

United States Patent

Ohta

[15] 3,644,959

[45] Feb. 29, 1972

[54] DEVICE FOR CLEANING PHOTOSENSITIVE MEMBER IN ELECTROPHOTOGRAPHY

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[22] Filed: June 17, 1970
[21] Appl. No.: 47,098

[30] Foreign Application Priority Data

June 24, 1969 Japan.....44/60108

[52] U.S. Cl.....15/256.52

[51] Int. Cl.....G03g 15/16

[58] Field of Search15/256.52, 256.53, 38, 48,
15/94, 89; 101/425; 355/15

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[57] ABSTRACT

A device for cleaning or removing the toner particles which cling to photosensitive cylinders used in electrophotographic processing, comprising a rotating cleaning brush for removing the clinging toner particles from the photosensitive cylinder and means for in turn, cleaning the toner from the brush comprising a rotating shaft having a plurality of disks arranged thereon at angles to the rotational axis of the shaft in such a manner that the peripheral portions of the disks enter into the bristles of the brush, and the clinging toner is removed from the brush by the combined rotational and axial movement of the peripheries of the disks. The gradual oscillating motion of the disk peripheries with respect to the bristles avoids sudden bending and springback of the bristles so that the toner is effectively prevented from being scattered or dispersed.

9 Claims, 3 Drawing Figures

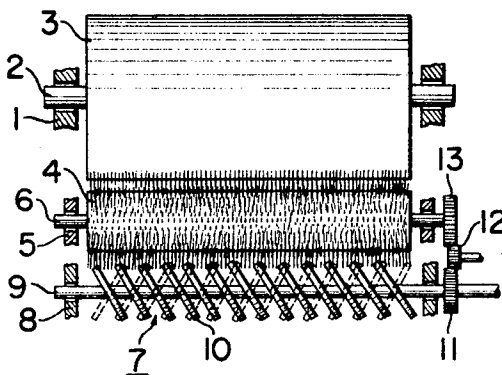


FIG. 1

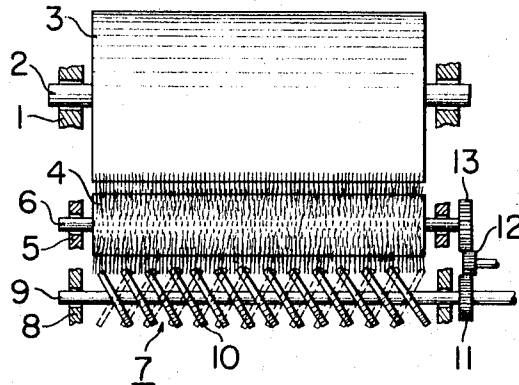


FIG. 2

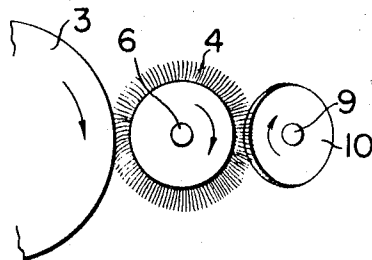
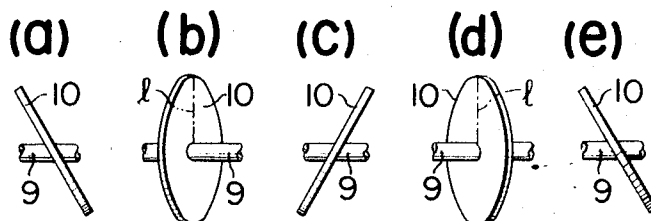


FIG. 3



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DEVICE FOR CLEANING PHOTOSENSITIVE MEMBER IN ELECTROPHOTOGRAPHY

BACKGROUND OF THE INVENTION

The present invention relates to a device for cleaning or removing the toner particles clinging to a reusable photosensitive member in electrophotography and specifically to cleaning a cleaning brush.

After the fundamental steps of charging, exposure, development and image transfer in electrophotography, the toner still remaining upon the electrophotographic photosensitive member is removed by means of a cleaning brush. The toner, which in turn attaches to the cleaning brush is then removed by applying a rod or bar-shaped cleaning means (for example as disclosed in U.S. Pat. No. 2,751,616). However, there is a distinctive disadvantage when the brush is flipped away or elastically moved away from the cleaning means, since the toner tends to scatter or disperse, thereby contaminating the photosensitive member again.

The present invention is intended to provide an improved device for removing the toner from the cleaning brush used to remove the toner attached to a photosensitive member in electrophotography.

SUMMARY OF THE INVENTION

The present invention provides a device for cleaning rotary cleaning brushes used in electrophotographic copying machines characterized by comprising a rotating shaft extending in parallel with the shaft of said cleaning brush and having a plurality of disks thereon arranged at angles to the rotational axis in such a manner that a part of the peripheral portion of each of said disks may be inserted into the bristles of the cleaning brush, so as to remove the toner particles clinging to the brush by the rotational and axial movements of the disk peripheries.

More particularly, upon rotation of the disks, their peripheral portions in contact with the brush bristles move axially in an oscillating manner with respect to the axis of the brush so that both the rotating and axial motions of the disks serve to remove the toner attached to the brush. Furthermore, the contacting motion of the disks with the bristles of the brush is gentle and gradual, so that the bowed bristles do not quickly spring back, as compared with conventional devices, and the toner is prevented from being scattered or dispersed.

The above features and advantages of the present invention will become more apparent from the following description of one illustrative embodiment thereof taken in conjunction with the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a top view of one embodiment of the present invention;

FIG. 2 is a side view indicating the rotational directions of the parts shown in FIG. 1; and

FIGS. 3a-e illustrate the angular positions of a given disk with respect to the shaft axis at 90° intervals during one complete rotation of the shaft.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a reusable photosensitive drum 3, such as a selenium Xerographic drum, carried by a rotary table shaft 2 journaled in bearings 1 and rotating in the direction indicated by an arrow in FIG. 2. A cleaning brush 4 carried by a rotatable shaft 6 journaled in bearings 5 rotates in contact with the rotary drum 3 in the same direction so that the relative velocity therebetween may be increased. The bristles of the cleaning brush may be made of furs of rabbits, feathers, untwisted silk fabrics and the like.

A device for cleaning this cleaning brush 4 is generally designated by 7 and is disposed in side-by-side relation with the brush 4. The device 7 comprises a metal shaft 9 journaled in bearings 8 and a plurality of disks 10 arranged on the shaft 9

at angles relative to the axis thereof in such a manner that some peripheral portions of these disks 10 may enter among and contact the bristles of the cleaning brush 4. The cleaning device 7 is rotated through a gear train consisting of the gears 11, 12 and 13 in the same direction as that of the cleaning brush 4 thereby increasing the relative velocity therebetween. The disks 10 may be of metal, preferably aluminum, or plastic, or other material, which is harder than the bristles of the cleaning brush. The angular arrangement of the disks 10 relative to the cleaning brush 4 may be readily understood from FIGS. 3a-e. Assume that the disks 10 is first inclined toward the left as shown in FIG. 3a. Upon rotation of the disk 10 through 90°, the angular position of the disk 10 relative to the cleaning brush 4 so changes that one radius 1 of the disk 10 becomes perpendicular to the axis of the shaft 9 as shown in FIG. 3b. Upon further rotation through 90°, the disk 10 is inclined to the right as shown in FIG. 3c. Upon further rotation through 90°, one radius 1 of the disk becomes perpendicular to the axis of the shaft 9 again as shown in FIG. 3d. Upon further rotation through 90°, the disk 10 returns to its initial position as shown in FIG. 3e. Thus, it will be readily seen that the angular positions of the disks 10 relative to the brush 4 vary as shown by the imaginary lines in FIG 1. That is, the disks 10 not only rotate but also displace in the axial direction of the cleaning brush 4 in contact therewith. By these rotational and axial displacements of each disk 10, the toner attached to the brush 4 may be completely removed and dropped by gravity. The angle of the disk 10 relative to the cleaning brush 4 is varied in such a manner that each disk 10 may contact with and move away from the bristles of the brush 4 very gradually. In other words, the movement of the bristles is like a gradual peristaltic movement. This means that the bristles of the cleaning brush 4 are not suddenly bowed and then sprung back so that rapid wear of the tips of the bristles of the brush 4 is prevented and the toner removed from the brush 4 may smoothly drop along the side surfaces of the disks 10, whereby the scattering of the toner may be effectively prevented.

What is claimed is:

1. A device for cleaning a rotary cleaning brush which in turn removes the toner from a reusable photosensitive member used in an electrophotographic process, said device comprising a rotary shaft extending in parallel with the rotary shaft of said rotary brush, and a plurality of thin disks carried by said shaft at angles in such a manner that some peripheral portions of said disc are inserted into and contact the bristles of said rotary cleaning brush, whereby upon rotation of said disks toner attached to said rotary cleaning brush may be removed away by both the rotary and axial movements of said disks with respect to said bristles.

2. A device for cleaning the bristles of a brush comprising:

a. a rotatable shaft positioned adjacent said brush;

b. drive means for rotating said shaft; and

c. means on said shaft having a plurality of thin disklike protruding peripheral portions extending into and contacting the bristles of said brush and arranged at an angle to the axis of said shaft, so as to execute oscillatory axial motion with respect to said bristles to produce transverse bristle agitation during shaft rotation.

3. A device as in claim 2, wherein said bristle contacting means comprises a plurality of disks whose peripheral portions are arranged at the same angle with respect to the shaft axis.

4. A device as in claim 3, wherein said disks are aluminum.

5. A device as in claim 3, wherein said disks are flat.

6. A device as in claim 5, wherein said disks are of the same diameter.

7. A device as in claim 2, wherein said drive means rotates said brush.

8. A device as in claim 7, wherein said drive means rotates said shaft in the same direction as said brush.

9. A device as in claim 7, wherein said shaft is positioned adjacent said brush, with its axis of rotation substantially parallel to the rotational axis of said brush.