

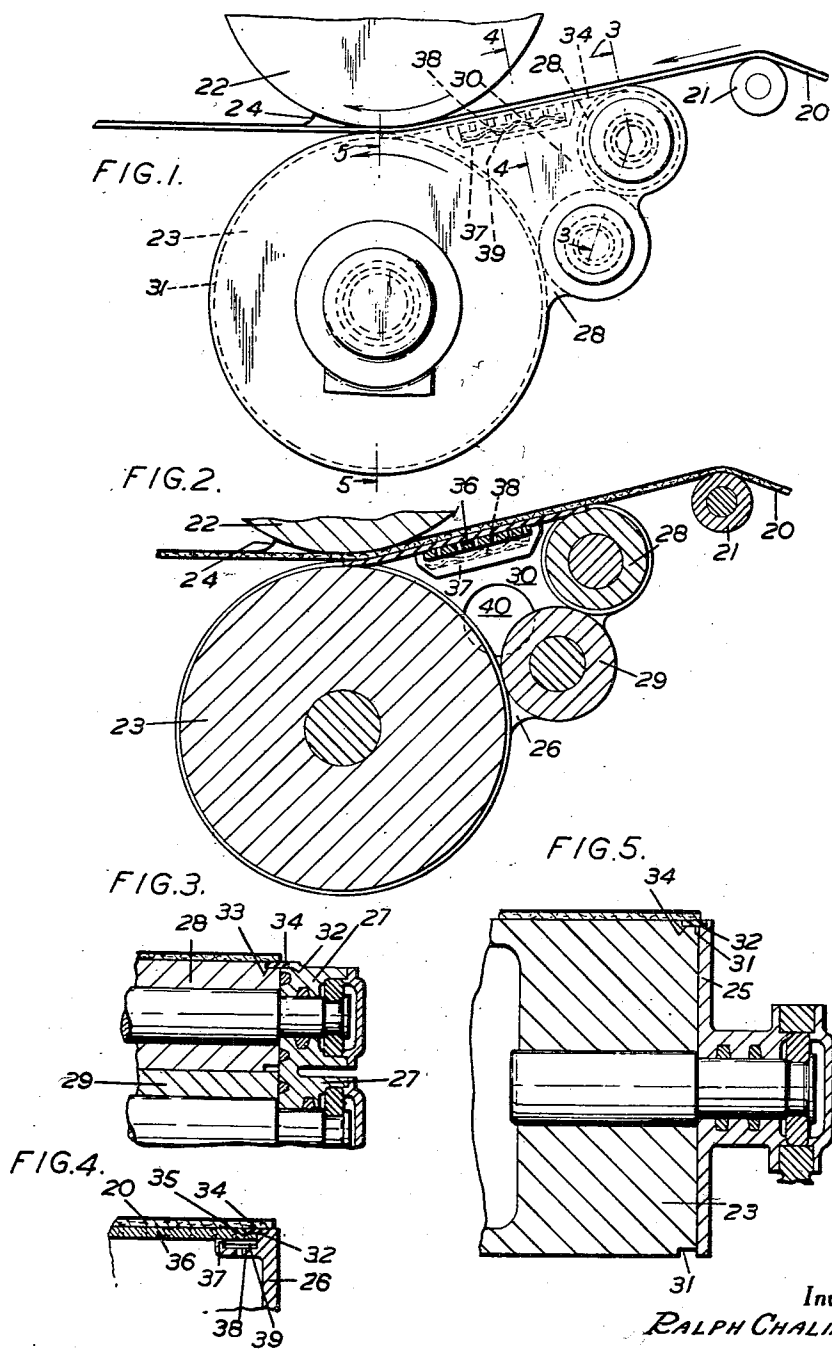
Feb. 12, 1957

R. C. HEYS  
PAPER-MAKING MACHINES

2,780,968

Filed Aug. 30, 1952

4 Sheets-Sheet 1



Inventor  
RALPH CHALINOR HEYS

The Firm of Charlesworths By

Attorneys

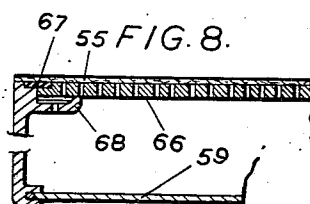
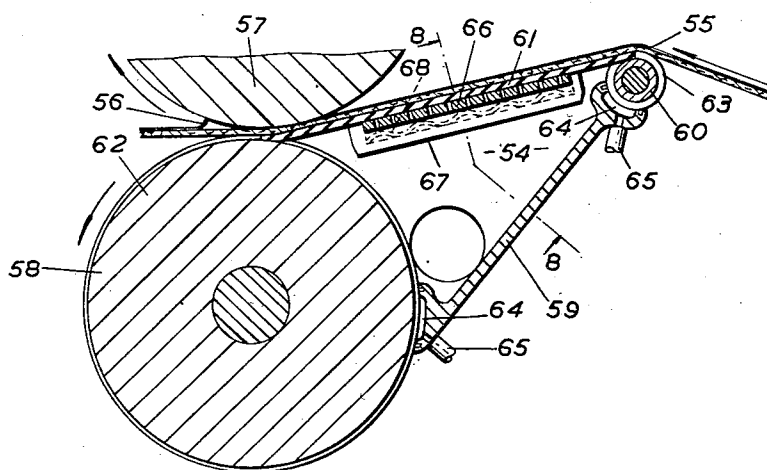
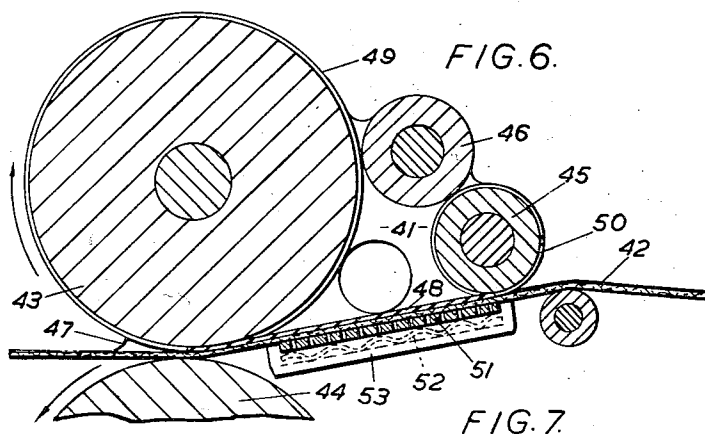
Feb. 12, 1957

R. C. HEYS  
PAPER-MAKING MACHINES

2,780,968

Filed Aug. 30, 1952

4 Sheets-Sheet 2



Inventor  
RALPH CHALINOR HEYS

The Firm of Charlesworth & Co. By

Attorneys

Feb. 12, 1957

R. C. HEYS

2,780,968

PAPER-MAKING MACHINES

Filed Aug. 30, 1952

4 Sheets-Sheet 3

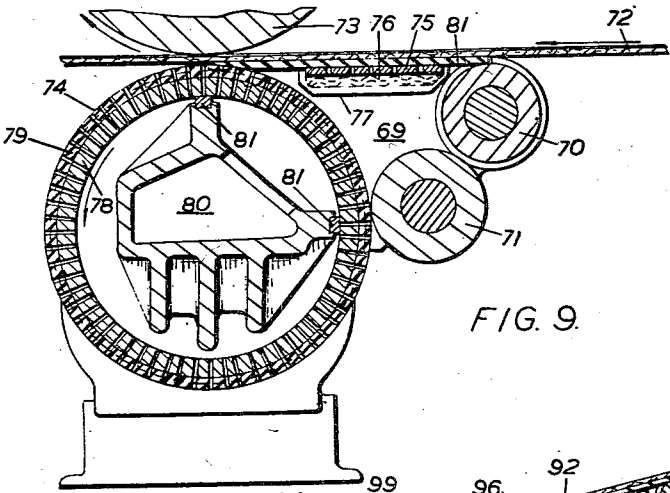


FIG. 9.

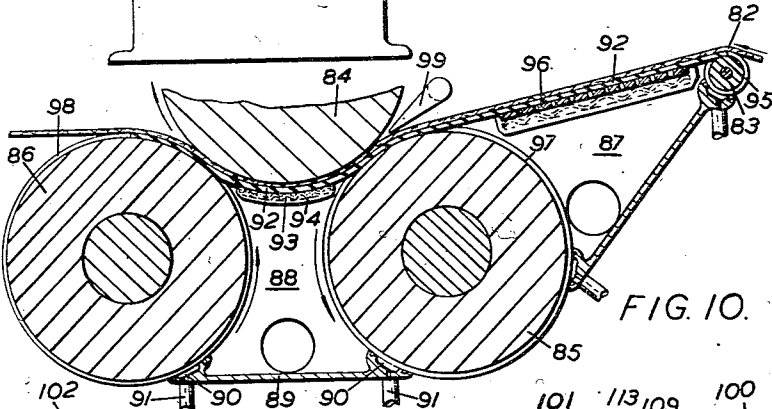


FIG. 10.

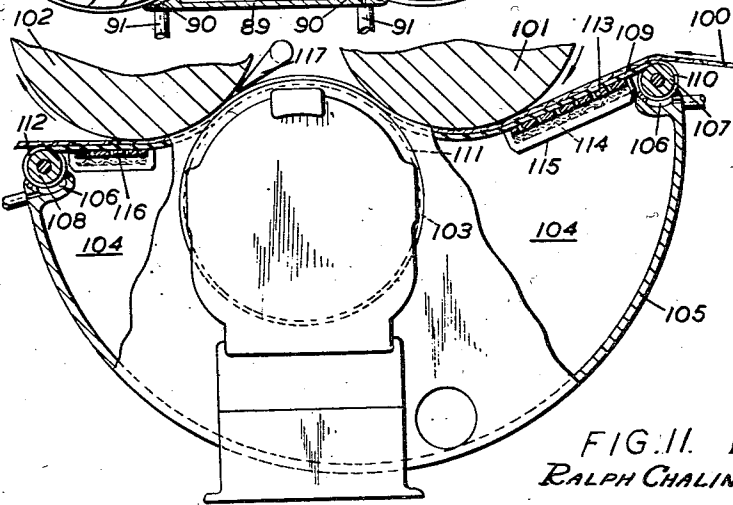


FIG. 11. Inventor  
RALPH CHALINOR HEYS

*The Firm of Charlesworth & Co.*

Attorneys

Feb. 12, 1957

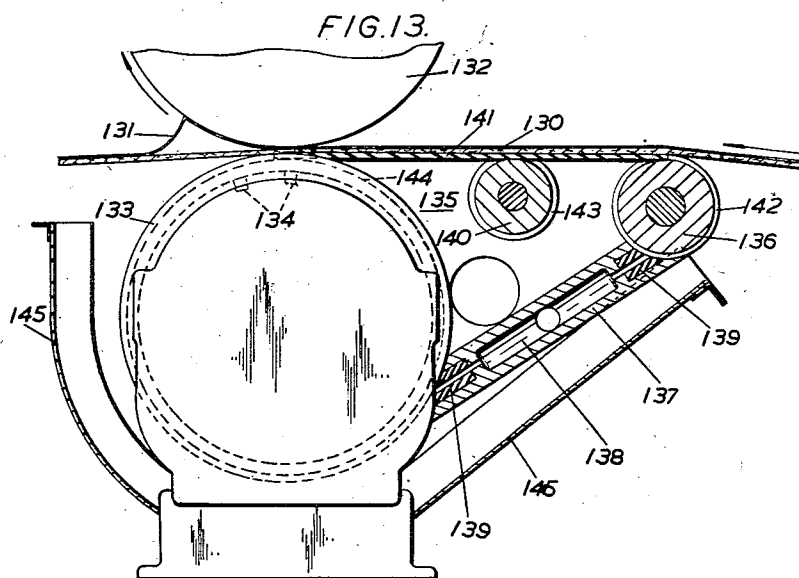
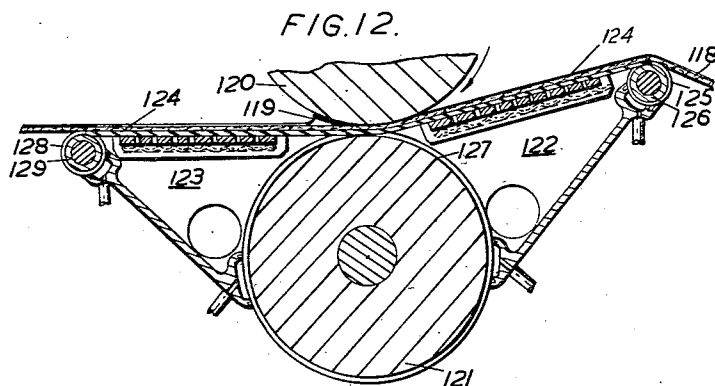
R. C. HEYS

2,780,968

PAPER-MAKING MACHINES

Filed Aug. 30, 1952

4 Sheets-Sheet 4



Inventor  
RALPH CHALINOR HEYS

*The Firm of Charles W. Hills* By

Attorneys

1

2,780,968

## PAPER-MAKING MACHINES

Ralph Chalinor Heys, Sheffield, England, assignor to  
Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin

Application August 30, 1952, Serial No. 307,271

Claims priority, application Great Britain  
September 1, 1951

2 Claims. (Cl. 92—49)

This invention relates to paper-making machines, and is particularly concerned with disposing of the water expressed at the nip of press rolls, which, if permitted to remain as a pool, damages and rewets the partially dried paper web passing through the nip. With the modern high-speed operation of the machines, the pool of water that mainly gathers in front of the nip has increased beyond the capacity of the felt to absorb it (the pool being isolated from the felt by the web itself) or the ability of even a suction roll to carry it away, and crushing of the wet web may result. Sometimes a suction nozzle dipping into the pool is used to reduce the accumulation of water, but there still remains some water capable of producing the disadvantages mentioned above. Furthermore, with present suction rolls, a tendency to shadow marking is present, and the invention is also concerned in overcoming this tendency.

The invention is applicable to the press sections of paper-making machines including at least one suction roll, but the invention has a special advantage in enabling existing machines having plain press rolls to have the benefit of suction extraction of moisture; and in this latter connection the invention may be applied to machines where the installation of a suction roll in the press section is inconvenient for constructional reasons, or because of cost.

According to the present invention, the pool of expressed water at the press of a paper-making machine is forced to the felt side of the web and felt layer passing into the nip of press rolls, and removed by a flow of air, so that the water may be either disposed of largely before it can pass into the nip or only passes in contact with the felt, where it is incapable of damaging the web.

Accordingly, therefore, the present invention comprises a press section of a paper-making machine having a chamber disposed at at least the entrance side of the nip of a pair of press rolls to and through which a paper web is led by means of a felt, with the mouth of the chamber adapted to make sealing contact with the felt, and means for creating a pressure differential within the chamber to produce a flow of air through the mouth by which water expressed at the nip may be extracted through the felt.

Suction may be used to force the water through the web and the felt, e. g. by forming a chamber as described above between the felt itself some distance in advance of the nip and the surface of the press roll contacted by the felt, suction either by a vacuum, or by "high velocity air," produced by a lower degree of suction, being applied to the chamber, through a suitable connection.

Alternatively, pressure may be used, the chamber being formed on the paper side of the felt between the surface of the press roll at that side and the paper some distance in advance of the nip, and admitting pressure air to the chamber.

The chamber is terminated in advance of the nip by

2

a sealing roll contacting the paper or the felt, as the case may be, and may be completed by a similar roll contacting the first roll and the surface of the press roll, or by a sealing plate extending between the surface of a sealing roll and the surface of the press roll, or between the surfaces of first and second rolls contacting the paper (or the felt) and the surface of the press roll respectively.

The ends of the chamber i. e., at the sides of the felt, may be closed by fixed plates in sealing contact with the surfaces of the press roll and the other roll or rolls, a connection for pressure air, or vacuum or high velocity air, being provided in one or both plates.

The press roll contacted by the felt may be a suction roll, to assist in disposing of the water forced to that side of the felt. Thus, a suction box may extend over the arc of the suction roll from the nip to the sealing point of the chamber with the suction roll.

Sealing strips may be carried along the edges of the end plates and into end grooves in the press roll and the roll contacting the felt in advance of the nip. Between the two rolls, one or more additional rolls may be disposed in the chamber to support the felt on its way to the nip. Alternatively or in addition, a perforated plate may be disposed across the mouth of the chamber to support the felt. The plate is preferably spring-urged into contact with the felt.

The edges of the sealing plate between rolls may have inserted rubber strips to contact the roll surfaces. These strips may be in pairs at the sides of a continuous channel with inlet connections through which water, steam, or pressure air may be admitted, the fluid assisting in maintaining the seals.

Several embodiments of the invention, some applicable to simple press sections with a single pair of rolls and others applicable to press sections with more than one press roll contacting one other roll, will now be described in greater detail with reference to the accompanying drawings, in which

Figure 1 is a side elevation of one construction of chamber;

Figure 2 is a corresponding view, in section taken in a vertical plane extending in the lengthwise direction of the machine;

Figures 3, 4 and 5 are fragmentary sections on the lines 3—3, 4—4, and 5—5 of Figure 1;

Figure 6 is a sectional side elevation similar to Figure 2, showing another form of chamber;

Figure 7 is a similar sectional side elevation of a further form of chamber;

Figure 8 is a section on the line 8—8 of Figure 7; and

Figures 9, 10, 11, 12, and 13 are sectional side elevations of five other forms of apparatus.

In Figures 1 to 5, a felt 20 carries a paper web over a guide roll 21 to the nip of upper and lower plain press rolls 22, 23, the web 24 being seen where it leaves the exit side of the nip of the two rolls. Side plates 25, 26 embracing the ends of the bottom roll 23 extend towards the guide roll 21 and are provided with bearing housings 27 for a sealing roll 28 making contact transversely across the underside of the felt 20 and a similar roll 29 making contact with both the roll 28 and the bottom press roll 23. The plates 25, 26 and the rolls 28, 29 thus enclose the sides and bottom of a chamber 30 below the felt at the inlet side of the nip of the rolls 22, 23. The deflection of the felt by the guide roll 21 imparts a resistance to the felt that augments the sealing pressure of the roll 28 against the felt.

At the ends of the roll 23 a groove 31 is formed in alignment with a groove 32 extending along the inner upper edges of the plates 25, 26. A similar groove 33 is formed round the ends of the roll 28. A rubber sealing

3

strip 34 fitted in each groove 32 and entering the grooves 31, 33 in the rolls 23, 28 extends laterally inwards into a groove 35 in the upper edge of a perforated plate 36 extending across the mouth of the chamber 30. The strips 34 thus seal the edges of the mouth of the chamber. The plate 36 rests on the edges of brackets 37 extending inwardly from the plates 25, 26, each bracket having a recess 38 to contain a wave leaf spring 39 to provide resilient support of the plate 36 against the underside of felt 20.

Any required amount of vacuum is applied to the chamber 30 via a connection 40, which serves as an outlet for air containing entrained moisture expressed from the web 24 and absorbed into the felt 20. The induced air flow through the web removes water that would otherwise form an objectionable pool in advance of the nip.

In Figure 6, a pressure chamber 41, generally similar to the vacuum chamber 30 of Figure 2, is formed on the upper side of a felt 42 in advance of the nip of upper and lower press rolls 43, 44, with rolls 45, 46 in contact with each other and with the paper 47 on the felt 42 and with the upper roll 43 respectively. Rubber sealing strips 48 complete the sealing at the edges, their ends entering grooves 49, 50 in the ends of the rolls 43, 45. A perforated plate 51 is urged against the underside of the felt 42 by a waved leaf spring 52 in a support 53. Pressure air from the chamber 41 forces water through the web 47 into the felt 42 and then blows it from the felt.

In Figures 7 and 8, a vacuum chamber 54 is formed on the underside of a felt 55 carrying a paper web 56 to the nip of upper and lower press rolls 57, 58, the underside of the chamber being formed by a plate 59 making contact with the periphery of the lower roll 58 and with the periphery of a guide roll 60. Rubber strips 61 seal the upper edges of the chamber and enter grooves 62, 63 round the ends of the rolls 58, 60. At the sealing ends of the plate 59, sealed chambers 64 are formed, to which water, air or steam is supplied by pipes 65 to maintain the sealing action. The felt 55 is supported along the upper side of the chamber by a plate 66 in supports 67 with waved leaf springs 68. Instead of making contact with the press roll directly, the sealing plate 59 may end in a further roll, similar to the roll 60, in sealing contact with the press roll.

In Figure 9, a vacuum chamber 69 is formed by rolls 70, 71 arranged between end plates, such as in Figures 1 to 5, below a felt 72 leading a paper web to the nip of upper and lower press rolls 73, 74, with a perforated plate 75 carried by waved leaf springs 76 in supports 77 to support the felt across the top of the chamber. The roll 74 is a suction roll having a perforated metal shell 78 with a rubber cover 79 similarly perforated, and a suction box 80 with seals 81 at the inner side of the shell 78 opposite the nips of the roll 74 with the rolls 73, 71 respectively. The chamber 69 is put under vacuum by communication with the suction box 80 through the perforations of the roll. Sealing strips 81 are provided along the upper edges of the chamber 69.

In Figure 10, a felt 82 leads a paper web over a guide roll 83 to the successive nips formed by one upper press roll 84 with two lower press rolls 85, 86. A vacuum chamber 87, generally similar to the chamber 54 of Figure 7, is provided in advance of the first lower roll 85 below the run of the felt 82 from the roll 83 to the point of contact with the roll 85, and a further vacuum chamber 88 is formed between the rolls 85, 86 by a sealing plate 89, with end chambers 90 to receive water, steam or air from pipes 91. At the upper side of the chamber 88 sealing strips 92 are urged against the felt 82 passing under the roll 84 by waved leaf springs 93 carried by supports 94. The strips 92 extend from end grooves 95 in the guide roll 83, over a spring-supported perforated plate 96, round end grooves 97 in the roll 85, and into end grooves 98 in the roll 86.

If there is any accumulation of water above the web

4

and felt at the entrance to the nip of the rolls 84, 85 this may be removed by a suction nozzle 99. Alternatively, the roll 85 may be a suction roll, e. g. as in Figure 9.

In Figure 11, a felt 100 carries a paper web to the successive nips of two upper press rolls 101, 102 with one lower press roll 103, which advantageously is a suction roll. A vacuum chamber 104 is formed by a plate 105 extending under the roll 103 and ending in sealing chambers 106 at guide rolls 107, 108 before and behind the rolls 101, 102 respectively. The upper edges of the end walls of the chamber 104 are sealed by strips 109 starting in end grooves 110 of the roll 107 and passing round end grooves 111 in the roll 103 to end in end grooves 112 in the roll 108. Support is provided for the felt 100 between the roll 107 and first contact with the roll 101 by a perforated plate 113 carried by waved leaf springs 114 in supports 115. A similarly supported perforated plate 116 is provided for the felt from its last contact with the roll 102 towards the roll 108. A suction nozzle 117 may be provided to remove water in advance of the nip of the rolls 102, 103.

In Figure 12, a felt 118 carries a paper web 119 to the nip of upper and lower press rolls 120, 121, with a vacuum chamber 122 in advance of the nip, as shown in Figure 7, and with a further vacuum chamber 123 at the outlet side of the nip, rubber sealing strips 124 extending along the edges of the upper sides of the chamber from end grooves 125 in a guide roll 126 through end grooves 127 in the roll 121 and ending in end grooves 128 in a final guide roll 129. The vacuum applied by the chamber 122 may be used to hold the paper to the felt after it leaves the press nip, or, if the paper has been directed away from the felt on leaving the nip, for conditioning the felt.

In Figure 13, a felt 130 carries a paper web 131 to and through the nip of a plain top press roll 132 and a bottom suction press roll 133, the suction seals of which are shown at 134. A vacuum chamber 135 is formed on the inlet side of the nip, between a sealing roll 136 and the roll 133, a sealing plate 137 at the bottom side of the chamber having a cavity 138 to be supplied with sealing fluid for delivery to the seals 139.

An intermediate roll 140 across the mouth of the chamber 135 supports the felt 130 between the roll 136 and the press nip, and rubber sealing strips 141 seal the upper edges of the sides of the chamber 135, the strips fitting end grooves 142, 143, 144 in the rolls 136, 140, 133. A save-all tray 145 is provided to catch water flung from the suction roll 133.

The chamber assembly may be set at any required position with respect to the axis of the roll 133, in accordance with the desired angle of approach to the nip of the felt 130.

What I claim is:

1. In a paper machine press section, in combination, a first press roll, a second press roll in nip defining relation thereto, a felt passing through the nip and carrying a web therethrough, a first sealing roll spaced from the press rolls and making sealing engagement with the felt, a second sealing roll making contact with said first sealing roll and one of said press rolls, and wall means outside the press rolls rotatably carrying both said sealing rolls, said wall means extending along and in sealing engagement with opposite edges of the felt from said sealing rolls to said one of said press rolls to define a chamber presenting an open mouth against the felt.

2. In a paper machine press section, in combination, a first press roll, a second press roll in nip defining relation thereto, a felt passing through the nip and carrying a web therethrough, a sealing roll spaced from the press rolls and making sealing engagement with the felt, a sealing plate making contact with said seal-

## 5

ing roll and one of said press rolls, means defining channels in the ends of the sealing plate contacting said sealing roll and said one of said press rolls, means defining inlet connections to said channels for sealing fluid, and wall means outside the press rolls rotatably carrying said sealing roll, said wall means extending along and in sealing engagement with opposite edges of the felt from said sealing roll to said one of said press rolls to define a chamber presenting an open mouth against the felt.

5

10

## 6

## References Cited in the file of this patent

## UNITED STATES PATENTS

|           |                |                |
|-----------|----------------|----------------|
| 209,003   | Young -----    | Oct. 15, 1878  |
| 256,047   | Randall -----  | Apr. 4, 1882   |
| 611,421   | Savery -----   | Sept. 27, 1898 |
| 1,197,856 | Pope -----     | Sept. 12, 1916 |
| 1,701,226 | Collins -----  | Feb. 5, 1929   |
| 2,174,744 | Hill -----     | Oct. 3, 1939   |
| 2,535,738 | Hrubecky ----- | Dec. 26, 1950  |

## FOREIGN PATENTS

|         |                     |               |
|---------|---------------------|---------------|
| 381,819 | Great Britain ----- | Oct. 13, 1932 |
|---------|---------------------|---------------|