

May 1, 1973

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3,730,710

ELECTROSTATIC IMAGING EMPLOYING A DOT ELECTRODE

Filed July 13, 1970

Fig. 1

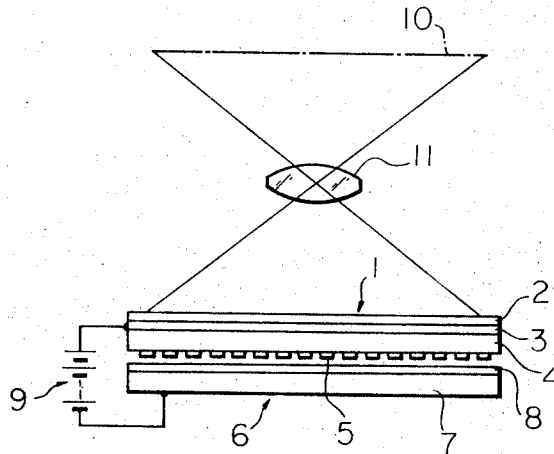
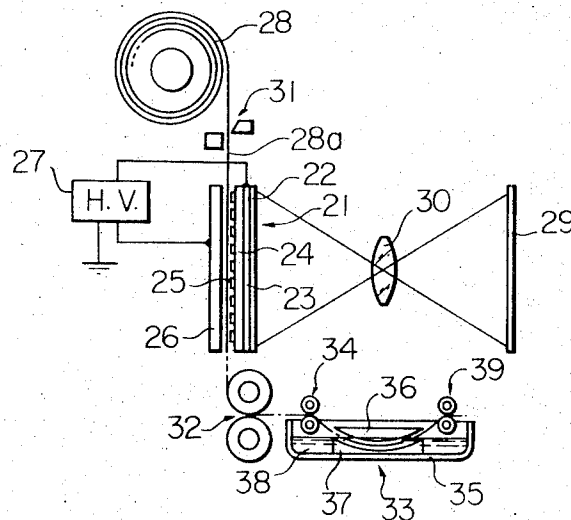


Fig. 2



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ELECTROSTATIC IMAGING EMPLOYING A DOT ELECTRODE

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Filed July 13, 1970, Ser. No. 54,239

Claims priority, application Japan, July 11, 1969,

44/55,225

Int. Cl. G03g 13/22

U.S. Cl. 96—1 R

2 Claims

ABSTRACT OF THE DISCLOSURE

An electrostatic image recording method is provided. For preparing a photoreceptor, a transparent electrode is mounted on a transparent support, a photoconductor layer is laid on said electrode and a plurality of separate dot electrodes are further provided on said photoconductor layer. A recorder having an insulating layer on an electrode is positioned so that said dot electrodes of said photoreceptor and said insulating layer of said recorder may be faced with each other. A potential is applied to said transparent electrode of said photoreceptor and said electrode of said recorder, and under this potential applying condition, they are exposed to light, whereby a charged image is formed on said recorder.

The present invention relates to a recording method for converting a light image to a charged image.

In the electrostatic image recording method of French Pat. No. 1,112,180 or British Pat. No. 755,486, there are seen the following defects. That is, the electric resistivity of portions of a photoconductive layer exposed to light is lowered to at most about $10^5 \Omega \text{—cm.}$ to about $10^8 \Omega \text{—cm.}$ and under such a low resistivity it is feared that a sufficient charge might not be applied to an insulating layer of a recorder, and as a charged image is made unclear, a good visible image is not obtainable in developing said charged image.

Further, in the device of Japanese patent publication No. 15,300/1965, small holes are made in an insulator and a metal and a photoconductor are made integral with said insulator to form a photoreceptor, but more than 100 meshes of holes are required for obtaining a sufficiently clear image for practical use and it is remarkably difficult and expensive to make such small holes in the insulator. In this case, further, as the holes are filled with the metal and the photoconductor, it is feared that the metal and the photoconductor may not be adhered sufficiently and that the photoreceptor may be unfavorable in practical use.

The present invention aims to overcome the defect seen in the above-mentioned patents and patent publication. The present invention employs a photoreceptor comprising a transparent support, a transparent electrode on said support, a photoconductor layer on said transparent electrode and a plurality of separate dot electrodes on said layer whereby after projecting a light image a charge is transferred to said dot electrodes smoothly, and taking advantage of the remarkably low resistivity of this exposed portion, the charge is transferred to an insulating layer of a recorder easily.

For a better understanding of the present invention as well as other objects and further features thereof, reference is made to the following detailed disclosure of this invention taken in conjunction with the accompanying drawing wherein:

FIG. 1 denotes the principle of the present invention; and

FIG. 2 denotes a schematic representation of an electrostatic image recording device for use in the method of the present invention.

In FIG. 1, a photoreceptor 1 for use in the method of the present invention is prepared through the steps of NESA-treating or treating in any other way a transparent support 2 of quartz glass or the like to provide a transparent electrode 3 on said transparent support 2, evaporating onto said transparent electrode 3 a monomer of a photoconductor such as Se, ZnO, CdS, (Cd, Zn)S or N-polyvinyl-carbazole or a mixture thereof with a binder of a proper synthetic resin or dissolving it in a proper solvent and applying the solution onto said transparent electrode to provide a photoconductor layer 4, and arranging a plurality of separate dot electrodes 5 on said layer 4. To make these dot electrodes 5, a net for chemical analysis of about 100 meshes is adhered onto said photoconductor layer 4, and a conductive metal such as copper is evaporated onto said layer 4 in a vacuum of about 10^{-6} torr. Herein, the dot electrodes 5 may be formed by another method wherein a uniform metal layer is previously prepared on the photoconductor layer 4 by evaporation and it is made to dots by a general photoetching. The shapes of these dot electrodes 5 may be proper, for example, they may be spherical or cylindrical, and the spaces among the electrodes are properly determined by how much the mesh effect of a final image is required. The heights of the dot electrodes 5 are desired to be uniform if possible. Further, in case that said dot electrodes 5 are made of rhodium or rhodium is evaporated to the dot electrodes 5 made of copper, the photoreceptor 1 is made more durable against the repetition of use.

In FIG. 1 a recorder 6 has an insulating layer 8 on a conductive electrode 7, and this recorder 6 is positioned face to face and in contact with the dot electrodes 5 of said photoreceptor 1. Herein, the insulating layer 8 may be separated from the electrode 7, for example, the electrode 7 may be a metal plate and the insulating layer 8 may be a sheet of paper applied insulation treating, and in this case the portion of said insulating paper contacted with the electrode 7 is desired to be treated conductively. The transparent electrode 2 and the electrode 7 of the recorder 6 are connected to a power source 9 so that high potential may be applied thereto. The polarity of the potential is determined properly by the characteristic of the semiconductor forming the photoconductor layer 4, that is, whether the semiconductor is N-type or P-type, which is required as a final visible image between a negative image and a positive image or what is the polarity of the toner to be used in development. In this case, any developer may be used as far as it is a pigmented material which is attractable to a charged image by electrostatic force.

As is mentioned above, a high potential is applied to the photoreceptor 1 and the recorder 6 which are faced and contacted with each other. In case that an image of a subject 10 is focused onto the photoconductor layer 4 through the transparent support 2 by a lens 11, the resistivity of the portion onto which the optical image is projected is dropped in accordance with the intensity of the projected light, and the charge of this portion is transferred to the recorder 6 through said dot electrodes 5. The decrease of the resistivity and the charge transfer are effected quite preferable through the dot electrodes 5 provided in the photoreceptor 1, and a high contrast charged image is formed on the recorder 6.

FIG. 2 denotes an electrostatic recording apparatus for use in an embodiment of the present invention. In FIG. 2, a photoreceptor 21 also comprises a transparent support 22, a transparent electrode 23, a photoconductor layer 24 and dot electrodes 25. A reference number 26 denotes a metal electrode plate. A power source 27 serves for applying potential of different polarities to said transparent electrode 23 of said photoreceptor 21 and said

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electrode plate 26. A rolled recording paper 28 has an insulating layer. 29 denotes a subject such as an original or the like, and 30 denotes a projection lens, respectively. A drawn-out portion 28a of said rolled recording paper 28 is put between said photoreceptor 21 and said electrode plate 26 with its insulating layer facing said dot electrodes 25. In this state, when a high potential is applied to the transparent electrode 23 of the photoreceptor 21 and the electrode plate 26 and an image of an original 29 is projected through a lens 30, a charged image is formed on said recording paper 28a in configuration corresponding to the optical image. The charged image bearing recording paper 28a, after having been cut to a proper length by a cutter 31, is fed out to a developing means 33 through a pair of feed rollers 32. This recording paper 28a is fed between a pair of feed rollers 34, and is immersed in a developer liquid 38 through guide plates 36 and 37 provided in a developer tank 35, and the charged image is made visible. The developed recording paper 28a is discharged through a pair of feed-out rollers 39. These steps are repeated in order to form many electrostatic images. Herein, the developing means 33 is not restricted to the above-mentioned one, but a general developing means for use in electrophotographic processes is used properly. Further, as recording paper, cut sheets may be used instead of the above-mentioned rolled paper. Further, in the case that the subject 29 is such as a photographic film, it is of course that the subject may be exposed to light in contact with the transparent support 22 of the photoreceptor 21.

In accordance with the method of the present invention using a photoreceptor having dot electrodes, as is stated above, a remarkably preferable and effective charged image can be obtained easily, and a high-quality visible image for practical use may be obtained.

What is claimed is:

1. An electrostatic image recording method which is characterized in comprising the steps of preparing a photoreceptor comprising a transparent support, a transparent conductive electrode on said support, a photoconductor layer on said electrode and a plurality of separate dot electrodes of conductive material disposed in closely spaced relationship on said photoconductor layer with said photoconductor layer being disposed between said conductive electrode and said dot electrodes and a recorder having an insulating layer on an electrode dis-

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posing said electrodes of said photoreceptor and said insulating layer of said recorder in face-to-face relationship with each other, applying a potential to said transparent electrode of said photoreceptor and said electrode of said recorder, and exposing said photoreceptor to light in this state whereby a charged image is formed on said recorder.

2. A system for recording an electrostatic image comprising:

a photoreceptor including a transparent support, a transparent conductive layer disposed on one surface of said support, a photoconductive layer disposed on the opposite surface of said conductive layer, and a plurality of individual conductive dots disposed in closely spaced relationship over the surface of said photoconductive layer with said photoconductive layer being disposed entirely between said conductive dots and said conductive layer,

a recorder including an insulating layer disposed on a conductive support, said insulating layer and said conductive dots being disposed in face-to-face spaced relationship, and

means for applying a potential between said transparent conductive layer of said photoreceptor and said conductive support of said recorder so that a charge image is formed on said recorder when a light image is projected onto said transparent support.

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U.S. Cl. X.R.

96—1.5; 117—17.5, 201, 210, 211