

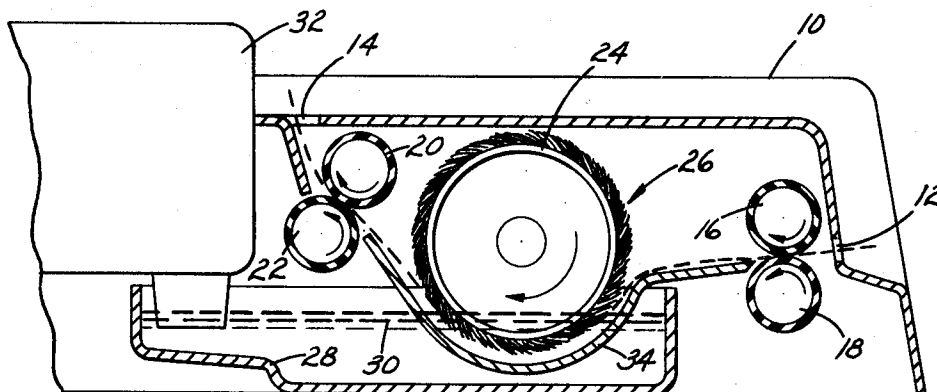
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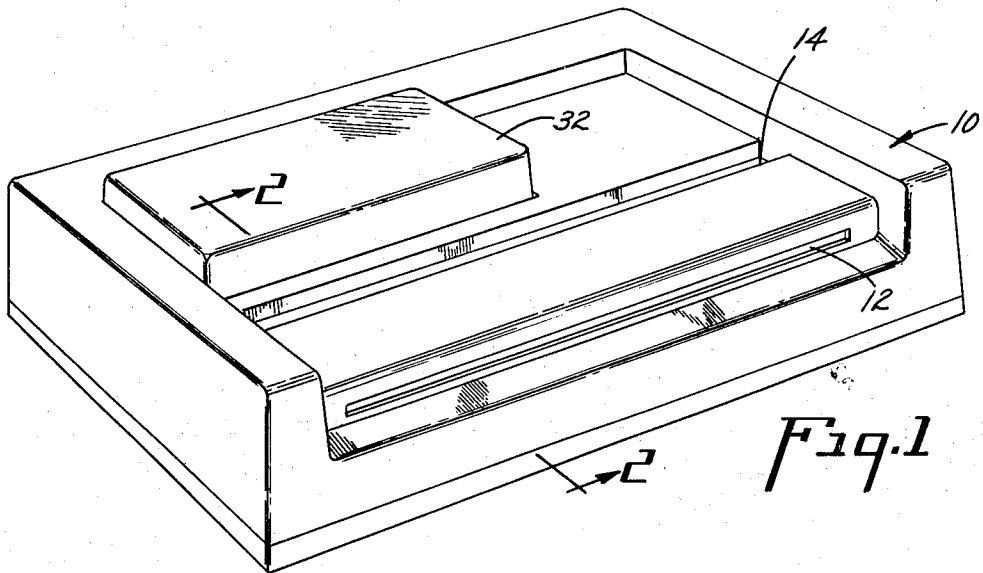
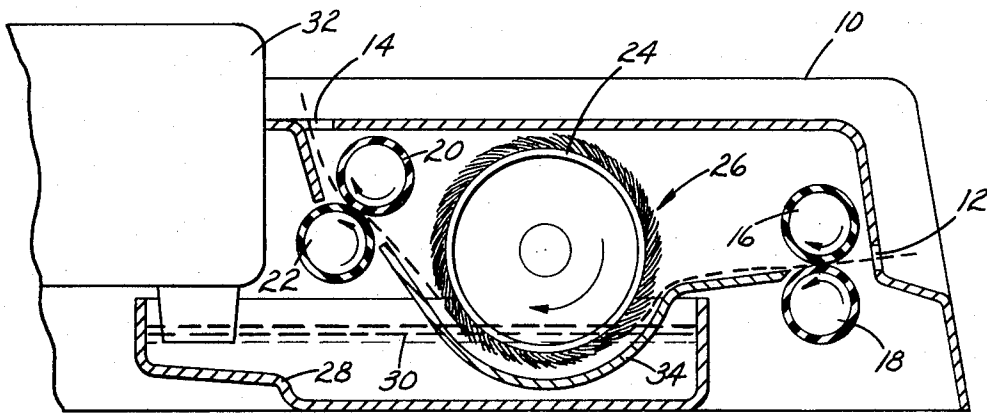
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[54] **METHOD AND APPARATUS FOR CLEANING
 SELECTIVELY FUSED MASTER**
8 Claims, 2 Drawing Figs.

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G03g 15/00
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117;37 LE/; 15/77, 100, 102; 355/15; 101/416,
423, 425

ABSTRACT: A roller having a relatively long napped loose-woven limp fabric on the surface thereof is rotated against the surface of a selectively fused electrostatic master to remove unwanted partially fused specks of material. The roller is rotated partially submerged in a liquid into which the removed material is deposited.





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METHOD AND APPARATUS FOR CLEANING SELECTIVELY FUSED MASTER

BACKGROUND OF THE INVENTION

This invention relates generally to the cleaning of masters and more particularly to the removal of unwanted partially fused specks from selectively fused electrostatically produced masters.

In the production of electrostatically developed masters, a master form is provided which has a chemical coating that normally maintains a charge on the surface thereof, but which coating will lose its surface charge when exposed to light. After the master is uniformly charged over its surface, the object to be copied is projected in a pattern of light and dark, or is placed between a light source and the master so that printed or opaque material on the original will block the light from striking the surface, whereas the background will permit the light to strike the surface of the coating. The areas blocked from the light will retain their charge while the areas exposed to the light will lose their charge.

Particles capable of being attracted to the charge on the surface are then brought into contact with the surface of the coating. Where the charge remains, these particles will adhere to the surface and where no charge remains, the particles will not adhere. This then provides a distribution of the particles on the surface of the coating which corresponds to printed or opaque material on the original. At this stage, however, the particles adhering to the surface are merely held thereon by electrostatic attraction, and hence they must be set or permanently fixed by fusing. The step of fusing is done by applying heat to the particles causing them to fuse together and to adhere to the coating.

One of the problems encountered with the process of electrostatically forming an image is the appearance of unwanted spots on the surface of the coating. These spots can be caused by many different phenomena. The coating itself may have small defective areas which do not properly lose their charge when exposed to light; the original may have small spots or imperfections thereon which are not intended to be reproduced; or dust or dirt or other particles may block the light at unwanted places. These, plus other factors, can contribute to unwanted specks.

When the master is set by the process known as selective fusing, these unwanted spots can be removed. In the process of selective fusing, the surface of the master is moved relative to an infrared light source. The heat from the infrared light strikes the particles causing them to heat up. When the particles heat up, the particles also radiate heat between themselves, and so the combination of the heat from the light source and the radiation between the particles themselves cause the particles to fuse. In such a case, a large mass or group of particles will radiate more heat between themselves than a smaller mass, and thus in any given time a larger area of particles will become more completely fused than smaller areas of particles. Hence, by controlling the time of exposure to the infrared light, groups of particles smaller than any given size can be incompletely fused, whereas groups of particles larger than this given size will be completely fused. Hence, by controlling the time of the exposure a group of particles smaller than for example a normal punctuation period (.) can be incompletely fused and thus susceptible to removal, whereas groups of particles larger than this size can be completely fused and thus impervious to removal.

In the past, these incompletely fused areas have not been removed as the surface is prepared for use as a lithography master by bringing them in contact with a hard rubber roller or with a short nap tightly woven felt roller. This prior art technique is effective for partial removal to some degree, but has the serious limitation that the rollers themselves soon become filled or clogged with the removed particles. Since the particles are abrasive, when they are retained by the roller they will scratch the coating on the surface of the master with detrimental effects. Even rotating the rolls in a solution has

not been a satisfactory answer to this problem, since the rollers still tend to remain filled and clogged.

SUMMARY OF THE INVENTION

According to the present invention, a method and apparatus for removing the partially fused particles from the master is provided which utilizes a relatively long napped loose, limp material which is at least partially submerged in a liquid and which is relatively movable across the surface of the master to remove the partially fused particles therefrom. In the preferred embodiment, the material is mounted on a roller partially submerged in a liquid and rotated in contact with the surface of the master is moved therepast. The use of a long napped, loose limp material allows the particles removed thereby to be dispersed into the liquid and thus prevents clogging.

DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of an apparatus according to this invention adapted to remove partially fused particles from an electrostatically developed master; and

FIG. 2 is a sectional view taken substantially on the plane designated by line 2—2 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing, a preferred embodiment of an apparatus for cleaning selectively fused masters is shown. The apparatus includes a housing designated generally as 10 having a master receiving opening 12 and a master discharge opening 14. Contained within the housing 10 are a pair of receiving rolls 16 and 18 located adjacent to receiving opening 12 and a pair of discharge rolls 20 and 22 located adjacent the discharge opening 14. These rolls 16, 18, 20 and 22 are each mounted by suitable means to rotate in the directions as indicated in FIG. 2 and are driven by a motor not shown. Interposed between the receiving rolls 16, 18 and the discharge rolls 20, 22 is a roller member 24. The roller member 24 is also rotatably mounted and driven by the motor in the direction shown by the arrow. The roller member 24 is provided with a surface covering or material 26 which is long napped fiber. The fibers of the material are loose and limp (i.e., they are "lacking in stiffness," "flacid" and "flexible") so that they will not scratch the surface of the master, nor will they form a tight structure which will capture and retain loosened particles.

The roller member 24 is positioned so that the lower portion thereof extends into a trough 28 which is partially filled with a liquid 30 maintained at a constant level by a replenishing bottle 32. To guide the master through the trough 28, a guide 34 is provided which is shaped to engage the master as it emerges from the receiving rolls and guide it through the trough 28 in contact with the fabric 26 on the roll 24, and thence out of the trough and into the discharge rolls 20 and 22.

In the operation of this device, the trough is filled with any suitable liquid. This liquid could be merely water; however, since the coating of the master normally needs to be treated so that the background can become hydrophilic and oleophobic the liquid preferably is of the type which is used in the process for so treating the coating.

In operating the device, the master is fed face up through the receiving rolls 16 and 18. The guide 34 will guide the master through the trough 28 with the roller member 24 rotating the fabric 26 in contact with the surface of the master. The path of travel is shown in dotted lines.

It is preferred that the roller member 24 be rotated so that it is traveling in the same direction as the lineal direction of travel of the master where it contacts the master. The linear speed of rotation of the roller member 24 should be substantially greater than the speed of the master where they are in contact. This will allow the long napped loose and limp material 26 to flail against the surface of the master and drag thereacross. This flailing and dragging action will be effective

to remove the partially fused small particles but will not remove the completely fused larger areas of particles. This type of material utilized in this manner also prevents the fabric 26 from becoming clogged with particles which it removed, the particles actually being deposited in the liquid 30.

As explained above, with prior art devices such as close weave short nap fabrics, such as felt, the fabric itself picks up and retains the particles even in the presence of a liquid and hence in a short period of time scratches the surface. With the present-type device, there is no clogging of the fabric so that the fabric can continue to operate as a removal vehicle without collecting the particles which it removes. The reasons for the superiority of the present device, in that it does not become filled or clogged with particles, are not completely understood. However, it is believed that such superiority is due at least in part to the fact that the long, loose, limp nap is not inherently tight and firm enough to retain the particles, and hence the material acts rather like a flail dragging across the surface of the master and wiping the partially fused particles from the surface. As the particles are loosened, they are not captured by the weave of the fabric, since the nap is loose and long, so the particles are deposited directly in the solution. With the prior art felt-type rollers, the roller was strongly urged into contact with the surface of the master. This type of operation results in the particles being forced into the nap of the fabric as they are being removed, and the tight weave short nap structure of the felt tends to hold or retain the particles so forced therein. This results in clogging the roll. Hence, by virtue of the fact that the present invention employs a long and loose, limp fiber, the conditions which contribute to clogging are not present.

What is claimed is:

1. A method of removing partially fused small particles from

an electrostatically developed image on a surface, comprising the steps of providing a material having a long nap, loose limp fiber structure, at least partially submerging said material in a liquid, and causing said surface and said submerged portion of said material to move relatively in contact, whereby the material will remove any small partially fused particles from the surface and said particles will be deposited in the liquid.

2. The method of claim 1 wherein said material is disposed on the surface of a roller, and said roller is rotated so that it moves in contact with said surface.

3. The method of claim 2 wherein said surface is moved relatively with respect to the rotating roller.

4. The method of claim 3 wherein said roller is rotated in the same direction as the surface where said material contacts said surface.

5. A device for removing partially fused small particles from an electrostatically developed image on the surface of an article comprising, a member having a long nap loose limp fiber material, trough means adapted to contain liquid means mounting said member with the material at least partially disposed therein, and means disposed to move the article and said member relatively with said surface of said article in contact with the material disposed in the trough.

6. The invention as defined in claim 5 wherein said member is a roller having said material on the surface thereof.

7. The invention as defined in claim 5 wherein said means to move said article and member includes means to move said article past said member.

8. The invention as defined in claim 5 wherein said member is a roller with the material on the surface thereof, and means to move the article and said member includes means to rotate said roller.

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