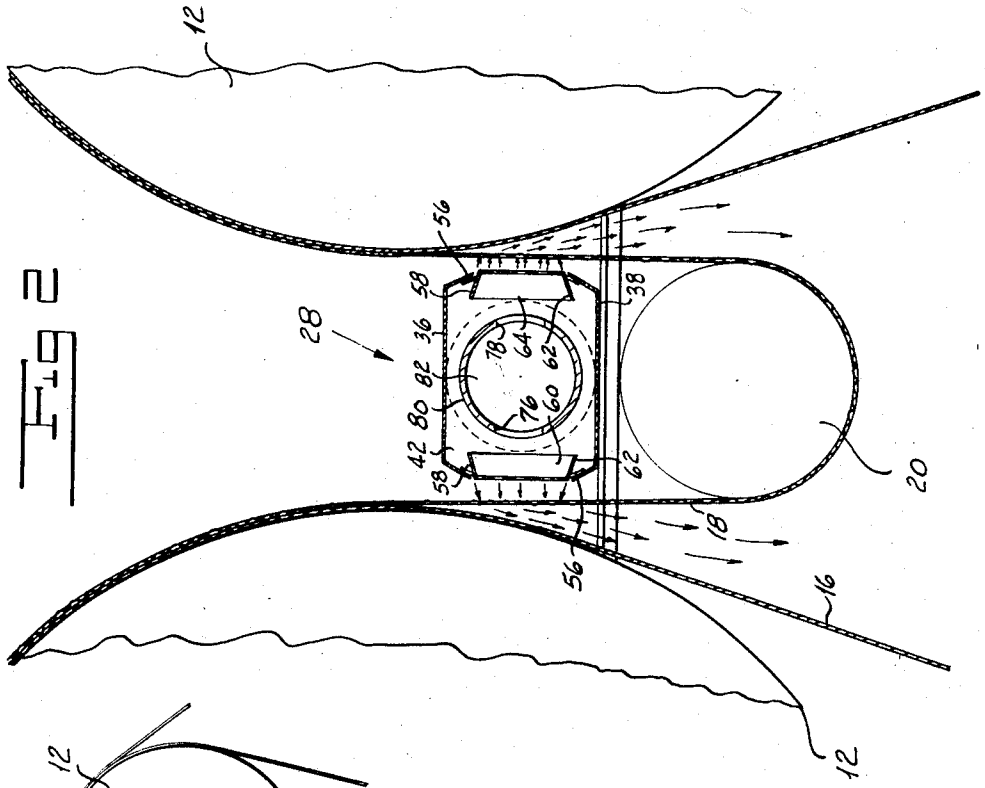


FIG. 2

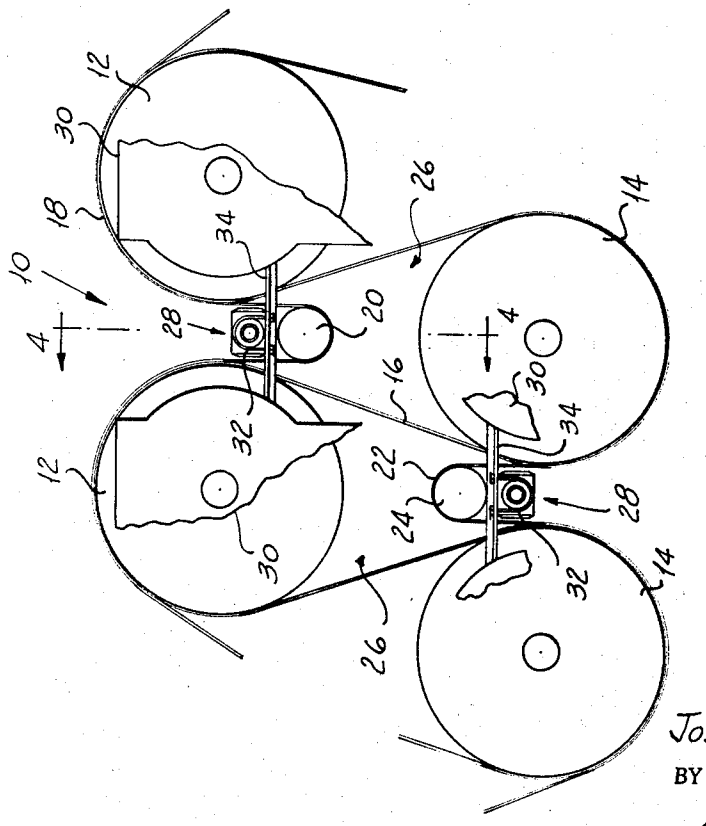


FIG. 1

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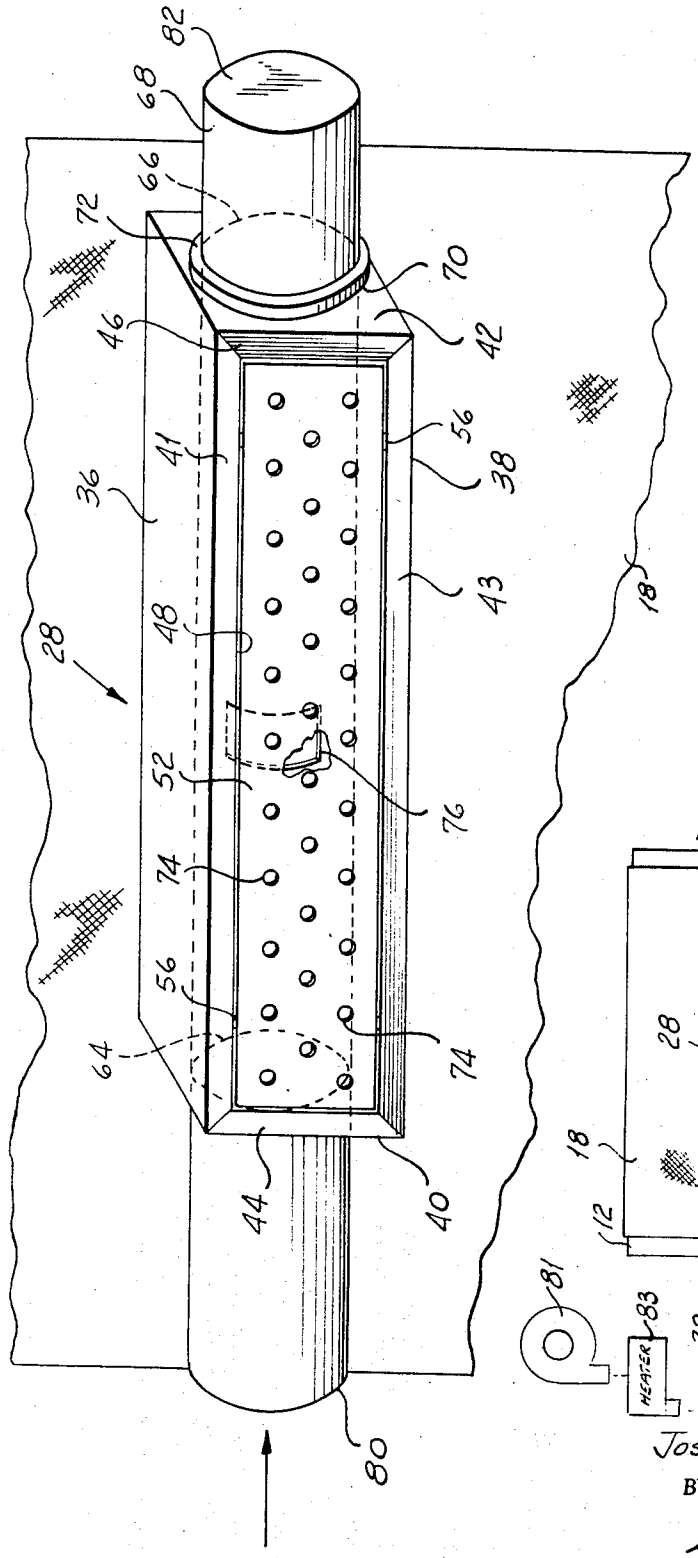


FIG. 3

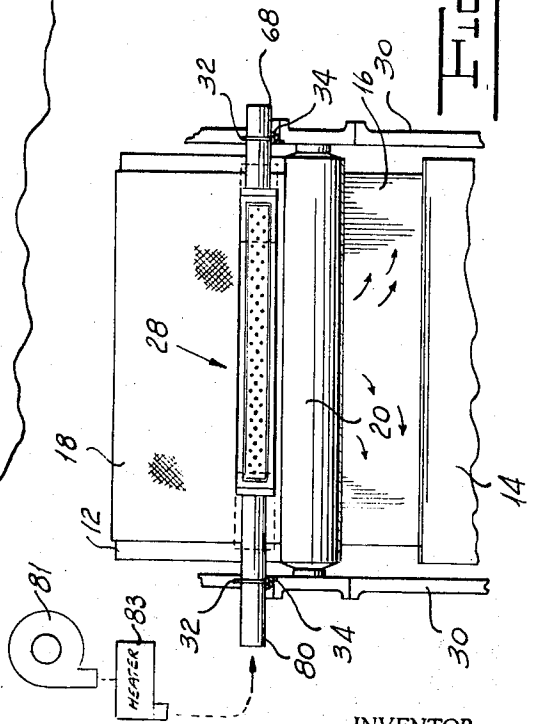


FIG. 4

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VENTILATING APPARATUS FOR PAPER MACHINE POCKET

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U.S. Cl. 34—155 11 Claims
Int. Cl. F26b *13/00*

ABSTRACT OF THE DISCLOSURE

Ventilating apparatus for the pocket of a paper machine having a felt made of relatively highly gas permeable material in which a plenum chamber mounted outside the pocket adjacent a wall of the pocket formed by the felt includes a perforated plate through which relatively low pressure air passes toward and through the felt and an elongated nozzle extending substantially continuously around the perforated plate forms a curtain of air which forms a seal around the area of the pocket wall supplied by the perforated plate to prevent escape of the low pressure air.

My invention relates to ventilating apparatus for relatively inaccessible locations and more particularly to an improved low pressure apparatus for ventilating a paper machine dryer pocket, which apparatus has a long life and which is economical as compared with ventilating apparatus of the prior art.

For effective operation of the drying section of a paper or board-making machine, it is essential that the moisture removed from the sheet during the drying operation be carried away from the dryer. It is usual to provide the dryer with a hood through which hot air is circulated to carry off moisture generated during the drying operation. While the dryer hood is generally effective for this purpose, it does not satisfactorily remove moisture which is trapped in relatively inaccessible spaces within the dryer. Such spaces or "pockets" are formed, for example, by the lengths of the paper web extending between the upper and lower dryer rolls and the portions of the felts extending from the dryer rolls to the felt rolls.

Various attempts have been made in the prior art to remove moisture from the pocket. For example, in one system heated air at a relatively high pressure is forced radially outwardly of the dryer roll through the machine felt and into the pocket. This system requires a source of high pressure air as well as seals between relatively movable parts. Such an arrangement obviously adds appreciably to the cost of the installation.

Other systems have been proposed wherein air is directed into the pocket from an end at one side of the machine. While satisfactory in some instances, these systems are unsatisfactory for others in that they produce uneven drying.

I have invented ventilating apparatus which effectively removes moisture from a relatively inaccessible space such, for example, as the pocket of a paper machine dryer. My apparatus does not require high pressure air. It promotes even drying of the sheet. My system has a relatively long life. It is effective, efficient and economical. My apparatus does not involve any physical contact between relatively moving parts.

One object of my invention is to provide ventilating apparatus for efficiently and effectively removing moisture from the pocket of a paper machine dryer.

Another object of my invention is to provide a dryer pocket ventilating apparatus which does not require high pressure air.

Still another object of my invention is to provide

ventilating apparatus for removing moisture from a paper machine pocket which is economical in construction and in operation.

Yet another object of my invention is to provide dryer pocket ventilating apparatus which promotes even drying.

A further object of my invention is to provide ventilating apparatus for a paper machine pocket, which apparatus has a long life.

A still further object of my invention is to provide ventilating apparatus for a paper machine pocket which does not involve frictional contact between relatively moving parts.

Other and further objects of my invention will appear from the following description.

In general my invention contemplates the provision of ventilating apparatus wherein a plenum chamber positioned in spaced relationship to a highly permeable dryer fabric outside the dryer pocket and supplied with relatively low pressure air has means for forming a curtain of relatively high velocity air providing an air seal with the fabric around a predetermined area to confine secondary air directed through the fabric area and into the pocket.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a schematic view of a portion of the dryer section of a paper making machine illustrating the relationship of my ventilating apparatus to other parts of the machine.

FIGURE 2 is a fragmentary elevation of a portion of the machine shown in FIGURE 1 drawn on an enlarged scale to illustrate the manner in which my apparatus supplies scavenging air to pockets of the machine.

FIGURE 3 is a perspective view of my ventilating apparatus for a paper machine pocket showing its relationship to the felt or fabric of the machine.

FIGURE 4 is a sectional view of my apparatus taken along the line **4**—**4** of FIGURE 1.

Referring now to the drawings, my ventilating apparatus is especially adapted for use with a paper machine dryer section indicated generally by the reference character **10** of a type known to the art. The dryer section **10** includes a plurality of upper dryer rolls **12** and a plurality of lower dryer rolls **14**. These dryer rolls are heated in a manner known to the art as by steam or the like to supply the heat required to remove moisture from the paper. The wet sheet or web **16** passes alternately around an upper dryer roll **12** and a lower dryer roll **14** throughout the dryer section **10** of the machine. The dryer section **10** is provided with an upper dryer felt **18** which passes over the top of a dryer roll **12**, thence down around a felt roll **20** and up over the top of the next dryer roll **12**. The lower felt **22** of the machine alternately passes under a lower dryer roll **14** and over a lower felt roll **24** throughout the dryer section of the machine.

As is known in the art, the felts **18** and **22** serve the function of holding the sheet **16** in close contact with the dryer rolls **12** and **14** as the sheet passes through the dryer section **10**. In applying my ventilating apparatus to the dryer section **10**, I employ a relatively highly permeable fabric for the felts **18** and **22**. One example of a fabric which may be employed in connection with my ventilating apparatus is an open mesh monofilament fabric having a relatively high permeability of the order of from about 100 to about 800 cubic feet per minute of air at half-inch pressure differential across the fabric.

As the web **16** passes between the upper and lower dryer rolls, it separates from the felts **18** and **22** to form

a plurality of pockets, indicated generally by the reference character **26**, along the machine. Specifically a pocket **26** is defined by the portion of the upper fabric **18** extending around the upper felt roll **20**, the lengths of the sheet **16** extending between the two upper dryer rolls **12** and the lower dryer roll **14** and the upper surface of the lower dryer roll **14**. It will readily be apparent that moisture tends to collect in the pockets **26**. For effective drying of the sheet **16** it is necessary that this moisture be removed. Attempts to remove the moisture by blowing air along the pocket from one end of the hood to the other result in uneven drying across the width of the sheet **16**. Moreover, as has been explained hereinabove, attempts to force air through the felt roll **20** intermediate the ends of the pocket require a high pressure source, mechanical air seals and makes the installation so expensive as to be prohibitive.

My ventilating system includes a plurality of units indicated generally by the reference character **28** disposed outside the pockets **26** adjacent the corresponding felt rolls **20** or **24**. I employ any suitable means for mounting the units **28** on the frame **30** of the machine. For example, I may employ U-bolts **32** secured to angle irons **34** mounted on the frame.

As is known in the art, the upper fabric or felt **18** assists in drying one side of the sheet **16** while the lower fabric or felt **22** assists in drying the other side of the sheet. I have discovered that while I need not provide one of my units **28** for every pocket **26** in the dryer section of the machine, it is necessary to distribute the units between pockets **26** associated with upper felt rolls and pockets **26** associated with lower felt rolls **24**. In this manner I balance the ventilating effect between the fabrics **18** and **22** associated with the respective sides of the sheet **16**. Owing to the fact that the construction of a unit **28** associated with an upper felt roll **20** is substantially the same as that of a unit **28** associated with a lower felt roll **24**, I will describe only a unit **28** associated with an upper felt roll **20**.

Each of the units **28** is generally boxlike in shape having a top **36**, a bottom **38** and ends **40** and **42**. I bend the longitudinal edges of both the top **36** and the bottom **38** to form flanges **41** and **43** at each side of the unit and provide similarly bent legs **44** and **46** which connect the flanges at the ends thereof. These flanges **41, 43, 44** and **46** form openings **48** in which I mount side plates **52** secured in the opening by any suitable means such as by tabs **56** secured to the underside of the corresponding flange. I provide each of the side plates **52** with inwardly directed flanges **58, 60, 62** and **64** which cooperate with the flanges **41, 43, 44** and **46** to form a generally continuous nozzle defined by the space between the edge of plate **52** and the opening **48**. It will be appreciated that the only interruptions in the nozzle are by the tabs **56** which are required to support the side plates **52**.

I provide the ends **40** and **42** with openings **64** and **66** to permit a supply pipe **68** to pass therethrough. Seals **70** surrounding the pipe **68** at each end of the unit **28** are retained in position by any appropriate means such as by flanges **72** on the end plates **40** and **42** of unit **28**. These seals **70** support the unit **28** in hermetically sealed relationship on pipe **68** while permitting it to be shifted laterally thereof. I provide each of the plates **52** and **54** with a plurality of spaced perforations **74**.

Pipe **68** has a pair of generally diametrically disposed openings **76** and **78**. I supply relatively low pressure heated air to one end **80** of the supply pipe **68** from any suitable source such as a blower **81** feeding a heater **83**. The other end of the pipe **68** carries a blank flange on plate **82** which prevents air from escaping from that end of the pipe. When air is supplied to the pipe **82**, it passes radially outwardly through openings **76** and **78** to the interior of the unit **28**. The nozzle formed by the plates **52** and the bent-over edges of the top **36** and bottom **38** produces a curtain of relatively high velocity air directed toward the surface of fabric **18**. Secondary low pressure air flows through the perforations **74** toward the fabric **18**.

I have discovered that by properly proportioning the aggregate area of the openings **74** with relation to the area of the nozzle opening formed by the plates **52**, the relatively high velocity curtain of air emanating from the nozzle forms an effective seal with the fabric **18** to confine the air flowing through the openings **74** to the area of the fabric **18** within the curtain. In an experimental installation I have made wherein the plenum formed by the chamber is 24″ long and 6″ wide with a 0.040″ slot providing a curtain about 22″ by about 4″ and with thirty-two 7/16″ holes in the side plate **52**, for example, the ratio of hole area to nozzle area is about five-to-one. It will readily be understood that this ratio will vary from installation to installation but the optimum area can readily be determined.

In operation of my ventilating apparatus for a paper machine drying pocket, I provide as many units **28** associated with either an upper felt roll **20** or a lower felt roll **24** as are necessary for effective ventilation. I then supply air at a relatively low presusre to the supply pipes **68** through the ends **80**. The closures **82** prevent escape of air through the other ends of the pipes and constrain the air supplied to the pipes to pass outwardly therethrough through the openings **76** and **78** and into the unit chamber. This air emerges through the nozzles formed by plates **52** and **54** and the bent-over edges of the top and bottom with a relatively high velocity effectively to form a seal for containing the secondary air passing through the openings **74**. Air passing through the perforations **74** within the high velocity air curtain then enters the pocket **26** through the permeable felt and then passes laterally outwardly of the pocket to the hood (not shown) of the dryer. Preferably, I make each unit of a length which is about two-thirds of the width of the fabric **18**. If for any reason it is desired to ventilate one portion of the sheet across its width more than others, I can shift the unit **28** along the pipe **68** without destroying the air seals. It is for that reason that I locate the openings **76** and **78** generally centrally of the sheet **18**. It is to be noted that my system not only does not require high pressure air but, also, it does not require any mechanical seals. Moreover, the units **28** are so positioned as to be readily accessible.

It will be seen that I have accomplished the objects of my invention. I have provided ventilating apparatus for a paper machine dryer pocket which does not require high pressure air. It does not require any mechanical air seals between parts moving relative to each other in the normal operation of the machine. It is relatively simple and inexpensive for the result achieved thereby. It promotes even drying of the sheet across the width thereof.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of my claims. It is further obvious that various changes may be made in details within the scope of my claims without departing from the spirit of my invention. It is, therefore, to be understood that my invention is not to be limited to the specific details shown and described.

Having thus described my invention, what I claim is:

1. In a paper making machine dryer having a pocket with a wall of gas permeable material extending around a roll, means located outside said pocket for directing scavenging air into said pocket over a predetermined area of said wall, means for forming a curtain of relatively high velocity air surrounding said area to confine scavenging air to said predetermined area and a source of lower velocity air for supplying air to said directing means and to said curtain-forming means.

2. In a dryer as in claim **1** including means mounting

said directing means for movement relative to said wall.

3. In a dryer as in claim 1 in which said directing means comprises a plenum chamber having a perforated wall, and in which said supplying means comprises a supply duct having an outlet in its wall and means mounting said chamber for adjustment with respect to said duct.

4. In a dryer as in claim 1 in which said directing means comprises a plenum chamber having a perforated wall and in which said curtain forming means comprises means forming an elongated nozzle surrounding said perforated wall, and in which said supplying means supplies said chamber.

5. In a dryer as in claim 4 in which said supplying means comprises a supply duct having an outlet opening and means mounting said chamber for movement relative to said outlet opening.

6. In a dryer as in claim 4 in which said perforated wall is a side wall and in which said chamber comprises top and bottom and end walls, said nozzle forming means including a peripheral flange on said perforated wall and flanges on said side and end walls.

7. In a dryer as in claim 4 in which the area of the opening of said nozzle is a predetermined fraction of the aggregate area of said wall perforations.

8. In a paper machine dryer having a pocket with spaced walls of a gas permeable material extending around a felt roll, ventilating apparatus including a plenum chamber having spaced walls, openings in said spaced chamber walls for permitting the passage of scavenging air therethrough, means mounting said plenum chamber between said pocket walls with said chamber wall openings facing said pocket walls over respective areas thereof, means for forming curtains of relatively high velocity air surrounding the respective areas to confine scavenging air to said areas, and a source of relatively lower velocity air for supply air to said chamber and said curtain forming means.

9. Ventilating apparatus as in claim 8 in which said curtain forming means comprises means forming elongated nozzles in the respective plenum chamber walls around the holes of said walls.

10. Ventilating apparatus as in claim 8 in which said air supplying means comprises a duct having respective openings associated with said chamber walls.

11. Ventilating apparatus as in claim 8 in which said air supplying means comprises a duct having an opening therein communicating with said chamber and in which said mounting means comprises seals between said chamber and said duct for adjustably mounting said chamber on said duct for relative movement with respect to said opening.

References Cited

UNITED STATES PATENTS

3,250,019	5/1966	Beachler	34—117
3,279,977	10/1966	Cirrito	34—156 XR
3,337,968	8/1967	Krikorian et al.	34—111
1,199,394	9/1916	Liebeck	34—111
1,853,408	4/1932	Crozier	158—2 XR
3,161,482	12/1964	Gschwind et al.	34—155 XR
3,263,344	8/1966	Stickle	34—122 XR
3,319,354	5/1967	Hering et al.	34—155

FOREIGN PATENTS

1,233,428	5/1960	France.
51,705	10/1932	Norway.

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