

Sept. 22, 1964

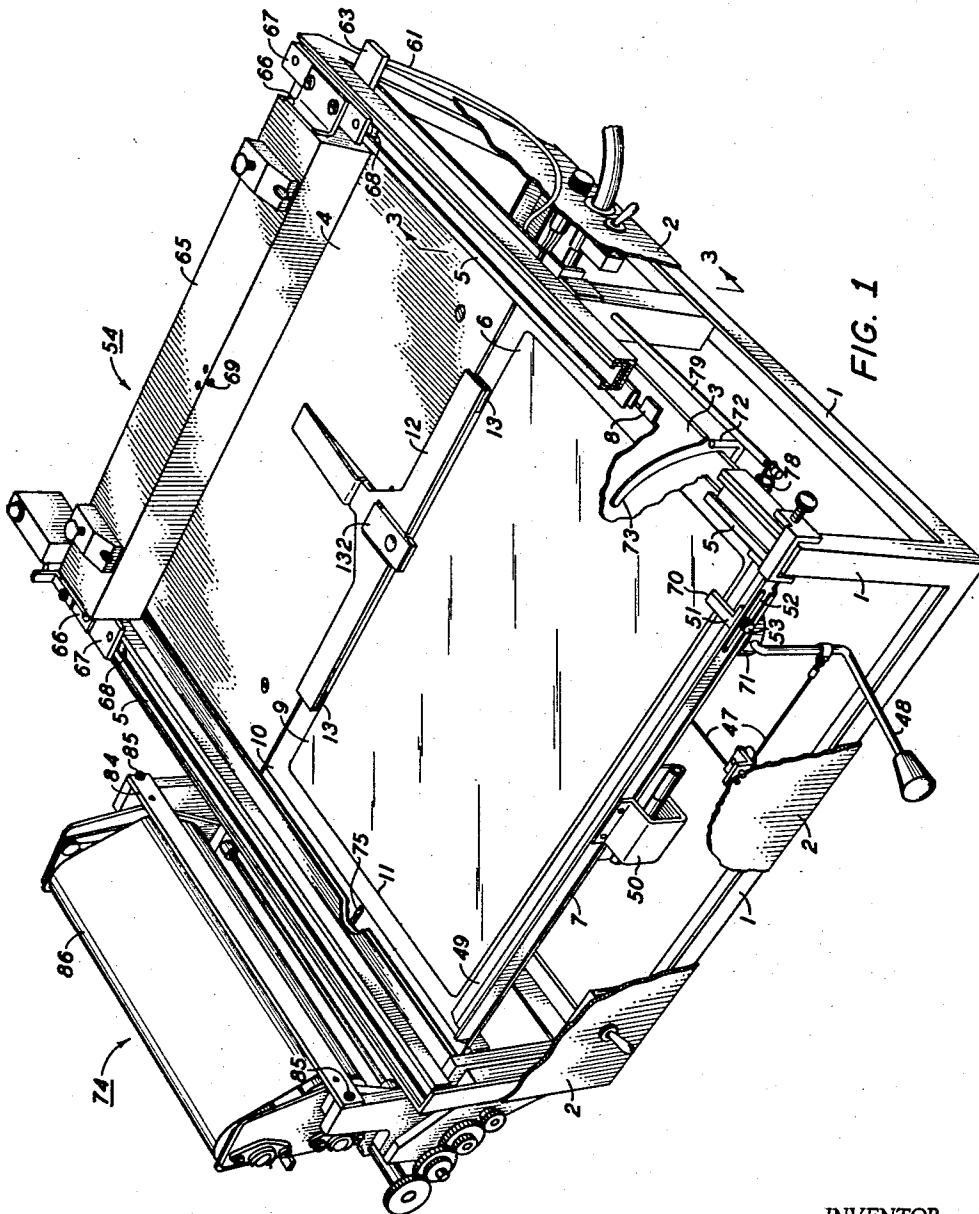
T. C. MURRAY ET AL

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS

Filed Nov. 1, 1962

5 Sheets-Sheet 1



INVENTOR
THOMAS C. MURRAY
JOSEPH B. STONE
FRANKLIN S. REESE
BY *Franklin S. Reese*
ATTORNEY

Sept. 22, 1964

T. C. MURRAY ET AL

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS

Filed Nov. 1, 1962

5 Sheets-Sheet 2

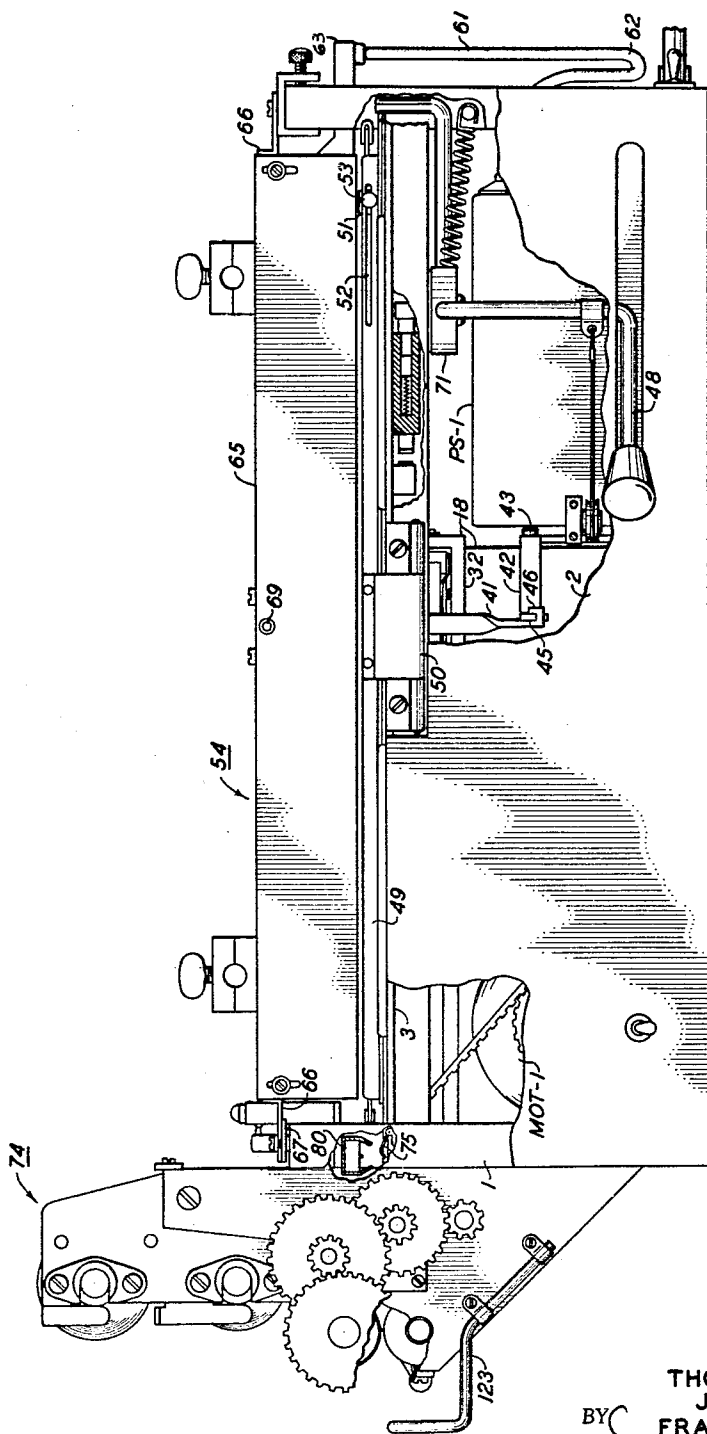


FIG. 2

INVENTOR
THOMAS C. MURRAY
JOSEPH B. STONE
FRANKLIN S. REESE
BY *Franklin S. Reese*
ATTORNEY

Sept. 22, 1964

T. C. MURRAY ETAL

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS

Filed Nov. 1, 1962

5 Sheets-Sheet 3

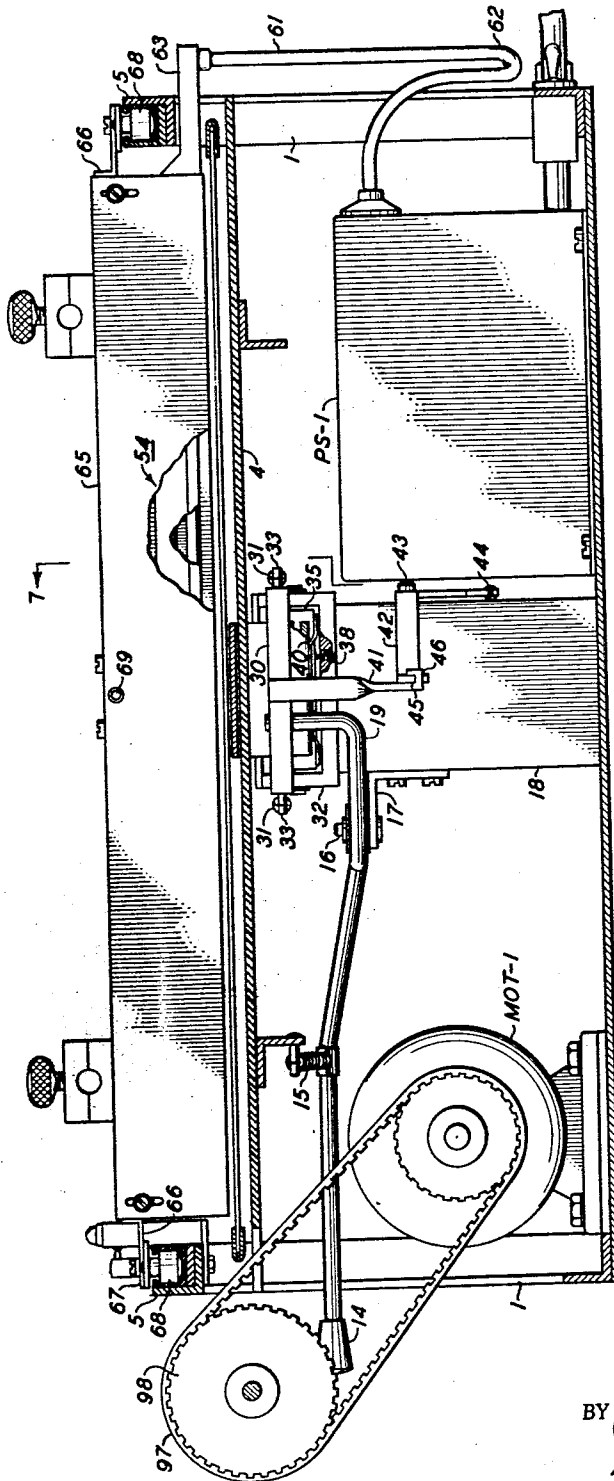


FIG. 3

INVENTOR
THOMAS C. MURRAY
JOSEPH B. STONE
FRANKLIN S. REESE
BY *Thomas C. Murray*
ATTORNEY

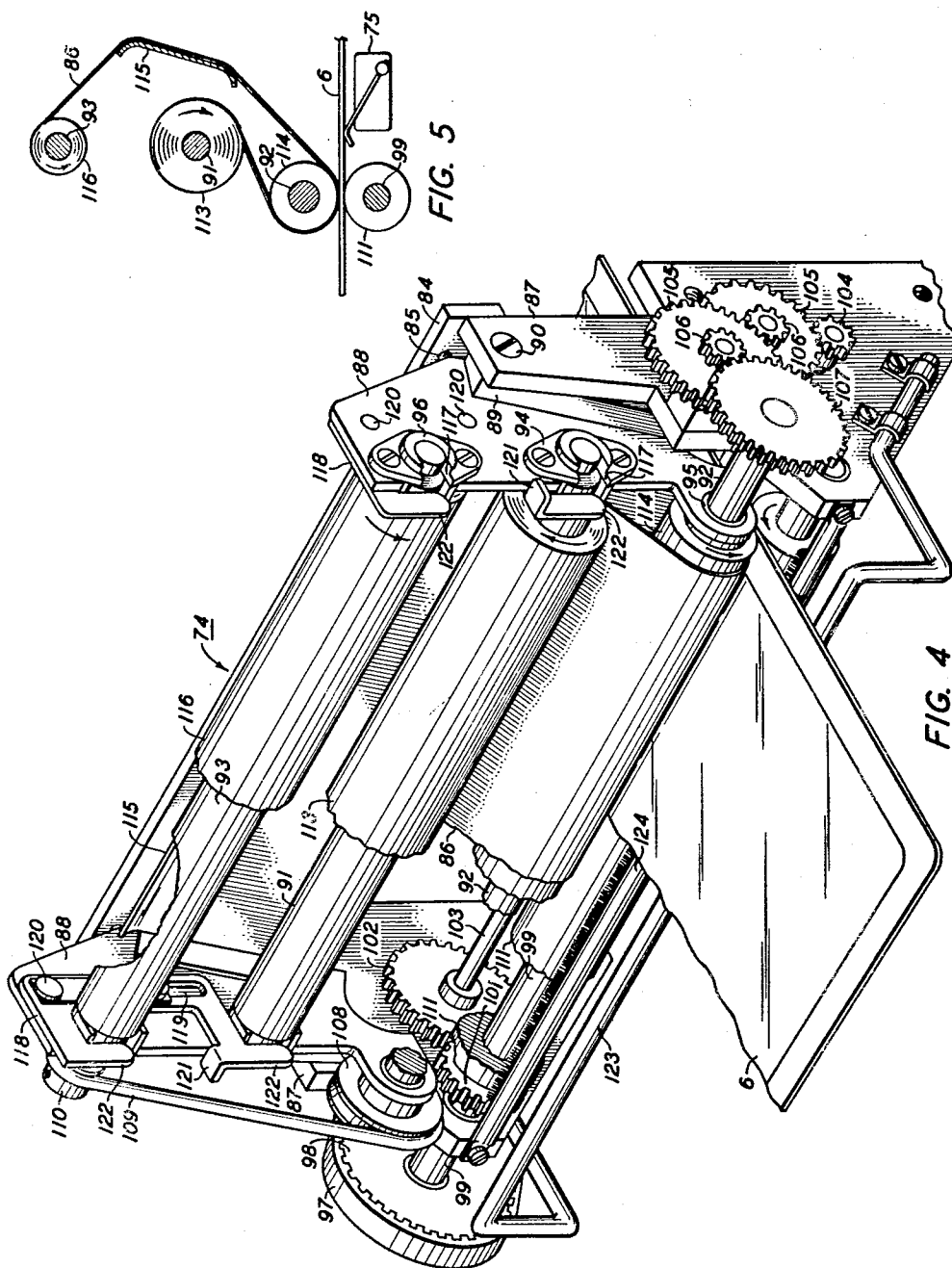
Filed Nov. 1, 1962

T. C. MURRAY ET AL

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS

5 Sheets-Sheet 4



INVENTOR.
THOMAS C. MURRAY
BY JOSEPH B. STONE
FRANKLIN S. REESE
James P. Schneider
ATTORNEY

Sept. 22, 1964

T. C. MURRAY ET AL

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS

Filed Nov. 1, 1962

5 Sheets-Sheet 5

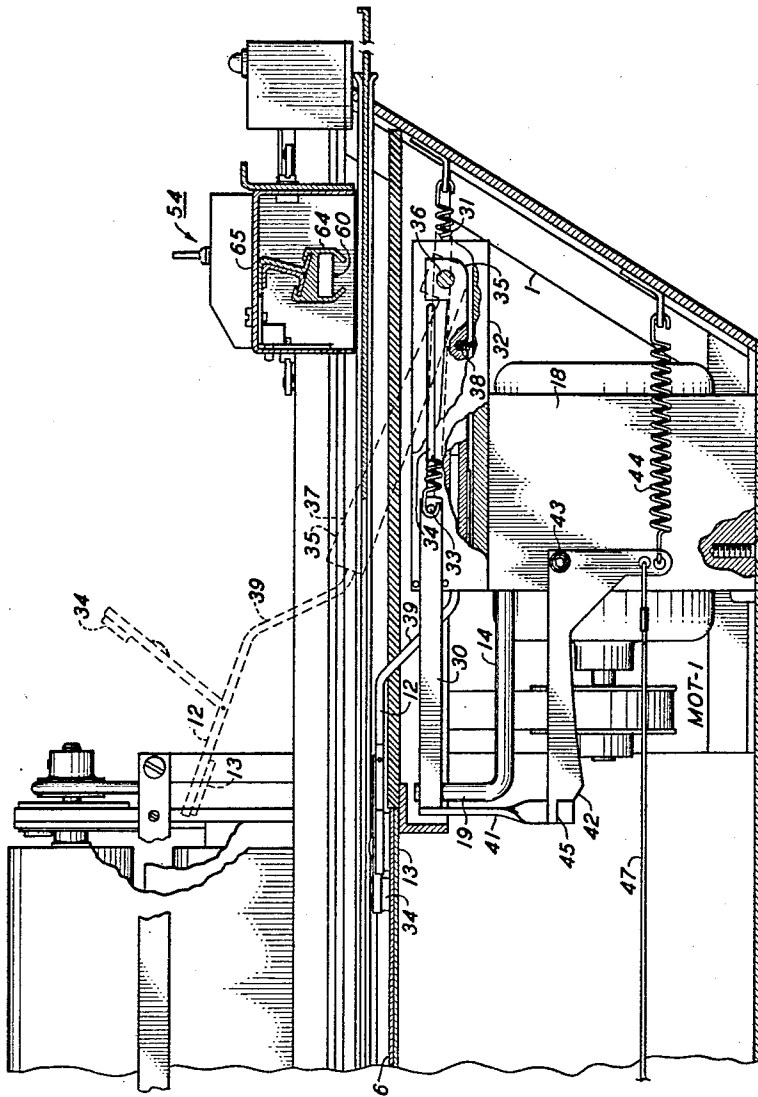


FIG. 6

INVENTOR

THOMAS C. MURRAY

JOSEPH B. STONE

FRANKLIN S. REESE

BY

Franklin S. Reese
ATTORNEY

1

3,149,356

XEROGRAPHIC PLATE CLEANING APPARATUS
Thomas C. Murray, Rochester, Joseph B. Stone, Penfield,
and Franklin S. Reese, Victor, N.Y., assignors to Xerox
Corporation, Rochester, N.Y., a corporation of New
York

Filed Nov. 1, 1962, Ser. No. 234,606
2 Claims. (Cl. 15—1.5)

This invention relates to a xerographic plate cleaning apparatus and specifically to apparatus adapted to automatically clean a xerographic plate with a web of fibrous material.

In the process of xerography, a metal plate containing a photoconductive surface is charged, exposed and developed. That is, a uniform electrostatic charge is placed on the plate surface. The plate is then exposed to a light image of copy to be reproduced, resulting in a latent electrostatic image of the original copy on the plate surface. The electrostatic image is developed by covering the plate surface with a finely divided powder. The powder adheres to the plate in the areas containing electrostatic charge, thus producing a powder image of the original copy. The powder image is transferred to a support material surface and is bonded thereto. A quantity of residual powder adheres to the plate surface after the image is transferred to the support material surface and must be removed before the xerographic plate can be used to develop a new image.

Heretofore cleaning of flat xerographic plates sometimes has been a hand operation wherein the plate containing the residual powder has been moved under an electrostatic discharge device and covered with an electrostatic charge. The plate was then manually wiped with a soft powder absorbent material, such as cotton. The electrostatic charge loosened the powder from the surface and the absorbent material wiped the powder off the surface. This method, though effective, was time consuming and dirty.

It is, therefore, the primary object of this invention to provide apparatus which will automatically clean a xerographic plate.

It is also an objective of this invention to provide a plate cleaning apparatus that will utilize a continuous web of material as the cleaning medium.

A further object of this invention is to provide a xerographic plate cleaning apparatus that will automatically clean a xerographic plate and place the plate in a position where an operator may pick up the plate for reuse.

Further objects of this invention are to provide web cleaning apparatus for use with flat xerographic plates, and to provide a web cleaning apparatus that does not require the attention of an operator, and is faster and less expensive to operate than the existing methods.

These and other objects of the invention are attained by means of a web of fibrous material mounted on rollers and forced into moving contact with a xerographic plate. A drive roll moves the plate through the apparatus and a cleaning roll forces the web into contact with the plate surface.

For a better understanding of the invention, as well as the objects and further features thereof, reference is had to the following detailed description of the invention to be read in connection with the accompanying drawings, wherein:

FIG. 1 is an isometric view of one embodiment of a xerographic transfer and cleaning unit;

FIG. 2 is a front view of the xerographic transfer and cleaning unit shown in FIG. 1 with portions broken away to show internal structure;

FIG. 3 is a sectional view of the xerographic transfer and cleaning unit shown in FIG. 1 taken along line 3—3

2

of FIG. 1 with portions broken away to show internal structure;

FIG. 4 is an enlarged isometric view of one embodiment of a web cleaning assembly of the xerographic transfer and cleaning unit shown in FIG. 1;

FIG. 5 is a schematic representation of the web travel of the web cleaning assembly; and

FIG. 6 is a fragmentary sectional view taken along line 6—6 of FIG. 3.

Referring now to FIG. 1, there is shown a xerographic transfer and cleaning unit including a frame 1 enclosed by side covers 2, here shown broken away to reveal the internal structure of the apparatus. The frame 1 has a front top cover 3, a rear top cover 4 and a pair of guide tracks 5 extending along the top side edges. The top cover 3 is sized to receive and support a xerographic plate 6. The plate 6 is properly positioned on the top cover 3 by abutting two sides of the plate against a front lip 7 and a side block 8 on the front and side top edges, respectively, of the frame 1.

The xerographic plate 6 consists of a photoconductive surface 9, such as selenium, on a conductive backing member 10. The photoconductive surface 9 does not completely cover the plate member 10, thus leaving a border or edge 11 around the outer periphery of the plate. When the plate 6 is placed in the transfer unit, there is a powder image on the photoconductive surface 9 which is to be transferred to a sheet of paper or support material. Proper alignment of the support material with respect to the powder image is important for proper registration of the final transferred image onto the support material. To ensure that the plate 6 does not move during the transfer operation, a plate clamp 12 is provided at the rear side of the plate 6 extending out of the rear top cover 4. Plate clamp 12 extends over front top cover 3, and plate 6 a distance sufficient to hold plate 6 but not to contact the photoconductive surface 9. A pair of polyurethane pads 13 on each end of the clamp 12 press against the plate 6 holding it securely in position.

To place the plate clamp 12 into a locked position wherein plate 6 is held rigidly in the transfer unit, as shown by the solid lines in FIG. 6, a plate clamp lever 14, shown in FIG. 3, is moved to the rear of the transfer unit against the action of tension spring 15 mounted between the rear top cover 4 and the clamp lever 14. The plate clamp lever pivots about a pin 16 mounted in a bracket 17 which is rigidly secured to a mounting block 18. The rearward movement of the plate clamp lever 14 moves an arm 19 which extends upwardly from the plate clamp lever to engage a spring loaded yoke 30, pulling the yoke forward against tension spring 31. The yoke 30 is a U-shaped member extending around a channel-shaped clamp mounting frame 32, rigidly secured to block 18.

The yoke 30 contains a pin or rod 33 (see FIG. 6) which extends through two slots 34 in each of the clamp mounting frame sides. The pin 33 extends across the channel-shaped mounting frame over a clamp receiving member 35 which fits into the channel portion of the clamp mounting frame and is pivotally attached to the rear of the mounting frame 32 by pivot pin 36. The top side 37 of the clamp receiving member 35 is slanted or sloped from the clamp end downward to the pivoted end. The pin 33 of the yoke 30 extends across the clamp receiving member and rides on the sloped surface 37. A pair of compression springs 38 in the bottom of the channel portion of the clamp mounting frame 32 press upward on the bottom of the clamp receiving member 35 urging it to a position shown by the dotted lines in FIG. 7. In this position, the plate clamp 12 would be away from the plate 6 in an unclamped position and the yoke 30 would be toward the rear of the transfer unit, that is, drawn in around the mounting frame 32 with the pin

3

33 extending across the clamp receiving arm at the lowest point of the sloped surface 37.

As the movement of the clamp lever 14 pulls the yoke 30 forward, the pin 33 rides on the sloped surface 37 of the clamp receiving member 35 forcing the clamp receiving member downward into the channel of the mounting frame 32 against springs 38. There is a grooved T slot in the bottom of the plate receiver member 35 which is adapted to receive arm 39 of the plate clamp 12. The plate clamp 12 is held in the T slot by a leaf spring 40 and moves with the receiving member so that as the receiving member is forced downward against the compression springs 38, the plate clamp moves downward and presses against plate 6.

The yoke 30 is held in a forward position holding the clamp 12 against the plate 6 by means of a locking arrangement consisting of an arm 41 extending downward from the yoke 30 and engaging a yoke lock lever 42. The lock lever 42 is pivotally mounted on the mounting block 18 by a pivot pin 43 and is urged into a locking position, as seen in FIG. 7, by a tension spring 44 attached to the frame 1 of the transfer unit. The yoke lock has a notched end 45 which engages a projection 46 on the end of arm 41, and holds the yoke in a forward position. Clockwise movement, as seen in FIG. 6, of the yoke lock releases the arm 41 and permits the yoke to be drawn rearward by springs 31. Release action of the yoke lock 42 is produced by a wire 47 attached to ejection lever arm 48 at the front of the transfer unit, the action of which will be discussed more fully below.

To aid in the proper alignment of the support material and the powder image, a longitudinal paper guide 49 is mounted along the front top edge of the transfer unit and is attached to the frame 1 by means of a hinge member 50 beneath the level of the front top cover 3. When the plate 6 is placed in the transfer apparatus, the paper guide 49 is in an open position, that is, swung away from and below the level of the front top cover 3. After the plate 6 is properly positioned on the front top cover 3 and is clamped in position with clamp 12, the guide 49 is swung upward onto plate 6 touching only the border portion 11. A small lateral paper guide 51 is mounted on longitudinal paper guide 49 to adjust the image registration on the support material in a lateral direction. The paper guide 51 is mounted in a slot 52 on paper guide 49 and is adjustably mounted therein by means of a set screw 53. When the paper guides 49 and 51 are in position, that is, a closed position overlying the top of the xerographic plate 6, a sheet of support material is abutted against the paper guide 49 and against paper guide 51 and allowed to rest on the xerographic plate 6.

The transfer of the xerographic powder image from the plate surface to the support material is effected by means of an electrostatic transfer device 54. The transfer device 54, herein shown as a corotron, includes an array of one or more corona discharge electrodes 60, as seen in FIG. 6, that are energized from a power supply PS-1 through flexible power line 61. The power line 61 passes through a protective insulated member 63 and contains a loose loop 62 which permits movement of the corona 54 across the entire length of the transfer unit. The discharge electrodes 60 are enclosed by the shielding member 64 which is mounted in a corotron housing 65. The electrodes 60 and the housing 65 traverse the transfer unit and are supported on each end by support member 66 mounted on roller brackets 67, each of which contain a pair of rollers 68 adapted to ride on tracks 5. In operation, the electrostatic field created by the electrostatic transfer device is effective to tack the transfer material electrostatically to the plate surface. Simultaneously with the tacking action, the electrostatic field attracts the toner particles comprising the xerographic powder image from the plate surface causing them to adhere electrostatically to the surface of the transfer material. Manual movement of the corotron 54 along tracks 5 causes

4

the corotron to traverse the support material and the xerographic plate. Simultaneous with the movement of the corona discharge device along track 5, the operator depresses button 69 initiating operation of the power supply PS-1 to the corona electrodes 60. As the corotron approaches the front of the transfer unit, the housing 65 contacts the leading point 70 of the lateral paper guide 51 producing a tipping motion of the paper guide 51 which moves longitudinal paper guide 49 away from the plate 6. Paper guides 49 and 51 then fall downward to the front of the transfer unit. The operator releases button 69 cutting off power to the corona discharge electrodes 60 and moves the corona discharge device back to the rear of the transfer unit. The paper or support material containing a xerographic powder image may now be removed from the xerographic plate 6.

After transfer of the powder image from the xerographic plate 6 to the support material, the support material is removed from the plate 6 and transferred to a suitable fusing device, as for example, the type disclosed in copending application, Ser. No. 227,472, filed October 1, 1962, in the name of Thomas C. Murray et al.

The xerographic plate may be removed from the transfer apparatus by actuating plate ejection lever 48. The ejection lever 48 extends through a pivot block 71 and terminates in a plate ejection arm 72. The ejection arm 72 extends upward through an arcuate slot 73 in the top cover 3, to a point above the top cover 3. In the non-operating position, the ejection arm 72 is back toward the frame 1 out of contact with the xerographic plate. As the ejection lever 48 is actuated the wire 47 releases the yoke locking device 42 which releases clamp 12 from the plate 6. Further movement of the ejection lever 30 moves the ejection arm 72 along slot 73 contacting plate 6. Continued movement of arm 72 forces plate 6 toward web cleaner 74.

As the plate 6 moves toward the web cleaner 74, it actuates microswitch 75 initiating operation of motor MOT-1 and drive roll 111. The plate 6 is forced between drive roll 111 and a cleaning roll 114 propelling the plate forward through the web cleaner 74. The ejection lever 48 is released and is returned to its non-operating position by means of tension spring 78 connected between the ejection arm 48 and a mounting rod 79 securely fastened to the frame 1.

After a xerographic plate has been used to produce a powder image and that image has been transferred to a support material, there is a certain quantity of residual powder which adheres to the plate surface. It is necessary to completely remove the residual powder prior to reusing the plate.

The residual powder is held on the plate by an electrostatic charge, therefore, prior to attempting to remove the powder from the plate surface, an opposite charge is applied to the plate surface. This is accomplished by a stationary electrostatic discharge device 80, herein also shown as a corotron in FIG. 2 and of the same construction as the corona charging device 54 except that it imparts a negative charge. As stated above, the xerographic plate 6 trips microswitch 75 as it is propelled forward by the ejection arm 48. Switch 75 is electrically connected to a power supply PS-1 to supply the voltage potential to corona 80. Therefore, during the time that the xerographic plate 6 is passing over microswitch 75, it is being moved beneath the corotron 80 and an electrostatic charge is being applied to the plate surface. A disposable fibrous web of material 86 is then forced into sliding contact with the plate surface and absorbs residual powder loosened therefrom by the application of electrostatic charge. The web cleaning apparatus, as seen in FIG. 4, consists of a pair of support frame members 87 secured to main frame 1 in a position to receive plate 6 as it is urged forward by ejection arm 72. Mounted between the support frames 87 are a pair of bearing plates 88 spaced from the frames 87 by spacers 89 and

5

pivotaly secured thereto by fasteners 90. Mounted between the bearing plates 88 are a web supply shaft 91, a web cleaning shaft 92 and a web take-up shaft 93 rotatably journaled in bearings 94, 95 and 96, respectively. An adjustment bar 84 is secured to both frame members 87 and contains a pair of set screws 85 that bear against the bearing plates 88. Movement of set screws 84 produces a pivoting movement of the bearing plates 88 and an adjustment of the space between a cleaning roll 114 on shaft 92 and a drive roll 111 thus regulating the pressure applied to the xerographic plate.

Power to the web cleaner is transmitted from motor MOT-1 through drive belt 97 to main pulley 98 to drive shaft 99. Drive shaft 99 is appropriately journaled in the support frame 87 and drives the plate drive roll 111. The opposite end of drive shaft 99 is journaled in the opposite support frame 87. A pinion 101 mounted on shaft 99 drives a gear 102 to supply power to a power transmission shaft 103. Shaft 103 is journaled in the support frames 87 and, at the opposite end from the gear 102, contains a pinion 104 which transmits power to a series of gears 105 and pinions 106 to produce a speed reduction in a gear 107 mounted on the web cleaning shaft 92. The speed of the shaft 99 and drive roll 111 is approximately 20 times as fast as the speed of the web cleaning shaft 92, thus producing a sliding motion of the plate past the web, and continually exposing clean web to the plate surface.

The cleaning shaft 92 contains a resilient roller around which the web 86 passes, and is pressed into intimate contact with the surface of the xerographic plate 6. On the opposite end of the web cleaning shaft 92 is a pulley 108 and a belt 109 for transmitting power to a pulley 110 mounted on a web take-up shaft 93. Shaft 93 accumulates used web material after it has been on contact with the surface of the xerographic plate 6. Clean web material is supplied from a roll 113 on supply roll shaft 91. The drive roll 111 consists of resilient material mounted on shaft 99 and is kept free of lint and dirt by a brush 124 supported by the frame members 87.

There is seen schematically in FIG. 5 a web 86 supplied from a roll 113 on a shaft 91 which passes around a rubber or resilient cleaning roll 114 on shaft 92 and contacts xerographic plate 6, passes behind a web guide 115 and is wound up on a take-up roll 116 on shaft 93. To permit replacement of the web supply roll 113 and removal of take-up roll 116, the bearings 96 and 94 are constructed with cut-out portions 117. A pair of lock clips 118 are joined to each of the bearing plates 88 to retain the shafts 91 and 93 in the bearings 94 and 96 respectively. The lock clips 118 contain a vertical slot 119 and are held in bearing plates 88 by studs 120 which pass through slots 119. The lock clips 118 are movable in a vertical direction by lifting upward on a lever 121. The upward movement of the lever 121 removes the locking arm 122 from the cut-out portions 117 of bearings 94 and 96, freeing the shafts 91 and 93.

As the plate 6 passes over microswitch 75, the microswitch is held in a depressed position but as the trailing edge of the plate passes over the microswitch, the switch is released turning off the power to drive rolls. The switch 75 is positioned and adjusted to cut off the drive motor when the margin of the plate 6 is between rolls 111 and 114. The plate is then stationary and supported essentially by the border 11, between the web cleaning roll 114 and the plate support roll 111. The forward or leading edge of the plate is supported upon a bracket 123 ex-

6

tending outward from the support frame 87. The plate will remain in this position supported by the bracket 123 and the web cleaning roll 114 and the plate support roll 111, until such time as it is picked up by an operator.

While the present invention as to its objects and advantages, as described herein, has been carried out in specific embodiments thereof, it is not desired to be limited thereby, but it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. A web cleaning apparatus for use in cleaning xerographic plates including
 - a pair of support frame members,
 - a pair of bearing plates pivotally connected to said frame members,
 - a drive roll journaled for rotation in said frame members to move a xerographic plate between the frame members,
 - a cleaning roll journaled for rotation in the bearing plates and positioned adjacent to the drive roll, said cleaning roll adapted to force a web of cleaning material into contact with the surface of a xerographic plate as the plate passes between the cleaning roll and the drive roll,
 - adjusting means to pivot said bearing plates relative to said frame members to change the spacing between the cleaning roll and the drive roll,
 - means to rotate said drive roll to produce movement of a xerographic plate,
 - and means to rotate said cleaning roll to present clean web material to the plate surface during passage of the plate between the cleaning roll and the drive roll.
2. A web cleaning apparatus for use in cleaning xerographic plates including
 - a pair of support frame members,
 - a pair of bearing plates pivotally connected to said frame members,
 - a drive roll journaled for rotation in said frame members to move a xerographic plate between the frame members,
 - a cleaning roll journaled for rotation in the bearing plates and positioned adjacent to the drive roll, said cleaning roll adapted to force a web of cleaning material into contact with the surface of a xerographic plate as the plate passes between the cleaning roll and the drive roll,
 - a web supply roll and a web take-up roll to continuously supply new web material to said cleaning roll and to take up used web material after it has passed around said cleaning roll,
 - adjusting means to pivot said bearing plates relative to said frame members to change the spacing between the cleaning roll and the support roll,
 - means to rotate said drive roll to produce movement of a xerographic plate,
 - and means to rotate said cleaning roll and said take-up roll to present clean web material to the plate surface during passage of the plate between the cleaning roll and the drive roll.

References Cited in the file of this patent

UNITED STATES PATENTS

1,401,014	Teitel	Dec. 20, 1921
2,095,697	Hammer	Oct. 12, 1937
2,752,271	Walkup et al.	June 26, 1956