

May 9, 1944.

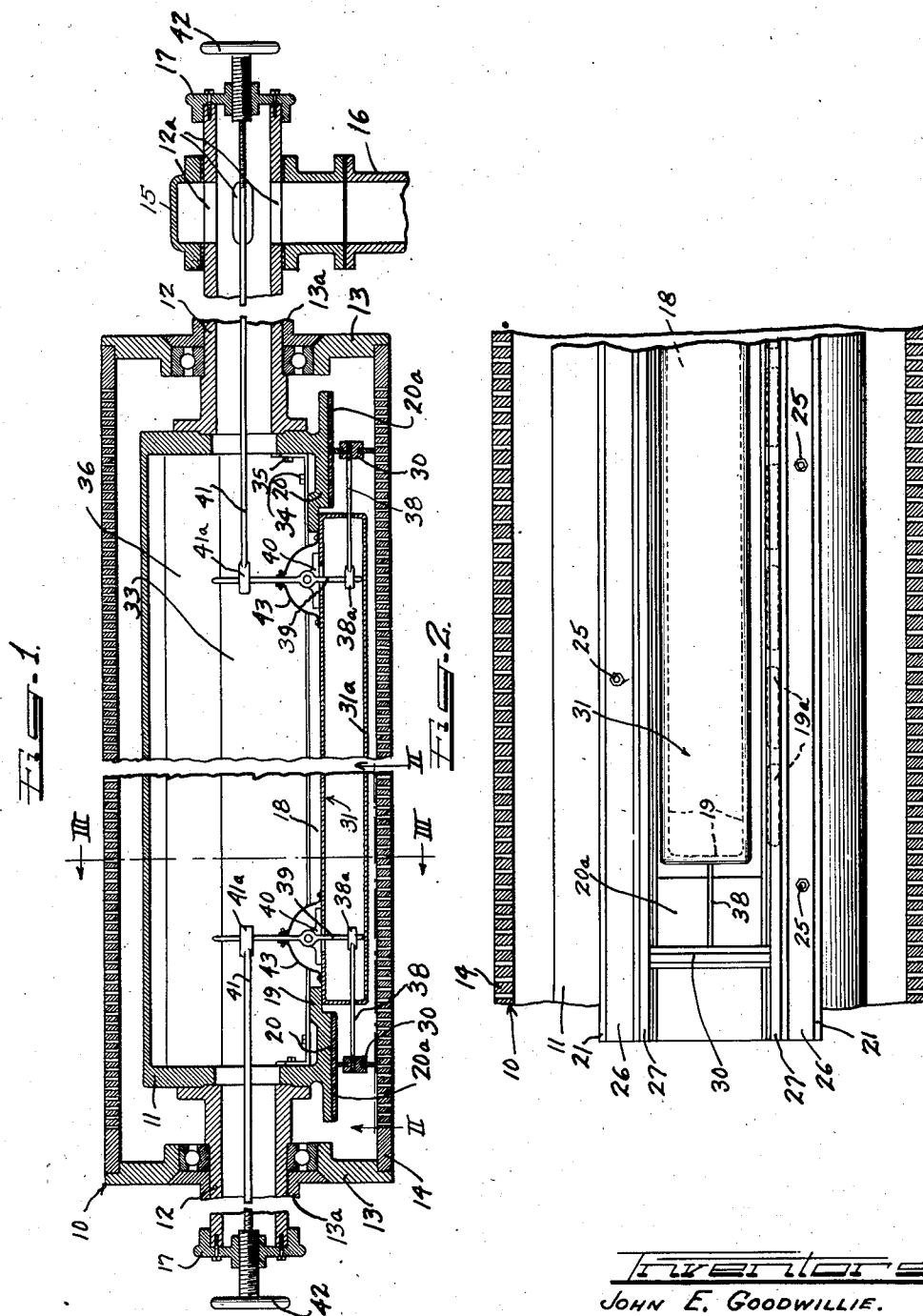
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2,348,340

SUCTION ROLL

Filed Feb. 13, 1941

2 Sheets-Sheet 1



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Fig. 3.

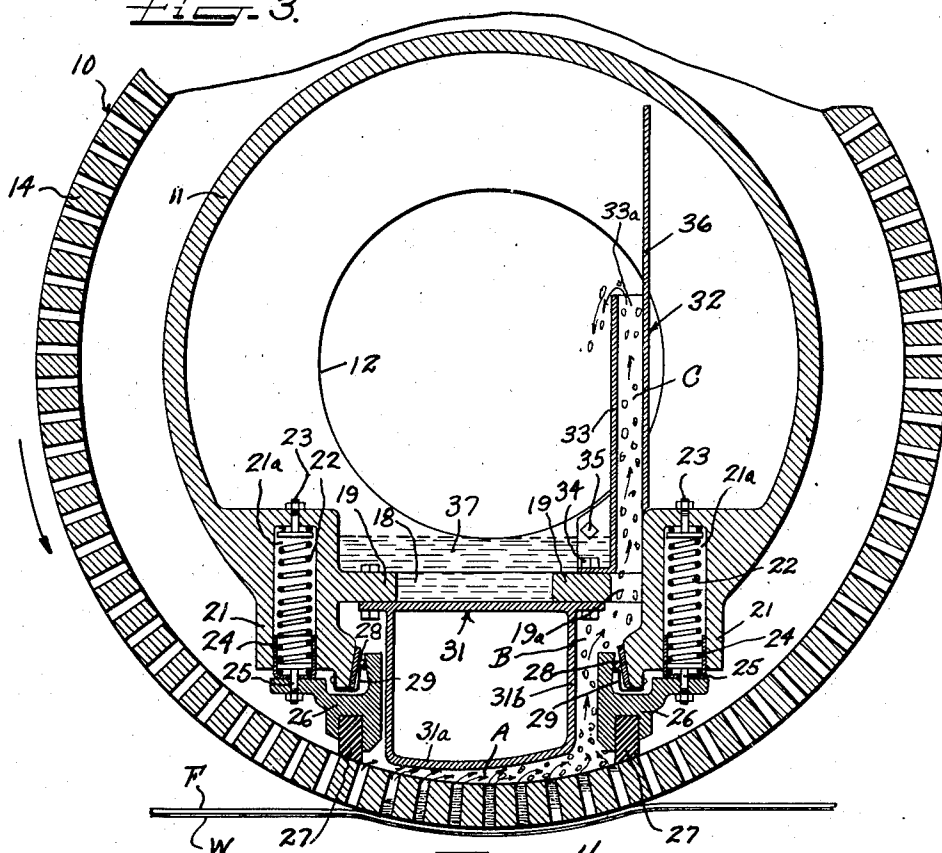
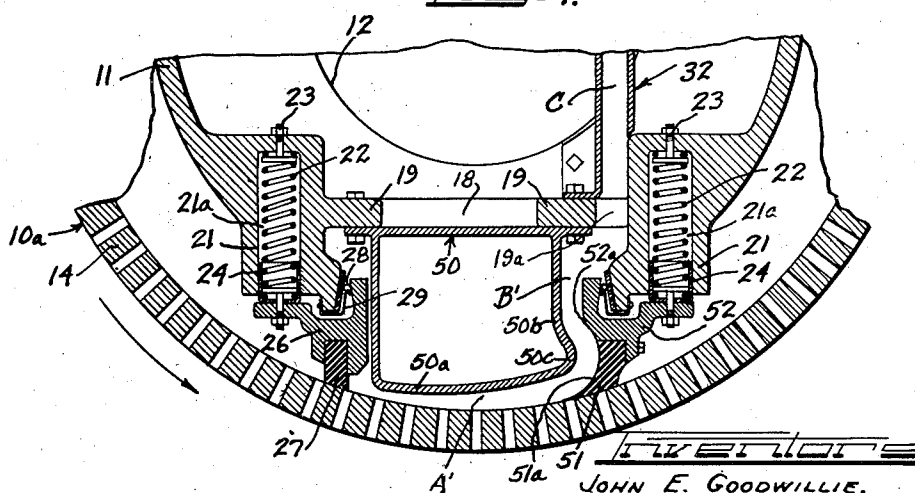


Fig. 4.



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2,348,340

SUCTION ROLL

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Application February 13, 1941, Serial No. 378,712

8 Claims. (Cl. 92—53)

This invention relates to suction rolls especially adapted for use in inverted position with the suction area in the lower half of the roll.

More specifically, the invention relates to the confinement of the air and water mixture drawn in through the holes of the perforated shell of a suction roll between the inside surface of the shell and a surface of the stationary suction box so as to maintain substantially uniform and moderately high velocity flow until the mixture is released in the interior of the suction box, thereby preventing remoistening of the felt and web acted on by the roll.

In the usual suction roll, the air and water mixture drawn in through the perforations of the revolving roll shell as these perforations pass the suction area is allowed to fall through an unimpeded passage into the stationary suction box within the shell. Now, if the suction box opens downwardly instead of upwardly and the suction area is in the bottom half portion of the roll, the velocity of the water and air mixture will materially decrease as soon as the mixture is freed from the perforations or holes in the shell. A high vacuum must be maintained to prevent the water droplets from again falling back into the holes and thus remoistening the felt and web. As a result, the use of suction rolls with suction areas in the lower half portion of the roll has always heretofore required high capacity vacuum pumps in order to maintain a high velocity flow of the water and air mixture drawn through the perforations in the shell, even after this mixture was freed from the shell.

In accordance with the present invention, however, the necessity for such high capacity vacuum pumps and the increased cost of operating such pumps has been avoided by providing a restricted path for the air and water mixture from the time it leaves the perforations in the shell until it is discharged to a point in the interior of the suction box where it cannot flow back into the shell.

In a preferred embodiment of the invention the restricted path is created by mounting a barrier in the suction area in spaced relation from the shell of the roll. A restricted passage is thus formed between the inner surface of the roll and the barrier. This passage communicates with another restricted passage adjacent the offgoing seal of the suction box and leading to the interior of the suction box at a point where the discharge of the water and air mixture cannot reach the roll. A convenient

form of barrier is a closed box mounted in the opening to the suction box and extending from the suction box into spaced relation with the interior of the shell. The surface of this closed box which is adjacent to the shell is in diverging relation with the shell and thus defines a confined passage which increases in height from the oncoming to the offgoing seal end thereof. A side wall of this box adjacent to the offgoing seal can cooperate with this seal and seal head as well as with the adjacent wall of the suction box to define a confined passage leading to the interior of the suction box.

It is, then, an object of this invention to provide a suction roll capable of being used with the suction box in an inverted position without necessitating the use of a high capacity vacuum pump and without increasing the power cost over the amount required for operation of a suction roll with the suction box opening in an upward direction.

A further object of this invention is to provide a suction roll with a restricted passage for air and water drawn through the perforations of the roll shell so as to maintain a high velocity flow of the air and water mixture to a point in the suction box where the mixture cannot recontact the shell.

A specific object of this invention is to provide a suction roll with a restricted path for fluids drawn into the roll by mounting a barrier on the suction box to provide a surface in the suction area closely adjacent to the inside surface of the roll.

A further object of the invention is to provide a suction roll with a restricted fluid passage between the seals which passage increases in height from the oncoming seal to the offgoing seal.

Another object of this invention is to provide a suction roll with a suction area in the bottom half portion thereof which is equipped to prevent gravity drainage of water back to the shell of the roll.

Another object of the invention is to provide a wall between the seals of a suction roll which is closely adjacent to the roll shell at the oncoming seal and which diverges from the roll shell as it approaches the offgoing seal.

Other and further objects of the invention will be apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which, by way of example, show two preferred embodiments of the invention. It will be understood, however, that

the invention is not limited to the two specific embodiments but, on the contrary, covers many other structures having the functions of the illustrated structure.

On the drawings:

Figure 1 is a broken longitudinal cross-sectional view of a suction roll according to this invention.

Figure 2 is an enlarged fragmentary plan view taken along the line II—II of Figure 1 and with parts shown in cross-section.

Figure 3 is a transverse cross-sectional view taken along the line III—III of Figure 1 with parts omitted.

Figure 4 is a fragmentary transverse cross-sectional view similar to Figure 3 but illustrating a modified embodiment of the invention.

As shown on the drawings:

In Figures 1 to 3 inclusive the reference numeral 10 designates generally a suction roll according to one embodiment of the invention. The suction roll 10 includes a stationary suction box 11 having hollow trunnions 12 at the ends thereof around which are rotatably mounted the end heads 13 of the perforated roll shell 14. The heads 13 have sleeve portions 13a projecting therefrom and adapted to be rotatably mounted in supporting bearings for the roll (not shown).

One of the trunnions 12 has openings 12a therethrough communicating with the interior of a housing 15 which is connected to a suction conduit 16.

Both trunnions 12 have the ends thereof closed with caps 17.

The suction box 11 has a longitudinal slot or opening 18 in the bottom portion thereof bounded by a flange 19.

The slot 18 terminates short of the ends of the suction box 11 as best shown in Figure 1 and flat decks 20 continue longitudinally from the end flanges 19. These decks 20 are cast integral with the suction box and can be covered with a smooth wear plate 20a if desired.

As best shown in Figure 3, the suction box 11 is built up on the longitudinal sides of the opening 18 to provide longitudinal heads 21. These heads have wells or grooves 21a therein opening at the bottoms thereof and receiving suspension springs 22 therein. The suspension springs are mounted on hangers 23 carried by the heads 21 and the bottom ends of the springs are encased in cups 24 slidably mounted in the wells or grooves 21a. Hangers 25 are secured to the lower ends of the springs 22 and extend through the cups 24 for carrying longitudinal seal mountings 26. These seal mountings 26 are in floating relation relative to the suction box 11 and carry longitudinal seals 27 engaging the inner surface of the shell 14. The springs 22 are regulated to suspend the mountings 26 so that the seals 27 will just engage the shell 14 to effect a sealing without undue rubbing against the shell.

The seal mountings 26 are in sealing relation with the heads 21 in all operative positions of the mounting. This sealing is effected by means of a small rod or wire 28 between adjoining tapered surfaces of the mounting and heads. The rods are held in place by means of spring clips 29 carried by the heads. Thus the mountings can rise and fall relative to the heads, but the wire 28 will always be urged into engagement with the adjoining tapered surfaces to prevent leakage between the seal mounting and heads.

The springs 22 can be adjusted by regulation

of the hangers 23 so that the seals will be suspended in proper contact with the shell.

End seals 30, as shown in Figure 1, are slidably mounted on the decks 20 and are movable toward and away from each other by mechanism to be hereinafter described for varying the length of the suction area. The longitudinal seals are not adjustable to vary the width of the suction area, although an adjustable longitudinal seal mounting could be used without departing from the principles of this invention.

In accordance with this invention a closed hollow box 31 is bolted or otherwise fixed on the flange 19 and extends between the seal mountings into close proximity with the inside surface of the shell 14. The wall 31a of the box adjacent to the shell 14, as best shown in Figure 3, is quite close to the shell at the end thereof next to the oncoming seal and then diverges into greater spaced relation from the shell at the off-going seal end thereof. The wall 31a has a smooth regular contour and is preferably spaced from one-eighth inch to one-quarter inch from the shell at the oncoming seal while it may be spaced from one-half inch to three inches from the shell at the off-going seal end thereof.

A restricted passage A is thus formed between the wall 31a and the shell 14 and this passage increases in height from the oncoming to the off-going seal ends thereof. A side wall 31b of the box cooperates with the off-going seal mounting 26 and the adjacent head 21 of the suction box to provide an upwardly extending passageway B communicating with the passageway A between the shell and wall 31a.

The flange 19 of the suction box is apertured as at 19a. A plurality of individual slots or apertures 19a can be provided along the length of the flange as shown in Figure 2, or a single long slot can be used.

This same flange 19 carries a shield device 32 providing a passageway C communicating with the passageway B, and extending into the interior of the suction box. The shield device 32 is composed of a plate 33 bolted to the flange 19 as at 34 and to the end walls of the suction box 11 as at 35. The plate 33 has end flanges such as 33a carrying another shield plate 36 which extends from the head portion 21 of the suction box to the top of the box as best shown in Figure 3. The plate 33 terminates at a central portion of the suction box 11.

The communicating passageways A, B and C thus provide a restricted or confined path for the flow of air and water drawn from the web and felt W and F passing under the roll as shown in Figure 3. This restricted path maintains a high velocity flow for the air and water mixture and the velocity of this mixture is not killed until the mixture is discharged into the main interior of the suction box 11 at a point where it cannot flow back to the shell.

As illustrated in Figure 3, the felt F and web W cover the suction area between the seals 27 and travel with the shell 14 in the direction indicated by the arrow. The first hole in the shell clearing the oncoming seal will be subjected to vacuum existing in the passage A and it will be evacuated so that as the holes advance toward the off-going seal 27, air and water will be drawn therethrough and will discharge into the passageway A. This air and water mixture will thus be drawn up through the passageways B and C and discharge into the interior of the suction box 11 at the upper end of the plate 33.

The velocity of the air and water mixture may slow up at the discharge from the passageway C but any water droplets released from the mixture due to the decrease in flow velocity can merely drop by gravity on top of the box 31 where a relatively shallow pond of water 37 may be formed. However, this pond of water 37 will be continuously drained through the suction trunnion 12 of the suction box.

The end seals 39 have rods 38 extending therefrom through the end walls of the box 31 and terminate in eye ends 38a in the box receiving levers 39 pivotally mounted on supports 40 carried by the top wall of the box. The other ends of the levers receive the eye ends 41a of control rods 41 which extend through the trunnions 12 into threaded relation in the hollow shanks of control wheels 42 which are threaded into the end caps 17. The interior and exterior threads on the shanks of the hand wheels 42 have different pitches so that a rotation of the hand wheels will effect a longitudinal shifting of the rods 41 to tilt the levers 39 and thus move the seals 30 toward and away from each other.

Flexible rubber or leather housings 43 can be secured on the box 31 and surround the levers 39 for preventing drainage of water into the interior of the box.

From the above descriptions it will therefore be understood that this invention now provides for the mounting of a barrier in the suction slot of a suction box for cooperating with the perforated shell of a suction roll to provide a restricted passageway communicating with the interior of the suction box for maintaining a high velocity flow of materials drawn out of the holes in the shell. This barrier prevents remoistening of the web or felt passing under the suction area of the roll and the suction rolls of this invention are especially adapted for operation with their suction areas in the lower portion of the roll.

In the modified suction roll 10a shown in Figure 4 parts identical with parts described in Figures 1 to 3 have been marked with the same reference numerals. In the roll 10a, however, a box 50 of a different shape than the box 31, is mounted on the flange 19 and cooperates with a modified offgoing seal 51 and seal mounting 52 to provide a more regular restricted path to the shield device 32. Thus the bottom wall 50a of the box 51 diverges from the shell 14 as it approaches the offgoing seal 51, but the side wall 50b of the box has an outwardly bowed curved corner 50c of the same contour as the inner face 51a of the seal 51. Likewise the seal mounting 52 has an inner face 52a curved to form a continuation of the curvature of the face 51a. As a result the passageway B' is free from abrupt shoulders and merges smoothly into the passageway A' as well as into the passageway C. The air and water mixture drawn through the perforations of the shell 14 thus flows along a smooth confined path to the interior of the suction box. The seal 51 gradually curves away from the shell 14 as shown, thereby eliminating a corner or pocket such as occurs in the structure shown in Figure 3.

It will, of course, be understood that various details of the invention may be varied through a wide range without departing from the principles of the invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. A suction roll comprising a longitudinally slotted suction box having an outturned head on each side of the slot and flanges projecting inwardly from said heads to define the periphery of the slot, seals floatingly carried by said heads outwardly of said flanges, a perforated shell rotatably mounted around said box in sealing engagement with said seals, a closed hollow box bridging said slot and secured to said flanges, said box having side walls extending between said seals and a bottom wall in closely spaced relation to said shell, one of said flanges having an opening therethrough, a shield member mounted on said flange and defining a passageway communicating with said opening, and said shield member extending to the central portion of said suction box, whereby said hollow box and said shield member cooperate with said shell and an adjacent seal to define a confined path for maintaining a high velocity flow of materials drawn through the shell until said materials are released in the interior of the suction box.

2. A suction roll comprising a suction box having spaced parallel outturned head portions, a flange extending inwardly from said head portions and defining a longitudinal opening for said box, suction seals floatingly mounted on said head portions, a perforated shell rotatably mounted around said suction box in sealing engagement with said seals, a closed hollow box secured to said flanges and bridging said opening, said box having side walls in spaced relation from said seals and a bottom wall in closely spaced relation to said shell, a shield member secured to said flange on one side of said opening defining a passageway to the central portion of the suction box, and said flange having an opening therethrough communicating with said passageway whereby an evacuation of said suction box will effect a drawing of water and air from the perforations of said shell along a confined path provided between the bottom wall of the box and the shell, the side wall of the box and the adjacent seal and said shield member.

3. A suction roll comprising a stationary suction box having downwardly extending head portions with open bottom chambers therein, an inturned flange between said head portions defining the periphery of a longitudinal slot in said suction box, springs suspended in said chambers of the heads, seal mountings carried by said springs, seals on said seal mountings in sealing engagement with said shell, a closed hollow box secured on said flange having side walls extending between said seals and seal mountings in spaced relation therefrom and a bottom wall in closely spaced relation from said shell, and said flange having an opening therethrough joining the space between a side wall of the box and the adjacent seal with the interior of the suction box.

4. In a suction roll including a perforated rotatably mounted shell, a stationary suction box in said shell, a longitudinal oncoming seal between said shell and suction box, and an offgoing longitudinal seal between said shell and said suction box, said seals defining a localized suction area on said shell, the improvements which comprise a barrier wall in said suction area spaced from one-eighth to one-quarter inch from said shell at the oncoming seal and spaced from one-half inch to three inches from said shell at the offgoing seal end thereof, and means defining a

passageway to the interior of the suction box adjacent said offgoing seal communicating with the space between the barrier wall and shell.

5. In a suction roll including a suction box, a perforated shell rotatably mounted therearound, and seals including offgoing and oncoming seals between the shell and box defining a localized suction area on the shell, the improvement of a wall between said seals extending from adjacent the oncoming seal across said suction area to terminate in spaced relation from the offgoing seal, said wall being spaced inwardly from said shell in diverging relation thereto to define a confined path increasing in capacity as it approaches the offgoing seal and communicating at its point of greatest capacity with the interior of the suction box.

6. A suction roll comprising a suction box having spaced opposed longitudinal heads depending therefrom, an oncoming seal supported on one head, an offgoing seal supported on the other head, said box having a longitudinal slot defined by a flange between said heads, a drain outlet at the end of said box, a liquid-pervious cylinder rotatable around said box and cooperating with said seals, a member mounted on said flange having side walls between said heads and seals and a bottom wall closely adjacent the cylinder at the incoming seal and diverging away from the cylinder toward the offgoing seal to cooperate with the cylinder for defining a restricted flow path, said side wall adjacent the offgoing seal being spaced from the seal and the head carrying the seal to define a passage communicating with the path, a conduit mounted in the box on the flange adjacent the offgoing seal carrying head, said conduit having a lower inlet end communicating with said passage, and said conduit having an upper discharge end in the box at a level above the bottom of the drain outlet.

7. A suction roll comprising a suction box having spaced opposed longitudinal heads depending therefrom, said box having a longitudinal slot defined by a flange between said heads, an on-

coming seal mounting suspended from one head, an offgoing seal mounting suspended from the other head, said offgoing seal mounting having a concave inner face, a perforated cylinder rotatable around said box, seals on the seal mountings cooperating with said cylinder to define a suction area thereon, a member mounted on said flange having side walls between said heads and seal mountings and a bottom wall closely adjacent the cylinder at the oncoming seal end thereof and diverging away from the cylinder toward the offgoing seal end thereof to define a restricted flow path, said member having a convex portion in spaced relation from the concave inner face of the offgoing seal mounting to cooperate therewith for defining a discharge passage for said path, and means connecting said passage with the interior of the box.

8. A suction roll comprising a suction box having spaced opposed seal carrying longitudinal heads depending therefrom, said box having a longitudinal slot defined by a flat flange between said heads, said suction box having flat decks between said heads at the ends of said slot, a hollow barrier box having a top wall mounted on said flange, side walls depending from said top wall between said heads, end walls between said decks, and a bottom wall providing a barrier, a perforated cylinder rotatably mounted around said suction box, longitudinal seals on said heads cooperating with said cylinder to define a localized suction area on the cylinder, end seals slidable on said decks between said longitudinal seals for sealing the ends of said suction area, lever means tiltably mounted on the top wall of said hollow barrier box, means for tilting said levers, and connecting links between said levers and said end seals extending through the end walls of the barrier box whereby tilting of said levers will shift the end seals to vary the length of the suction area.

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