United States Patent [19]

Hastwell

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[54] **CLEANING SYSTEM FOR WETTING TANK ROLLERS**

[75] Inventor: **Peter J. Hastwell,** Elizabeth Grove, Australia

[73] Assignee: **Savin Business Machines Corporation,** New York, N.Y.

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[52] **U.S. Cl.**..... **118/4,** 118/104, 118/203, 15/256.53

[51] **Int. Cl.**..... **B05c 1/08,** B05c 11/04, A46b 15/00

[58] **Field of Search**..... 118/4, 104, 203, 118/204; 15/256.51, 256.52, 256.53; 355/4

[56] **References Cited**

UNITED STATES PATENTS

2,303,171	11/1942	Morrison	118/203
3,641,969	2/1972	Hakanson	15/256.53 UX
3,561,400	2/1971	Smitzer	118/203 X
2,953,952	9/1960	Alexander	15/256.52 X
2,884,893	5/1959	Kabelitz	118/4 X
3,121,247	2/1964	Malicky et al.	118/104 X

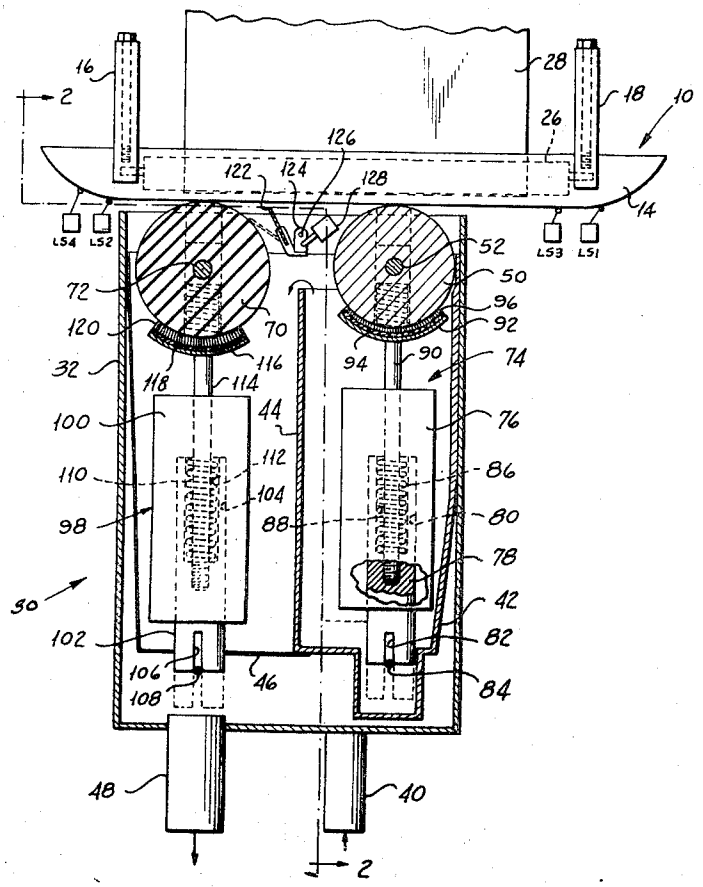
Primary Examiner—James Kee Chi

Attorney—Henry L. Shenier, Francis M. O'Connor et al.

[57] **ABSTRACT**

Cleaning apparatus for the rollers of the wetting system of an electrostatic copying machine in which arcuate pile pads are rapidly reciprocated into and out of contact with the roller surfaces during inactive periods thereof to scrub the surfaces while at the same time imparting rotary motion thereto to move them through the clean wetting liquid in the tank with which the rollers are associated.

13 Claims, 3 Drawing Figures



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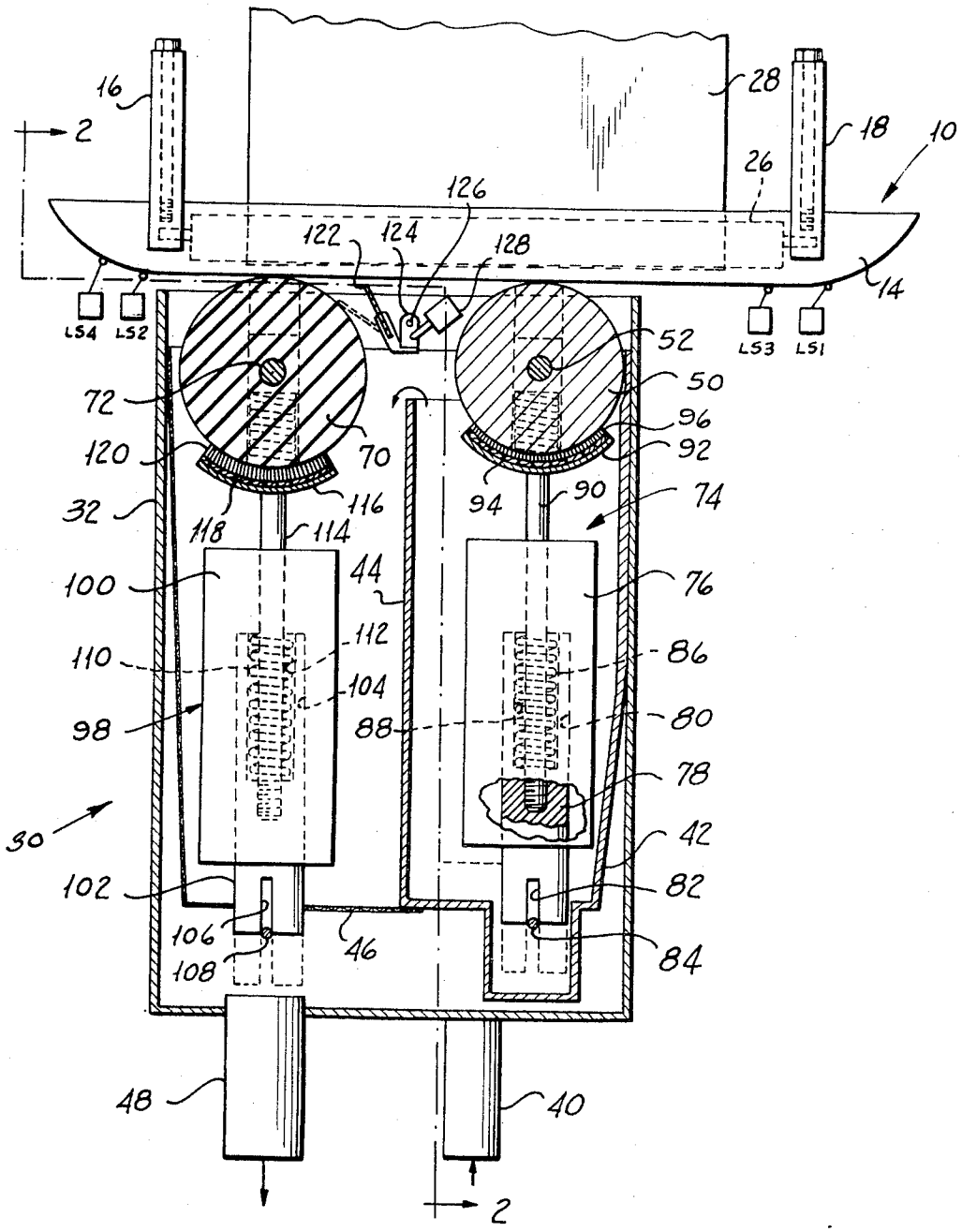
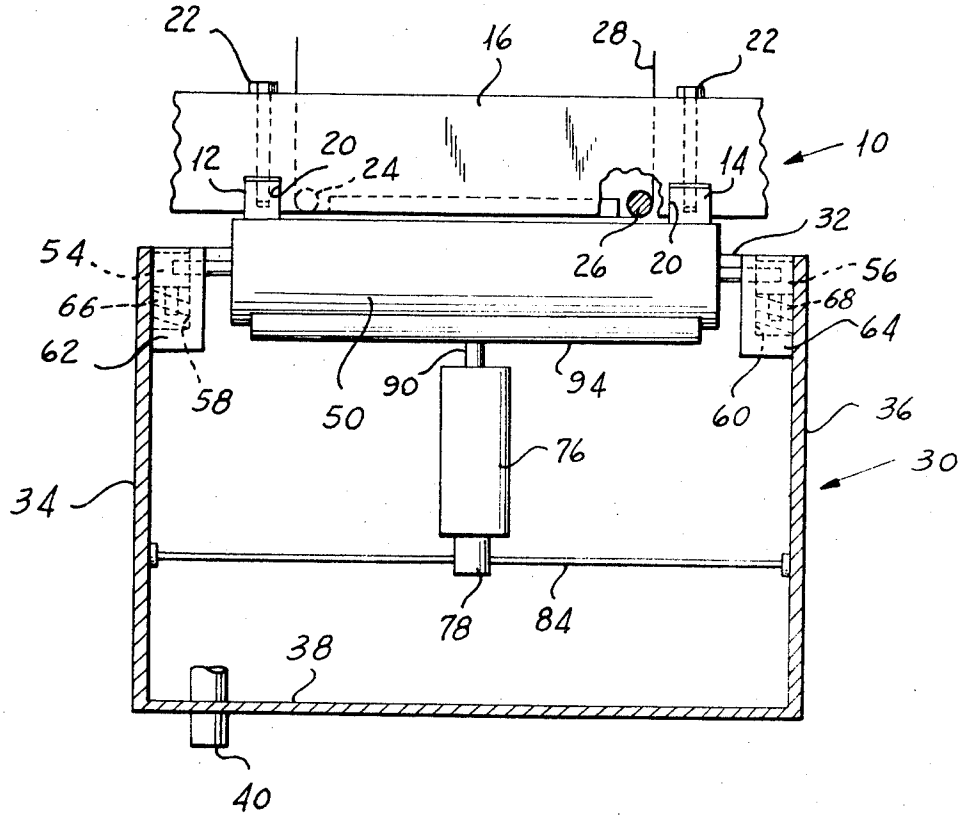
SHEET 1 OF 2

FIG 1



INVENTOR.
Peter J. Hastwell
BY
Shenier & O'Connor
ATTORNEYS

Fig 2



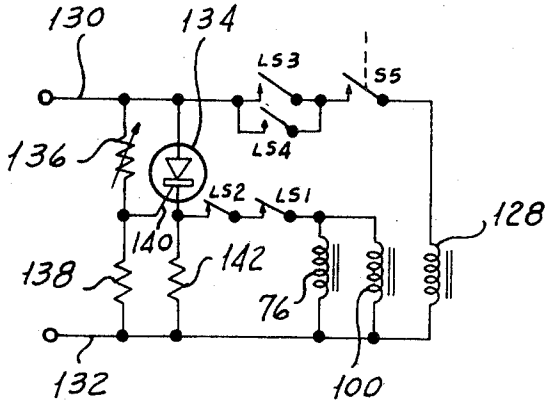


Fig 3

INVENTOR.
Peter J. Hastwell
BY
Shenier & O'Connor
ATTORNEYS

CLEANING SYSTEM FOR WETTING TANK ROLLERS

BACKGROUND OF THE INVENTION

My copending application Ser. No. 47 273 filed June 18, 1970, now U.S. Pat. No. 3,709,594, discloses a Method and Apparatus for Electrostatic Color Printing. The apparatus disclosed therein comprises a movable carriage supporting the copy material for movement past a plurality of stations at which the copy material successively is charged, exposed to an image to be reproduced, prewet with clear developer liquid, subjected to developer liquid containing toner, wet following the developing operation and then dried. The same unit is employed to accomplish both the prewetting and postwetting operations. This unit comprises a tank holding a supply of clear developer carrier liquid. Both a rubber roll and a metal roll are rotatably supported for movement on the tank with a portion thereof below the level of liquid in the tank. In the course of the prewetting operation, both rollers are active and carry the clear liquid up into contact with the surface of the copy material on the carriage. In the course of the postwetting operation in which the carriage moves in the reverse direction relative to the wetting unit, the steel or metal roller is active while a wiper is brought into engagement with the surface of the rubber roll to wipe it clear of liquid to cause it to remove excessive liquid from the copy material.

Clear carrier liquid is supplied to the wetting tank by a system incorporating an electrostatically-operated filter which removes toner from the liquid being returned to the supply system from the tank. The supply system is described in detail in my copending application referred to hereinabove.

While the supply system with its filter supplies clean liquid to the tank, I have discovered that the rollers themselves tend to become dirty or to collect toner particles from developer on the copy material as the rolls are driven by the carriage in the course of its passage thereby during the postwetting operation. This dirt on the rolls may produce an entirely spoiled or distorted color print. Even where the print is not entirely destroyed, it is not as clear and crisp as is desirable and the background picks up undesirable amounts of toner particles from the rolls.

I have invented a wetting system for an electrostatic copy machine which overcomes the difficulties of wetting systems of the prior art. My system effectively removes toner particles from the applicator rolls. It minimizes the possibility of spoiled or distorted color prints owing to the presence of toner on the applicator rolls. It is so arranged that it does not interfere with normal operation of the rolls in applying wetting material to the copy medium. It is relatively simple in construction and in operation for the result achieved thereby.

SUMMARY OF THE INVENTION

One object of my invention is to provide a cleaning system for wetting tank rollers which overcomes difficulties experienced with wetting systems of the prior art.

Another object of my invention is to provide a cleaning system for wetting tank rollers which effectively removes toner particles and the like collecting on the surfaces of the rollers.

Still another object of my invention is to provide a cleaning system for wetting tank rollers which minimizes the possibility of spoiled and distorted color prints resulting from material collecting on the wetting tank rollers.

A further object of my invention is to provide a cleaning system for wetting tank rollers which operates only during inactive periods of the wetting system.

A still further object of my invention is to provide a cleaning system for wetting tank rollers which is simple in construction and in operation for the result achieved thereby.

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

In general, my invention contemplates the provision of a cleaning system for wetting tank rollers in which arcuate pile pads, elongated in the direction of the axis of the rollers are reciprocated during inactive periods of the wetting system into and out of engagement with the roller surfaces to scrub the surfaces thereof and to impart rotary motion to the rollers to move them through the clean liquid in the tank.

BRIEF DESCRIPTION OF THE DRAWINGS

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:

FIG. 1 is a sectional view of my cleaning system for wetting tank rollers.

FIG. 2 is a sectional view of the system illustrated in FIG. 1 taken along the line 2—2 of FIG. 1 and drawn on an enlarged scale.

FIG. 3 is a schematic view of one form of electrical circuit which may be used to control my cleaning system for wetting tank rollers.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, the electrostatic copying machine with which my cleaning system for wetting tank rolls is used is of the type shown in my copending application referred to hereinabove. The machine includes a carriage, indicated generally by the reference character 10, comprising respective rails 12 and 14 supported in sides 16 and 18 of the carriage by means of bolts 22 which position the rails 12 and 14 in slots 20 in the respective sides 16 and 18. As is more fully pointed out in the copending application, the carriage 10 supports respective guide rolls 24 and 26 which guide the copy material 28 so that the length thereof extends across the underside of the carriage between the rolls 24 and 26. The carriage 10 is adapted to be driven from left to right as viewed in FIG. 1 in a prewetting step and from right to left as viewed in FIG. 1 in a postwetting step.

The wetting system, indicated generally by the reference character 30, comprises a tank having respective ends 34 and 36 and a base 38. An inlet conduit 40, extending through the base 38, leads into a sub-tank 42 positioned within the tank 32. As is more fully pointed out in the copending application, clear developer carrier liquid is supplied to inlet conduit 40 by a circulating system including an electrostatic filter (not shown) which removes dirt such as toner particles from the liquid. Clean liquid supplied to the sub-tank 42 through the pipe 40 fills the sub-tank and flows over a wall 44

of sub-tank 42 into the tank 32. The circulating system is such that the wetting fluid fills the tank 32 approximately to the level of the upper edge of the wall 44 of the sub-tank 42. After passing into the main tank 32, the fluid passes through a screen 46 to an outlet conduit 48 leading back to the circulating system.

The wetting system 30 includes a postwet and prewet roller 50 which is formed of any suitable metal such for example as aluminum. Roll 50 is carried by a shaft 52 which is supported in respective shaft bearings 54 and 56 mounted in bores 58 and 60 in blocks 62 and 64 on the sides 34 and 36 of the tank 32. Respective springs 66 and 68 normally urge the shaft bearings 54 and 56 upwardly as viewed in FIG. 2.

System 30 also includes a prewetting roll 70 formed of a suitable material such as polyurethane rubber having a shore hardness preferably of about 20. The shaft 72 of the roll 70 is supported in a manner similar to that described hereinabove in connection with roll 50. As the carriage 10 moves over the unit 30 the rails 12 and 14 engage the rollers 50 and 70 to rotate them and to move them slightly downwardly against the action of the associated bearing springs. In this condition of the apparatus, the surface of the paper is slightly spaced from the surfaces of the rolls 50 and 70 so that as the rolls carry wetting liquid upwardly into contact with the surface of the paper, the roll surfaces do not positively engage the paper so as to disturb the image thereon in the postwetting step.

The cleaning system indicated generally by the reference character 74, associated with the roll 50, includes a solenoid 76 supported in the sub-tank 42 by any suitable means. An armature 78 associated with the solenoid 76 is located in a bore 80 in the solenoid 76. A slot 82 in the armature 78 receives a guide rod 84 to guide the solenoid in its movement. A spring 86 located in a bore 88 in the armature 78 normally urges the armature downwardly as viewed in FIGS. 1 and 2. A rod 90 threaded into the armature 78 carries an arcuate plate which is elongated in the direction of the axis of roll 50. A fabric 94 adhered to the upper surface of the plate 92 by any suitable means has a pile 96 which is adapted to engage the surface of roll 50. As will be described more fully hereinbelow, when the carriage 10 is in position over the unit 30 the solenoid 76 is inactive and the pile 96 is out of engagement with the roll surface. However, when the solenoid is pulsed, the pile moves upwardly into engagement with the surface of roll 50. As it does so, it not only scrubs the surface of the roll, but it also initiates a rotary movement of the roll 50 in a direction which is determined by the initial set of the pile as it engages the roll.

I provide another cleaning system, indicated generally by the reference character 98, similar to that provided for the roll 50, for roll 70. The system 98 includes a solenoid 100 having an armature 102 adapted to reciprocate vertically in a bore 104 in the solenoid 100. A slot 106 adjacent to the lower end of armature 102 receives a guide rod 108. A spring 110 positioned in a bore 112 in armature 102 normally urges the armature downwardly as viewed in FIG. 1. A rod 114 threaded into the armature 102 carries an arcuate plate 116 which is elongated in the direction of the axis of roll 70. A fabric 118 adhered to the upper surface of plate 116 has a pile 120 adapted to engage the surface of roll 70. As is pointed out hereinabove, in connection with the system 74, when the carriage 10 is positioned over the unit 30, solenoid 100 is not energized and pile 120 is out of engagement with the surface of roll 70.

A bracket 124 pivotally carried on a pin 126 on tank 32 supports a wiper blade 122 for movement into and out of engagement with the surface of roll 70 along a line above the normal level of liquid in the tank 32. A solenoid 128 is adapted to be energized to move the blade 128 from the position out of engagement with the roll to the position in engagement with the roll. As will more fully be explained hereinbelow, in the course of a prewetting operation as carriage 10 moves from left to right in FIG. 1, both rolls 70 and 50 are to carry liquid up into contact with the surface of the copy material 28. Thus, in this direction of travel of the carriage 10, solenoid 128 is not energized. In the course of a postwetting operation, only roll 50 is to carry liquid up into contact with the surface of the copy material 28 carrying the image. For that reason, in this direction of movement solenoid 128 is energized to move the wiper blade 122 into the broken line position illustrated in FIG. 1 at which it engages the surface of roll 70.

Referring now to FIG. 3, I have shown one form of electrical control circuit for my cleaning system which causes solenoids 76 and 100 to be pulsed only during times at which the carriage 10 is not over the wetting unit 30. The circuit of FIG. 3, moreover, ensures that solenoid 128 is energized only during the direction of travel of carriage 10 from right to left as viewed in FIG. 1. The circuit of FIG. 3 includes respective conductors 130 and 132 connected to a suitable source of alternating current potential, such for example, as 240 volts. This voltage is half-wave rectified by a silicon-controlled rectifier 134 connected in series with an output resistor 142 between conductors 130 and 132. A variable resistor 136 and a resistor 138 connected in series between conductors 130 and 132 form a voltage divider for applying a potential to the gate 140 of the diode 134. Resistor 136 provides a means for varying the interpulse time of the output of rectifier 134.

Respective normally closed limit switches LS1 and LS2 connected in series with each other, connect the two solenoids 76 and 100 in parallel with output resistor 142. It will be seen that as long as both of these switches are closed solenoids 76 and 100 will be pulsed by the half-wave rectified output from the rectifier 134. If, however, either of these two limit switches LS1 and LS2 is open, the solenoids will not be pulsed. Referring again to FIG. 1, it will be seen that one of the two limit switches LS1 and LS2 is open whenever any part of the carriage 10 is over the unit 30 so that neither of the solenoids will be pulsed during the time when the wetting unit is to perform its wetting function. Moreover, when the solenoids are deenergized springs 86 and 110 position the felts 94 and 118 out of engagement with rolls 50 and 70.

As has been pointed out hereinabove, solenoid 128 should be energized to move blade 122 into engagement with roll 70 when the carriage travels right to left over the unit 30. Normally open limit switches LS3 and LS4 connected in parallel with each other are connected in series with a normally open switch S5 and with winding 128 between conductors 130 and 132. Switch S5 is under the control of the reversing drive system (not shown) of carriage 10 so as to be closed at any time at which the carriage 10 is moving from right to left. As the carriage enters into the space over the system 30 the rail 14 or some appropriate part of the

carriage 10 closes LS3 to energize solenoid 128. As the leading part of the carriage moves out of the space over the system 30, rail 14 closes switch LS4 to provide a holding circuit for solenoid 128 until the trailing edge of the carriage 10 leaves the space over the system 30. In the reverse direction of movement of the carriage the solenoid 128 will not be energized owing to the fact that switch S5 is not closed.

In operation of my cleaning system, so long as the carriage 10 is not in the space over system 30 both switches LS1 and LS2 are closed and the pulses produced by the half wave rectifier are applied to solenoids 76 and 100. Under the action of the pulses the armatures 78 and 102 vibrate rapidly in a vertical direction alternately to bring the piles 96 and 120 into engagement with the rolls 50 and 70 and out of engagement with the rolls. This action causes the rolls to rotate in a direction or directions determined by the initial set of the pile. At the same time the piles scrub the surfaces of the rolls as they rotate. Dirt such as toner particles removed from the surfaces of the rolls in this manner is carried off by the clean liquid circulating through the tank 32.

Whenever carriage 10 is in the space over the system 30 the carriage operates switches LS1 and LS2 to deactivate the cleaning system. Moreover, in the movement of the carriage from right to left solenoid 128 is activated over that period of time during which the carriage is over the system 30.

It will be seen that I have accomplished the objects of my invention. I have provided a system for cleaning the rollers of the wetting system of an electrostatic copying machine. My system minimizes the possibility of production of unsatisfactory prints as a result of dirty rolls. It achieves this result without interfering with the normal operation of the wetting system. It is relatively simple in construction and in operation for the result achieved thereby.

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 wetting system for applying a liquid to a length of material travelling along a path past said system, apparatus comprising a tank for holding a supply of said liquid at a predetermined level therein, an applicator roll, means mounting said roll on said tank at a location at which said roll is partially immersed in said liquid to cause said roll to carry wetting liquid from said tank to the surface of material travelling thereby, an element mounted for reciprocating movement adjacent to said roll, means for reciprocating said element and means responsive to reciprocation of said member for concomitantly scrubbing the surface of said roll while rotating said roll.

2. Apparatus as in claim 1 including means responsive to the presence of material adjacent to said wetting system for disabling said reciprocating means.

3. Apparatus as in claim 1 in which said element comprises a pile fabric, the pile of which is adapted to engage the surface of said roll.

4. Apparatus as in claim 3 in which said fabric is generally arcuate in cross sectional shape and in which said fabric has a length approximating that of said roll.

5. Apparatus as in claim 4 including means for rapidly reciprocating said pile fabric toward and away from said roll.

6. Apparatus as in claim 5 in which said reciprocating means comprises a solenoid and means for pulsing said solenoid.

7. Apparatus as in claim 6 including an armature associated with said solenoid and a rod connecting said armature to said fabric.

8. A wetting system for an electrostatic copier having means for moving a length of copy material back and forth past said system including in combination, a tank for holding a supply of developer carrier liquid, a first roll, a second roll, means mounting said rolls on said tank for rotary movement with the axis thereof generally perpendicular to the direction of movement of said moving means relative to the system, said rolls being partially immersed in the liquid in said tank, respective lengths of pile material associated with said rolls, means mounting said pile material length adjacent the respective rolls for reciprocation relative thereto in directions generally perpendicular to the roll axes between positions in engagement with the roll surfaces and positions out of engagement with the roll surface, and means for driving said pile material lengths between said positions concomitantly to scrub said rolls and to impart rotary movement thereto.

9. Apparatus as in claim 8 including means responsive to the presence of said moving means over said system for disabling said driving means.

10. Apparatus as in claim 8 including a wiper blade associated with one of said rolls, means mounting said blade for movement between an operative position in engagement with said one roll and an inoperative position away from said one roll, a solenoid adapted to be energized to move said blade from its inoperative position to its operative position and means responsive to movement of said moving means in one direction relative to said system and to the presence of said moving means over said system for energizing said solenoid.

11. A system as in claim 8 in which said driving means comprises respective solenoids and means for pulsing said solenoids.

12. A system as in claim 11 including means for varying the rate at which said solenoids are pulsed.

13. A system as in claim 8 in which said lengths of pile material are arcuate in cross section.

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