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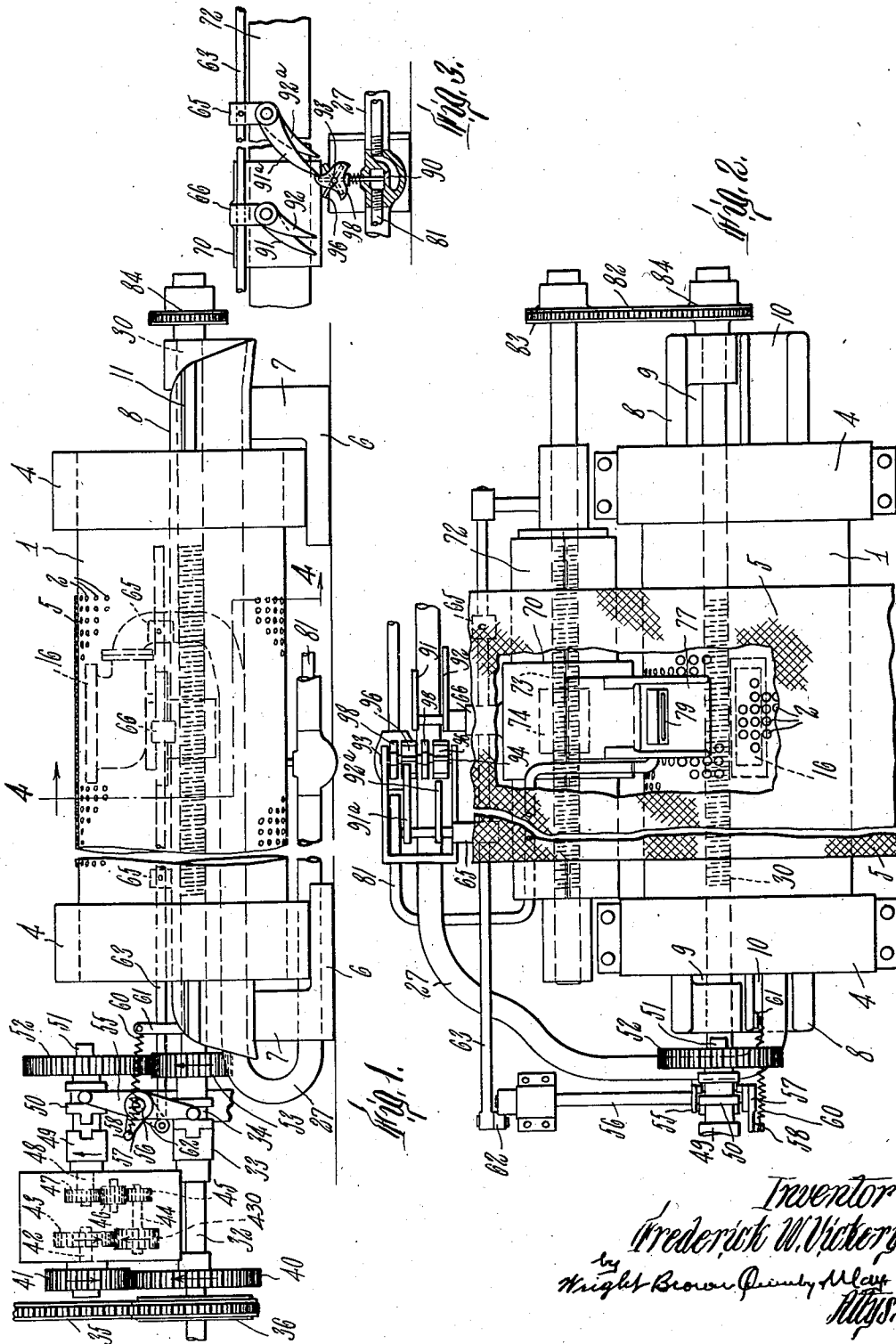
F. W. VICKERY

2,352,991

MACHINE FOR CONDITIONING FELTS OF PAPER MAKING MACHINES

Filed April 14, 1941

2 Sheets-Sheet 1



**July 4, 1944.**

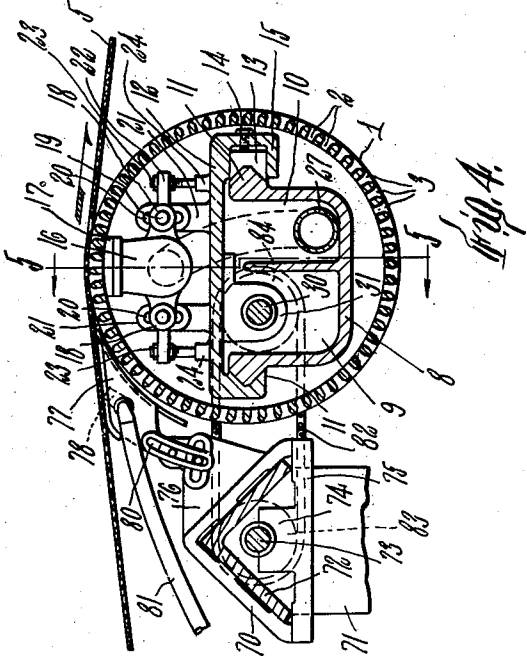
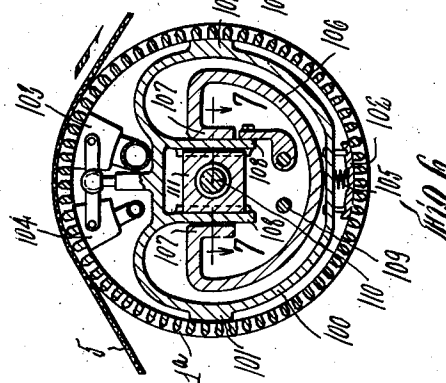
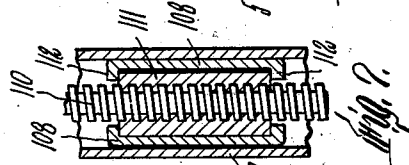
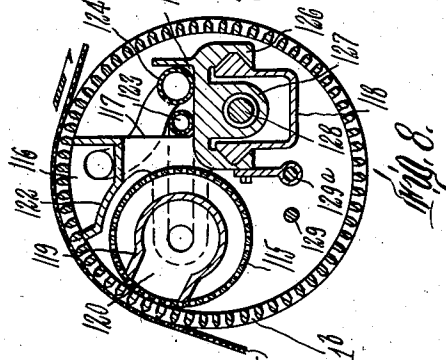
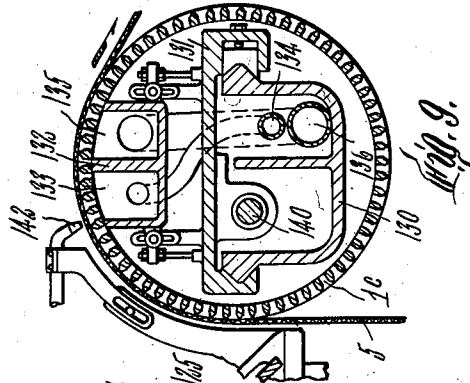
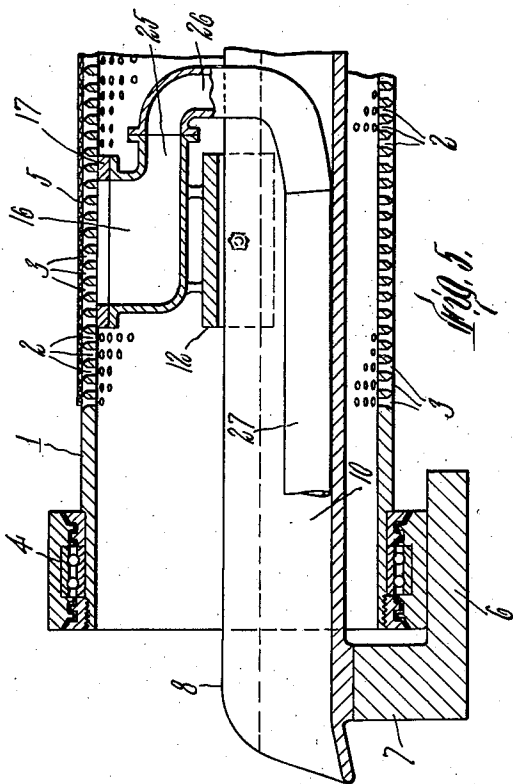
**F. W. VICKERY**

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# MACHINE FOR CONDITIONING FELTS OF PAPER MAKING MACHINES

Filed April 14, 1941

2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,352,991

MACHINE FOR CONDITIONING FELTS OF  
PAPERMAKING MACHINES

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Application April 14, 1941, Serial No. 388,434

8 Claims. (Cl. 92—50)

It has been proposed in the paper-making industry to employ a revolving foraminous or perforated hollow cylinder over which the paper-making felt passes with a stationary suction box inside, both the cylinder and the box being the full width of the paper-making machine, the suction box being kept in contact with the inside of the cylinder in order to make an air tight joint and to confine the suction effect to the area covered by the suction box. This perforated cylinder is arranged to be rotated by the passage of the felt thereover. This arrangement is extremely satisfactory where used on work which necessitates a continuous operation on the full width of the machine, such, for example, as on the "making wire" of the machine, but when used on felts difficulties are encountered. For example, if water is added to the felt for the purpose of cleaning it, it is necessary to remove that water and to leave the place where the water has been applied with substantially the same moisture content as before the water was applied. To do this a heavy suction is required to operate on the full width of the felt, with such an intensity that it over-conditions the felt, producing a heavy drag and excessive wear and other deteriorations of the felt. On the other hand, if the operation of such a full width suction roll is interrupted, the sudden change of conditions which results from the conditioning apparatus being alternately in and out of operation affects the uniformity of the product being made.

It has also been known to use a perforated ring less than the total width of the felt and to carry such ring on a vacuum box, both of which are traversed backward and forward across the felt as shown, for example, in the Vickery Patent No. 2,173,317. With this arrangement little more than a line contact is possible between the felt and the ring because it is not practicable to provide an extended arc of wrapping contact with a part only of the width of the felt and consequently it is not possible to use it on high speed machines as the length of the felt within which the suction effect is produced is too short.

The present invention has for an object, therefore, to provide a conditioning mechanism which combines the advantages of each of the prior constructions hereinbefore described, but which avoids their undesirable features.

This is done by using a revolving foraminous or perforated hollow cylinder the full width of the felt and about a substantial arc of which the felt passes, the cylinder being rotated by contact with the moving felt, and with this perforated or

foraminous cylinder to use a suction box of substantially less width than the felt located within the cylinder and caused to traverse within the cylinder throughout the working width of the felt, together with a cleaning liquid-applying device also of less width than the felt and movable with the suction box and being so positioned as to direct cleaning liquid against or through the felt just before it is acted upon by the suction box. By "working width" is meant the width equal to the width of the paper being made. Any width of felt beyond that of the paper being made is inactive in so far as the making of the paper is concerned. The driving effort exerted by the moving felt on the cylinder is thus exerted over the full working width of the felt, while the suction drag tending to slow its rotation is exerted thereon over a very narrow zone. The driving effort is therefore many times the retarding effort and is not dependent upon any increase in arc of wrap, but to the fact that the length of the cylinder is very much greater than the length at which resistance to its rotation is applied. Moreover, all of the retarding effect, being transmitted through the cylinder, is exerted throughout the full width of the felt, instead of locally, so as to minimize strains and distortions. This liquid-applying device may be either inside or outside of the cylinder, and when outside it may, if desired, be located on the opposite side of the felt from the suction box.

For a more complete understanding of this invention, reference may be had to the accompanying drawings in which

Figure 1 is a somewhat diagrammatic elevation of a conditioning machine embodying the invention.

Figure 2 is a top plan of the same.

Figure 3 is a detail partly in side elevation and partly in section showing controls for liquid supply and suction.

Figure 4 is a detail section on line 4—4 of Figure 1.

Figure 5 is a detail section on line 5—5 of Figure 4.

Figure 6 is a view somewhat similar to Figure 4, but showing a modification.

Figure 7 is a detail section on line 7—7 of Figure 6.

Figures 8 and 9 are views somewhat similar to Figures 4 and 6 but showing further modifications.

Referring to the construction shown in Figures 1 to 5, there is shown at 1 a foraminous hollow cylinder of metal having closely spaced perfora-

tions 2 extending therethrough with their outer ends flaring as at 3. This cylinder is mounted for free rotation, being shown as supported at opposite ends in anti-friction bearings 4. These bearings are positioned beyond the side edges of the paper-making machine felt 5. This felt is suitably guided to extend over an arcuate portion of the circumference of the cylinder within that lengthwise portion thereof in which the perforations 2 are positioned. The bearings 4 are supported at opposite ends on the angle members 6, the upstanding legs 7 of which carry a stationary support 8 which extends completely through the cylinder 1.

As shown best in Figure 4, this support 8 may be provided with a pair of lengthwise extending channels 9 and 10 and its outer side walls may be provided with guideways 11 for slidably receiving a carriage 12. This carriage 12 engages directly with one of the ways 11 and has a bearing block 13 adjustable by the screws 14 supported in a channel portion 15 for engaging the opposite way 11. This adjustable block 13 provides means for taking up wear between the carriage and the support so that the carriage may be maintained in free sliding engagement with the support without undue play. This carriage 12 supports a suction box 16 of less width than the felt 5 and adapted through its mounting on the carriage 12 to be moved lengthwise within the cylinder throughout the full width of the felt. It is shown as provided with a mouth plate 17 on its upper edge shaped to bear against the inside wall of the cylinder 1 and making a substantially fluid tight joint therewith. It is shown as provided with oppositely extending supporting arms 18 having pintles 19 slidable in slots 20 of arms 21 upstanding from the top face of the carriage 12 and extensions 22 of the arms 18 are adjustably secured by studs 23 threaded into bosses 24 on the top face of the carriage 12 and having suitable nuts thereon engaging above and below the extensions 23.

The suction box 16 is provided with an outlet 25 to which may be secured a pipe connection 26 leading to a flexible hose 27 which lies within the channel 10. The channel 9 has extending therethrough a threaded shaft 30 and engaging on the threads thereof is a bracket 31 depending from the under side of the carriage 12 so that as this shaft 30 is rotated in one or the other direction, traversing motion is imparted to the slide 12 and thus to the suction box with relation to the cylinder 1. This shaft 30 is arranged to be rotated, and for this purpose a reversing drive mechanism has been provided.

The drive mechanism may be of any desired construction, but as shown it comprises a shaft 32 in alinement with the shaft 30 and arranged at times to be coupled directly for rotating the shaft 30 through the fixed and slidable clutch elements 33 and 34. The shaft 32 is driven in time with the paper machine as by means of a chain 35 passing over a sprocket wheel 36 on the shaft 32 and over a sprocket wheel on some convenient rotary shaft (not shown) of the paper machine. The shaft 30 is also connected to be rotated in the reverse direction to that imparted from the shaft 32 through the clutch elements 33 and 34 and preferably at a higher rate of speed. This is accomplished by any suitable reversing gear mechanism, that shown comprising the gear 40 carried by the shaft 32 meshing with a gear 41 on a shaft 42 which also carries a gear 43 meshing with a gear 430 on a shaft 44.

The shaft 44 carries a gear 45 meshing through a reverse gear 46 with a gear 47 on a shaft 48, and the shaft 48 may be connected through the clutch elements 49 and 50 with a shaft 51 carrying a gear 52 meshing with a gear 53 carried by the shaft 30. The gears of the train leading from the gear 40 to the gear 53 may be of such relative sizes as to speed up the rotation of the shaft 30 from its speed derived directly through the shaft 32, this being for the purpose of effecting a quick return of the carriage 12 and certain other parts which will later be described, while in inoperative condition, the slower traverse being accomplished while these parts are acting on the felt.

The movable clutch elements 50 and 34 are connected for simultaneous and opposite motion as by means of a pivoted double clutch yoke 55. On the shaft 56 on which this yoke is rockable is a crank arm 57 having a pin 58 arranged to contact with the yoke 55 alternately on either side of its fulcrum, and a spring 60 reacting between this arm and a fixed element 61 tends to throw the arm to either one of its yoke-engaging positions and rock this arm from one to the other of its clutch positions whenever it is moved sufficiently to carry the pin 58 beyond substantial alinement with the shaft 56. Another arm 62 carried by the shaft 56 is pivoted to an actuating rod 63 which may be moved axially by impingement on either of a pair of dogs 65 thereon of a member 66 carried by the carriage 12 so positioned that the rod 63 is moved in one or the other direction when the carriage 12 approaches a desired limit of its axial motion, thus causing a reversal of the direction of rotation of the threaded shaft 30 and starting the traverse of the carriage 12 in the reverse direction. This carriage 12 thus acts to effect a traverse of the suction box 16 across the working width of the felt while the cylinder 1 prevents direct contact between the felt and the suction box so that it is permitted its desired axial motion without an undesirable drag exerted thereon by suction from the suction box.

Means are also provided for applying to the felt the desired cleaning liquid which is thereafter removed by the action of the suction box. In the construction shown in Figures 1 to 5, the application of this cleaning liquid, such as water, is made outside of the cylinder itself but by means which traverses the width of the felt in time with the traverse of the suction box. To this end there is mounted in advance of the cylinder 1 in the direction of travel of the felt 5, a second slide or carriage 70, this being mounted on a transverse support 71 having an angle guide member 72 thereon for directly supporting the slide 70. A shaft 73 threaded to a pitch corresponding to that of the shaft 30 is housed within the angle of the member 72 and is threaded into a half nut 74 formed on a cross bar 75 secured to the slide or carriage 70. This slide 70 carries a bracket portion 76 on which is adjustably supported a nozzle carrier 77 for supporting a nozzle 78 through which a supply of cleaning liquid may be applied to the felt 5. As shown best in Figure 2, this nozzle may have an elongated opening 79 of a width somewhat less than that of the suction box so that the width of the felt to which the cleaning liquid is applied at one time is limited to the width next thereafter subjected to suction from the suction box. This nozzle may be adjustable from and toward the left as desired through screws and

arcuate slot connections at 80 and it may be connected with a suitable supply of cleaning liquid under pressure, as through a flexible pipe 81. The shaft 73 and the shaft 30 are connected for simultaneous and equal turning motion and to this end they are shown as connected by a chain 82 passing over suitable sprocket wheels 83 and 84 on these respective shafts.

Means may be provided by which the supply of cleaning liquid, and if desired, also, the suction, may be automatically turned on and so held during the active direction of traverse of the carriages 12 and 70 and shut off during the inactive directions of traverse. This may be accomplished by a pair of normally closed valves, one of which is shown at 90 in Figure 3 for the pipe 81 and a similar valve (not shown) for controlling the suction through the second pipe 27 by opening or closing a vent to the atmosphere. Each of these may be operated in suitable timed relation by pairs of dogs 91, 92 and 91a, 92a pivoted to lugs 66 and 65, respectively. These dogs 91, 92 and 91a, 92a, which may be spring pressed to operative position, actuate star wheels such as 96 on shafts 93 and 94, each of these shafts carrying a valve-actuating cam member 98 having half as many lobes as points on the corresponding star wheels so arranged as to alternately open or allow to close the corresponding control valve. The dogs 91 and 92 step the star wheels to open the valves while the dogs 91a, 92a following after, shut off the valves, all these dogs being idle in the reverse direction of motion. This particular operating means forms no part of the present invention, and is shown in greater detail in my application Serial No. 154,005, filed July 16, 1937 (now United States Letters Patent No. 2,308,574 granted January 19, 1943.)

The mechanism heretofore described thus acts to cause a traverse between the nozzle and the suction box with respect to the felt crosswise of the felt and the felt may be acted upon through a substantial arc of the circumference of the cylinder 1, since it is supported by this cylinder throughout its full width and the suction box is out of direct contact therewith. The cleaning liquid is applied to the felt and is thereafter removed by the suction box, and this action takes place at any one time over a portion only of the width of the felt. Thus the advantages of the full length support over the cylinder for the felt, which allows a substantial arc of contact, coupled with the reduced suction and wear of the felt possible with the relatively narrow suction box and nozzle are obtained, and a driving force applied by the felt to a length of the cylinder greater than the length (crosswise of the machine) of the suction box insures that the cylinder will revolve at the same speed as the felt even when the machine has to be installed in a space which permits of only the minimum arc of contact of the felt.

It is not, however, essential that the cleaning liquid be applied outside of the felt supporting cylinder and in Figures 6, 7 and 8 arrangements are shown wherein the application of the cleaning liquid is made from within this cylinder. Thus in Figure 6 there is shown mounted for traverse within the cylinder 1a a carriage 100 which is provided with pads 101 and 102 directly engaging the inner wall of the cylinder. This carriage 100 supports a suction box 103 and a liquid applying device 104, the liquid applying device being arranged in advance of the suction

box 103 in the direction of rotation of the cylinder 1a. These devices 103 and 104 are arranged to be resiliently held against the inner wall of the cylinder as by means of one or more springs 105 reacting between the lower portion of the slide 100 and the pad 102. A stationary support 106 extends through the cylinder 1a and through the carriage 100 and is provided with spaced bearing walls 107 between which corresponding walls 108 of the slide 100 extend. The traverse motion of the carriage 100 is produced by the rotation of a threaded shaft 110 engaging within an internally threaded nut 111 which is mounted between end guide flanges 112 of the wall members 108, as shown best in Figure 7. The carriage 100 is thus allowed up and down play with reference to the nut 111 but is constrained to move axially through the cylinder 1a by rotation of the threaded shaft 110. Reverse of traverse may be produced by stop dogs on the carriage and on the reverse rod 109 arranged with the cylinder 1a, and the control of liquid supply and suction may be accomplished by motion of this rod and a rod 109a movable with the carriage in a manner similar to that shown in Figures 1 and 2, except that the valves are located beyond one end of the cylinder 1a in this construction.

In Figure 8 a further modification is shown having to do particularly with a different device for supplying the cleaning liquid. Referring to this figure, this liquid is supplied to the inside face of the cylinder 1b through a foraminous ring 115 of substantially smaller diameter than the cylinder and positioned within it. This ring 115 is of a length preferably somewhat less than that of the suction box 116 and is mounted for rotation on a carriage 117 mounted for axial motion along a U shaped support 118. The ring 115 engages externally with the internal face of the cylinder 1b so as to be rotated by contact therewith. Within it is positioned a non-rotatable shield 119 into which the cleaning liquid is introduced, this liquid being discharged therefrom through the passage 120 which opens against the inner wall of the member 115. In order that the suction box 116 may be positioned as close to the liquid discharge portion as desired, one wall 122 of this suction box is laterally extended to the desired extent. The liquid is supplied to the interior of the shield 119 through the pipe 123 and the suction box 116 is connected to a suitable suction apparatus (not shown) through a suction pipe 124. Both the pipes 123 and 124 are supported in a channel 125 on the top face of the carriage 126 which has a depending portion 127 internally threaded for the reception of the lead screw 128 by the rotation of which the suction box and the liquid supply device are caused to traverse the width of the felt 5. The reverse of the carriage motion and the control of the valve is accomplished as in the modification of Figure 1 through the reverse rod 129 and the carriage-carried rod 129a, respectively.

In some cases it may be desired to supply the cleaning liquid to the opposite side of the felt from that from which it is withdrawn. Mechanism for accomplishing this is illustrated in Figure 9. Within the foraminous cylinder 1c is positioned the fixed support 130 which may be substantially like the support 8 illustrated in Figure 4. On this may be slidably mounted a carriage 131 which carries a two-part suction box 132 mounted similar to the box 116 of Figure 4. One

of the parts of this box 133 is connected through a pipe 134 to a source of moderate suction while the portion 135 of the suction box is connected through the pipe 136 to a heavy suction. The pipes 134 and 136 are arranged in one channel of the support 130 and at the other is positioned a threaded shaft 140 connected to cause axial motion of the carriage 131 in a similar manner to the screw 30 which moves the carriage 12 of Figure 4, mounted alongside the cylinder 1c, but on the other side of the felt 5, is the slide carrying the liquid supply which may be substantially the same as that shown in Figure 4, except that in Figure 9 the felt passes between the liquid nozzle and the cylinder 1c, whereas in Figure 4 the same side of the felt is exposed to discharge from the liquid nozzle as contacts with the periphery of the cylinder 1. The nozzle 142 through which the cleaning liquid is supplied to the felt 5, as shown in Figure 9, applies this liquid to the opposite side of the felt 5 from that occupied by the cylinder 1c and closely adjacent to the low suction portion 133 of the suction box. Thus as the felt moves the low suction pulls the cleaning liquid into and through the felt removing the major portion of the free water after which the high suction box removes the water held by way of moisture in the fibers of the felt itself.

From the foregoing description of certain embodiments of this invention, it should be evident to those skilled in the art that various other changes and modifications might be made without departing from the spirit or scope of this invention.

I claim:

1. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length at least as great as the working width of the felt of a paper-making machine and over an angular portion of the periphery of which the felt engages throughout the working width of the felt, means supporting said cylinder for rotation about its axis with the felt, a device including a suction box of less width than said felt supported within said cylinder and having its suction face engaging the inner face of said cylinder opposite to the felt, means for reciprocating said device lengthwise of said cylinder while in contact with the inner face of said cylinder, and means in advance of such suction box in the direction of motion of the felt for applying cleaning liquid to the felt limited to the width of the felt next thereafter subjected to suction from said box.

2. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length at least as great as the working width of the felt of a paper-making machine and over an angular portion of the periphery of which the felt engages throughout the working width of the felt, means supporting said cylinder for rotation about its axis with the felt, a device including a suction box of less width than said felt supported within said cylinder and having its suction face engaging the inner face of said cylinder opposite to the felt, means for reciprocating said device lengthwise of said cylinder while in contact with the inner face of said cylinder, and means within said cylinder in advance of such suction box in the direction of motion of the felt for applying cleaning liquid to the felt limited to the width of the felt next thereafter subjected to suction from said box.

3. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length at least as great as the working width of the felt of a

paper-making machine and over an angular portion of the periphery of which the felt engages throughout the working width of the felt, means supporting said cylinder for rotation about its axis with the felt, a device including a suction box of less width than said felt supported within said cylinder and having its suction face engaging the inner face of said cylinder opposite to the felt, means for reciprocating said device lengthwise of said cylinder while in contact with the inner face of said cylinder, and means outside of said cylinder in advance of such suction box in the direction of motion of the felt for applying cleaning liquid to the felt limited to the width of the felt next thereafter subjected to suction from said box.

4. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length at least as great as the working width of the felt of a paper-making machine and over an angular portion of the periphery of which the felt engages throughout the working width of the felt, means supporting said cylinder for rotation about its axis with the felt, a device including a suction box of less width than said felt supported within said cylinder and having its suction face engaging the inner face of said cylinder opposite to the felt, means for reciprocating said device lengthwise of said cylinder while in contact with the inner face of said cylinder, and means on the opposite side of the felt from said cylinder in advance of such suction box in the direction of motion of the felt for applying cleaning liquid to the felt limited to the width of the felt next thereafter subjected to suction from said box.

5. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length greater than the width of the felt of a paper-making machine and over an arc of the circumference whereof the felt extends, means supporting said cylinder beyond opposite side edges of the felt for rotation about its axis with the travel of the felt, a stationary support extending through said cylinder, a suction box of less width than the felt mounted for motion along said support and with its open face in substantial contact with the inner wall of said cylinder at said arc, means for moving said box back and forth in said cylinder throughout the working width of said felt, and means for supplying a cleaning liquid to said felt in advance of such suction box limited to the width of the felt next thereafter subjected to suction from said box.

6. Felt conditioning mechanism, comprising a foraminous hollow cylinder of a length greater than the width of the felt of a paper-making machine and over an arc of the circumference whereof the felt extends, means supporting said cylinder beyond opposite side edges of the felt for rotation about its axis with the travel of the felt, a stationary support extending through said cylinder, a suction box of less width than the felt mounted for motion along said support and with its open face in substantial contact with the inner wall of said cylinder at said arc, means for moving said box back and forth in said cylinder throughout the working width of said felt, means for supplying a cleaning liquid to said felt in advance of such suction box limited to the width of the felt next thereafter subjected to suction from said box, and means for moving said cleaning liquid supply means across said felt with the motion of said suction box.

7. Felt conditioning mechanism, comprising a

foraminous hollow cylinder of a length greater than the width of the felt of a paper-making machine and over an arc of the circumference whereof the felt extends, means supporting said cylinder beyond opposite side edges of the felt for rotation about its axis with the travel of the felt, a stationary support extending through said cylinder, a suction box of less width than the felt mounted for motion along said support and with its open face in substantial contact with the inner wall of said cylinder at said arc, means for moving said box back and forth in said cylinder throughout the width of said felt, an annular foraminous member of less width than the felt and of smaller diameter within said cylinder and in advance of such suction box and mounted for movement with said suction box, said annular member contacting the inner face of said cylinder and being mounted for rotation thereby, a shield for closing off the openings of said annular member except in an arc facing the

adjacent portion of said cylinder, and means for supplying cleaning liquid to the interior of said member.

5 8. In combination a felt conditioner having a suction box of less width than the working width of a paper machine reciprocable across the working width of such felt and having means for rendering such conditioner operative while passing in one direction and inoperative while passing in the opposite direction, said conditioner comprising means for supplying cleaning liquid to the felt in advance of such suction box, a foraminous hollow cylinder of a length at least as great as the working width of the felt and over an angular portion of which said felt passes, the wall of said cylinder being interposed between the suction box and the felt and against the inner face of which said suction box rides, said cylinder being free to be rotated with the felt passing in contact therewith.

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