

United States Patent

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[33] **Japan**
[31] **43/33225**

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34, 37, 38-40, 42, 64, 122; 117/37 LX; 118/637
LX; 355/15

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[54] **DEVICE FOR CLEANING DEVELOPED ELECTROSTATIC PHOTOGRAPHIC COPY SHEET**
7 Claims, 4 Drawing Figs.

[52] U.S. Cl..... 134/64,
117/37, 118/637, 134/15, 134/122, 355/15
[51] Int. Cl..... B08b 1/02

ABSTRACT: A device for cleaning excess toner from an electrostatic photographic copy sheet that is advanced on an upward incline over a supply chamber that discharges cleaning liquid over the copy sheet to be collected in a storage chamber. Rollers are provided to advance the copy sheet, and the rollers act as a weir to retard the liquid flow and improve the cleaning.

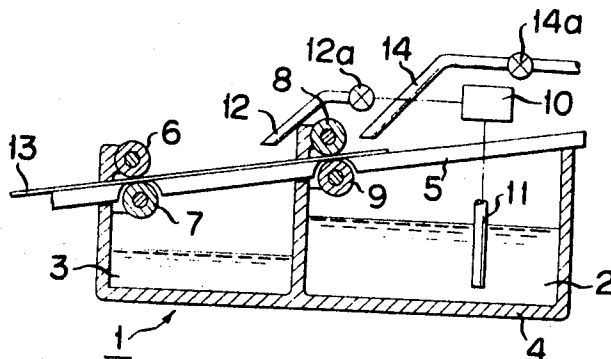


FIG. 1

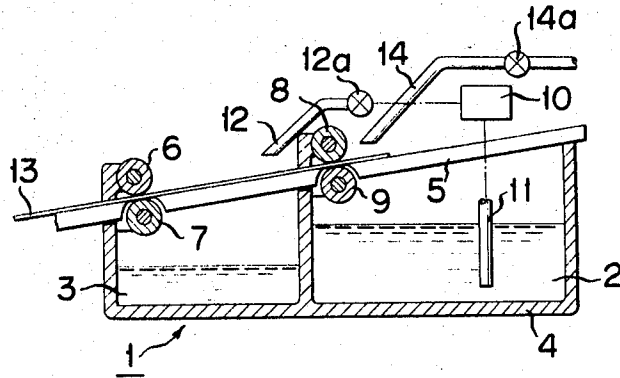


FIG. 2

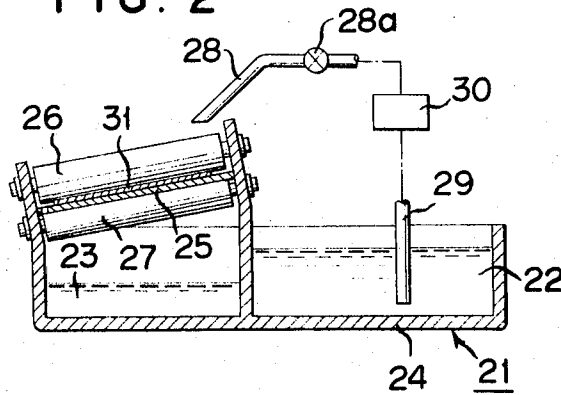


FIG. 3

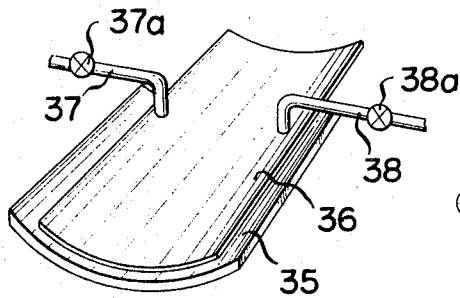
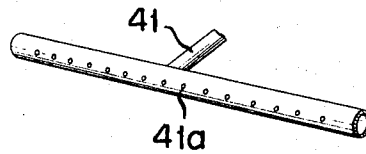


FIG. 4



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DEVICE FOR CLEANING DEVELOPED ELECTROSTATIC PHOTOGRAPHIC COPY SHEET

BACKGROUND OF THE INVENTION

The present invention relates to a device for cleaning electrostatic photographic copy sheet, more specifically developed copy sheet.

Known is an electrostatic photographic or photocopying method in which a light-sensitized sheet is formed by applying a layer of photoconductor such as zinc oxide in a binding resin upon the surface of a support or substrate such as electrically insulating paper sheet; light pattern is projected upon this sensitized sheet, thereby forming an electrostatic latent image by photoelectric emission; and said electrostatic latent image is developed into a visible image by a highly sensitive developing solution containing finely divided toner having a very small particle size.

Since the photoelectric emission generated in the sensitized layer consisting of said photoconductor by the light pattern projection is very weak, a highly sensitive developing solution must be used for developing the latent image. In this case, it has been found out that the use of a developing solution having not only a high sensitivity but also high concentration of toner will bring about very satisfactory results. However, when such developing solution having a high concentration of toner is used, a large amount of toner is attached upon the front and back surfaces of the developed sheet so that the excess toner other than required for the development of the latent image must be washed off. When the copy sheet developed as described above is immersed in a cleaning liquid to be shaken by pincette, the excess toner shakes like a string threading from the surface of the sheet. When the shaking of the sheet is stopped, the excess toner is deposited back upon the sheet so that a long time will be required to wash off the excess toner in this method. Another cleaning method was tried. That is, the developed sheet is immersed in a cleaning liquid to which are applied strong vibrations generated by a ultrasonic wave generator, but the result is the destruction of the desired image. Furthermore, when the strong pressure is applied to the copy sheet by rollers or when the sheet is clamped by pincette or the like, the developed image tends to be damaged.

SUMMARY OF THE INVENTION

In brief, the present invention provides a method and device for cleaning developed electrostatic photographic sensitized sheet in which said sheet is inclined and a cleaning liquid or solution flows or is poured over the surface of the sheet from the higher side thereof, thereby washing off the excess toner attached to the sheet.

According to the present invention, a sensitized sheet guide plate is disposed on an incline over the used cleaning liquid storage chamber so that the cleaning liquid flows from the upper or higher side of the sheet being advanced upwardly upon the guide plate, thereby washing off the excess toner attached to the sheet.

According to another embodiment of the present invention, the guide plate is so disposed as to incline upwardly in the direction of advancement of the sheet to be cleaned.

According to a further embodiment of the present invention, the guide plate is so disposed as to be inclined relative to the direction of the advancement of the sheet and to the direction perpendicular to said direction of the advancement. In this embodiment, only one cleaning liquid discharging means may be required to provide a satisfactory result and the used cleaning liquid may be directed into the storage chamber.

According to a further embodiment of the present invention, the guide plate is so disposed as to be curved relative to the direction of advancement of sheet. In this embodiment, two cleaning liquid discharging means are employed and the used liquid is directed toward the center of the curved guide plate and then into the storage chamber.

One of the objects of the present invention is to provide a method and device for washing off the excess toner attached upon the sensitized sheet developed by a developing solution having a relatively high toner concentration.

Another object of the present invention is to provide a cleaning device which can be readily made automatic if required.

The above and other objects, features and advantages of the present invention will become more apparent from the following description taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF DRAWING

FIGS. 1 and 2 are sectional views showing different cleaning devices according to the present invention;

FIG. 3 is a perspective view showing the essential part of a further embodiment of a cleaning device according to the present invention; and

FIG. 4 is a perspective view showing one example of a cleaning liquid ejecting or discharging pipe.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 to 3 showing different cleaning devices, a cleaning device 1 shown in FIG. 1 comprises a cleaning liquid reservoir 2, a used cleaning liquid storage chamber 3, the assembly of said reservoir 2 and the storage chamber 3 constituting a cleaning liquid chamber structure designated in its entirety by reference numeral 4, a guide plate 5 for copy paper disposed on an incline over the cleaning liquid chamber 4, two pairs of feed rollers 6, 7, 8 and 9 disposed across the guide plate 5 and journaled to the sidewalls of the chamber 3, a cleaning liquid circulation pump 10, a pipe 11 for communicating the pump 10 with the reservoir 2 and a pipe 12 extending from the pump 10 and opening into the storage chamber 3. A developed copy sheet 13 discharged from a developing chamber (not shown) is directed upwardly upon the guide plate 5 by the lower pair of feed rollers 6 and 7. The cleaning liquid stored in the reservoir 2 is pumped up by the pump 10 to the pipe 12 through which the flow is regulated by valve 12a to be discharged in the vicinity of the upper pair of feed rollers 8 and 9 disposed higher than the lower pair of feed rollers 6 and 7. The cleaning liquid discharged out of the pipe 12 flows over the copy sheet 13 to wash it. The lower pair of feed rollers 6 and 7 also serve as a weir for temporarily preventing the flow of the cleaning liquid so that the copy sheet 13 may be sufficiently washed and cleaned. Consequently, the excess toner upon the copy sheet 13 may be washed off and directed together with the cleaning liquid into the storage chamber 3. A pipe 14 having a regulating valve 14a for blowing heated air has an outlet disposed upstream of the upper pair of feed rollers 8 and 9 so that the washed copy sheet discharged through the upper pair of feed rollers 8 and 9 is dried and fixed by the heated air from the pipe 14.

Next referring to the cleaning device designated in its entirety by 21 in FIG. 2, this cleaning device 21 comprises a cleaning liquid chamber structure 24 consisting of a cleaning liquid reservoir 22 and a used cleaning liquid storage chamber 23, a guide plate 25 secured to the upper sidewall of the storage chamber 23 so as to extend thereover on an incline, a pair of rollers 26 and 27 journaled to the sidewalls of the storage chamber 23 across the guide plate 25, a pipe 28 having a regulating valve 28a opens toward the higher or upper side of the pair of rollers 26 and 27, and a cleaning liquid circulation pump 30 connected to the pipe 28 and to a pipe 29 extending from the reservoir 22. A copy sheet 31 is advanced upon the guide plate 25 in the inclined state relative to the longitudinal direction thereof, that is the direction of advancement. The cleaning liquid pumped up by the pump 30 from the reservoir 22 is discharged from the opening of the pipe 28 in the vicinity of the upper side of the pair of rollers so as to wash off the excess toner and clean the copy sheet 31. The

lower side of the guide plate 25 is perforated so that the cleaning liquid drops into the storage chamber 23 through the perforations together with the excess toner washed off by the cleaning liquid from the copy sheet. The guide plate 5 and 25 shown in FIGS. 1 and 2 respectively may be comprised of a fin-shaped member.

FIG. 3 shows a cleaning device of the type in which a curved guide plate 35 is disposed on an incline with respect to the direction of advancement of copy sheet 36. Pipes 37 and 38 having regulating valves 37a and 38a, respectively open to the upper side of the guide plate 35 and the copy sheet 36 is advanced along the curved surface of the guide plate 35 from the lower end thereof toward the higher end while being uniformly washed by the cleaning liquid discharged from the pipes 37 and 38.

Instead of the pipes 12, 28, 37 and 38 shown in FIGS. 1, 2, and 3 respectively, a pipe 41 having a group of small diameter holes 41a as shown in FIG. 4 may be used. The pipe 14 for blowing the heated air may be used in the devices shown in FIGS. 2 and 3 in a similar manner.

According to the method of the present invention a developed copy sheet is advanced upwardly on an incline while a cleaning liquid flows over the copy sheet from the higher side so that the excess toner may be washed off from the copy sheet. The cleaning operation may be made very rapidly and effectively always with fresh cleaning liquid without causing any damage to the image while the copy sheet is being advanced.

I claim:

1. A device for cleaning excess toner from an electrostatic photographic copy sheet comprising
 - a cleaning liquid chamber having side portions defining a supply reservoir and a receiving storage chamber;
 - a guide plate on which the copy paper is advanced, said guide plate located above said liquid chamber and inclined relative thereto;
 - said guide plate having the inclination directed upwardly in a linear relationship from one side of the storage chamber

to the other;
 roller means associated with said guide plate for feeding said copy sheet for advancement therealong, said roller means comprising two sets of rollers, a first set located above said storage chamber and a second set located above said supply reservoir at a higher level than said first set;
 cleaning discharge outlet means located above said guide plate, said discharge outlet means having a connection to receive cleaning liquid from said supply reservoir and discharge the liquid to flow onto said copy sheet and into said storage chamber; and
 said first set of rollers positioned to receive said liquid discharge thereagainst and act as a weir to delay the liquid flow and thereby increase the cleaning effect of the liquid.

2. A device according to claim 1 in which said guide plate is curved in its lateral dimension with its longitudinal center portion having the closest spacing to said liquid chamber, and said discharge means comprises a pair of outlets, each outlet positioned respectively on each side of said guide plate above guide plate areas spaced farthest from said liquid chamber.

3. A device according to claim 1 in which said discharge outlet means comprises a pipe having a plurality of holes therein.

4. A device according to claim 1 in which said guide plate is positioned above both said supply reservoir and said storage chamber, and said discharge outlet means is located above said storage chamber.

5. A device according to claim 4 in which drying means is located above said guide plate and said supply chamber.

6. A device according to claim 1 in which said guide plate is positioned solely above said storage chamber, and said discharge outlet means is located above said storage chamber.

7. A device according to claim 6 in which said guide plate is inclined transversely relative to the longitudinal direction of advancement.

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