

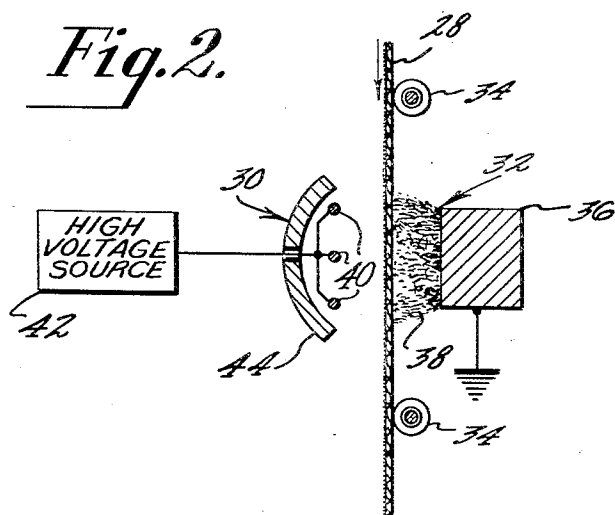
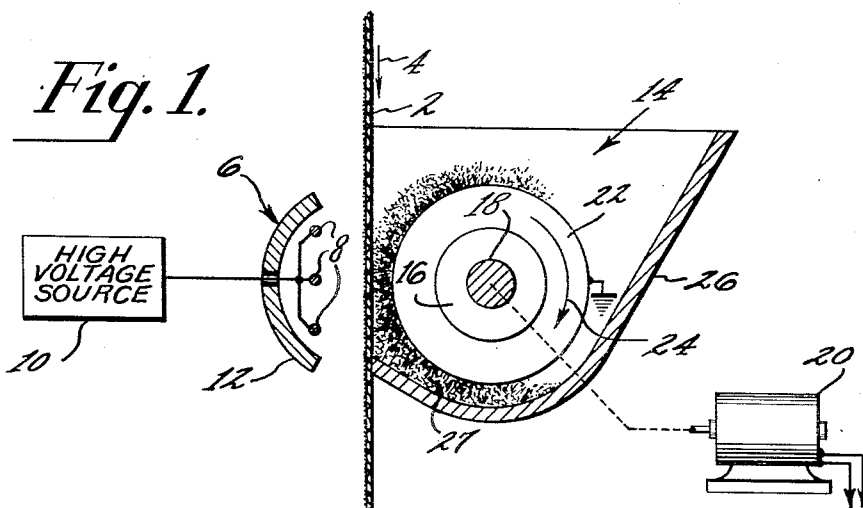
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ELECTROSTATIC PHOTOGRAPHY

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ELECTROSTATIC PHOTOGRAPHY

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This invention relates to electrostatic photography, and more particularly to means for charging an image receiving member.

In the art of electrostatic photography, means have been provided for applying an initial, over-all charge onto the surface of a photoconductive record or image receiving member. These means usually include a charging element, which may be in the nature of a corona discharge device, and a conductive metal backing plate. In such apparatus, the uniformity of the applied electrostatic charge on the record member is influenced by the uniformity of the record member with the backing plate. Since the record member may be in the form of a flexible strip, such as coated or treated paper, and is moved past a stationary, rigid, metal, backing member, it is not infrequent that inadequate contact has resulted in nonuniform charging and, therefore, poor quality prints.

It is an object of the present invention to provide an improved charging unit wherein the foregoing difficulties are obviated.

It is another object of the present invention to provide an improved charging unit as set forth characterized in that a non-rigid, or compliant, metallic backing member is provided which is capable of maintaining intimate contact with the back surface of the record member.

In accomplishing these and other objects, there has been provided, in accordance with the present invention, a charging unit which includes a corona discharge device disposed on one side of a member to be charged, and a compliant metal backing member positioned on the opposite side of the member to be charged. The compliant metal backing member includes brush-like tufts of magnetic particles supported by a magnetic structure.

A better understanding of this invention may be had from the following detailed description, when read in connection with the accompanying drawing in which:

Figure 1 is a cross-sectional end view of an improved electrostatic charging unit embodying the present invention; and

Figure 2 is a similar view of a somewhat different structure also embodying the present invention.

Referring, now, to the drawing in more detail, there is shown, in Fig. 1, a charging unit which features a rotating backing member. A member 2 which is to be charged is moved, in the direction of the arrow 4, past a charging means such as a corona discharge device 6. The corona discharge device 6 includes a plurality (three being shown) of corona discharge wires 8 which may be connected to a suitable source 10 of high voltage electrical energy 10. A shield member 12 of magnetic material (for a purpose to be set forth presently) is positioned adjacent to the wires 8 to direct the discharge toward the member 2 to which the charge is to be applied. The member 2, to which the charge is applied, may be a strip of material such as paper having a photoconductive coating on one side thereof. If such is the case, it is desirable to apply the corona discharge from the device 6 to the coated side of the strip 2.

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On the opposite side of the member 2 from the discharge device 6, there is positioned a backing assembly 14 which serves as a ground plate in the effecting of the charging of member 2. The backing assembly 14 comprises a rotatable magnetic structure 16 mounted on a shaft 18. The shaft 18 is coupled to be driven by a motor 20. The magnetic structure may include a plurality of closely spaced, disk-like plate members 22 which are oriented at an angle to the shaft 18 and parallel to each other. With this arrangement, when the shaft 18 is rotated by the motor 20 in a direction indicated by the arrow 24, the plate members 22 will appear to wobble as well as rotate. The rotating elements are positioned for rotation in a tray or trough 26 of non-magnetic material which serves to guide the member 2 in the desired path. This trough holds a quantity of magnetic metal particles 27, such as iron filings. The magnetic particles 27 are magnetically attracted to and are carried by the magnetic plate members 22. The shield member 12, which is associated with the corona discharge device 6, is made of magnetic material. If the plate members 22 are magnetized to one magnetic polarity and the shield member 12 is magnetized to an opposite polarity, the magnetic field established between the two elements will cause brush-like tufts of the magnetic particles 27 carried by the plate members 22 to extend toward and intimately engage the surface of the strip 2. The wobbling motion of the plate members 22, as they rotate, causes the bristles of the brush-like tufts to sweep back and forth across portions of the strip or charge receiving member 2. The relative motion of the brush-like tufts with respect to the surface of the strip causes the entire surface of the strip 2 to be uniformly swept. The backing assembly 14 is electrically grounded and serves to carry off the displaced charges that result from the application of the corona discharge to the opposite face of the strip 2.

Because the surface of the strip is contacted by the brush-like tufts of the magnetic particles, the contact between the strip and the backing assembly is uniform. The brush-like tufts constitute a resilient or compliant contact means which maintains a uniform contact with the strip irrespective of irregularities in the surface contour of the strip.

A similar, but simpler, arrangement is shown in Fig. 2. A member 28 which is to be electrostatically charged is caused to pass between a corona discharge device 30 and a compliant backing means 32. The member 28 may be guided in its path by a pair of guide rollers 34. The backing means includes a magnetic member 36 which carries a brush-like tuft of magnetic particles 38 such as iron filings.

As in the case of the apparatus illustrated in Fig. 1, the corona discharge device comprises a plurality of wires 40 which are connected to a source 42 of high voltage electrical energy. A shield member 44 is positioned adjacent the wires 40 to direct the discharge toward the surface of the member 28. As before, the shield member is made of magnetic material and is magnetized to a magnetic polarity which is opposite from the magnetic polarity of the member 36. This arrangement establishes a rather concentrated magnetic field between the member 36 and the shield member 44. This field maintains the brush-like tufts of magnetic particles in position to engage the surface of the member 28. Here, too, the magnetic member 36 is electrically grounded to carry off the displaced charge that results from the application of the corona discharge to the opposite face of the member 28.

The engagement between the tufts of magnetic particles 38 and the back of the member 28 is resilient or com-

pliant whereby the tufts may follow any irregularities in the surface of the member 28 and maintain a uniform electrical contact with that surface.

Thus, there has been provided an improved electrostatic charging unit which is characterized by a non-rigid or compliant backing member for uniformly contacting the surface of a member to be charged.

What is claimed is:

1. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising a corona discharge device positioned to act upon one surface of said chargeable member, a compliant backing member positioned adjacent to the surface opposite from that acted upon by said corona discharge device, and the compliance of said backing member providing means whereby to engage said surface opposite from that acted upon by said corona discharge device bidimensionally and uniformly.

2. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising a corona discharge device positioned adjacent to one surface of said chargeable member, means for directing discharge from said corona discharge device onto said surface of said chargeable member, compliant backing means positioned adjacent the opposite surface of said chargeable member from said corona discharge device, and the compliance of said backing means providing means whereby to effect uniform contact with said opposite surface during charging of said chargeable member.

3. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising a corona discharge device positioned adjacent to one surface of said chargeable member, means for directing electrical discharge from said device onto said chargeable member, and a backing means positioned adjacent the surface of said chargeable member opposite from said discharge device, said backing means including a magnetic structure providing a directed magnetic field for holding brush-like tufts of magnetic particles in position compliantly to engage said surface of said chargeable member opposite from said discharge device.

4. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising means defining a path of advancement for said chargeable member, charging means positioned adjacent to said path, backing means positioned adjacent to said path opposite said charging means, said path lying between said charging means and said backing means, said backing means including a magnetic structure providing a directed magnetic field for holding brush-like tufts of magnetic particles which will extend in the direction of said path from said magnetic structure and which will be positioned compliantly to engage the surface of said chargeable member

as said chargeable member is advanced past said charging means.

5. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising means defining a path of advancement for said chargeable member, charging means positioned adjacent to said path, backing means positioned adjacent to said path opposite said charging means, said path lying between said charging means and said backing means, said backing means including a stationary magnetic structure providing a directed magnetic field for holding brush-like tufts of magnetic particles which will extend from said magnetic structure in the direction of said path compliantly to engage the surface of said chargeable member as said chargeable member is advanced past said charging means.

6. Apparatus for imparting an electrostatic charge on a chargeable member, said apparatus comprising means defining a path of advancement for said chargeable member, charging means positioned adjacent to said path, backing means positioned adjacent to said path opposite said charging means, said path lying between said charging means and said backing means, said backing means including structure having rotatable disk-like polar members for providing a directed magnetic field for holding brush-like tufts of magnetic particles carried by said rotatable magnetic structure which will extend toward said path to engage the surface of said chargeable member as said chargeable member is advanced past said charging means.

7. Apparatus for imparting an electrostatic charge on a chargeable member comprising means for supporting a chargeable member, a corona discharge device, said device having a shield of magnetic material and means for producing a corona discharge, a magnet, said means for producing a corona discharge being disposed to act on a chargeable member supported by said first named means on one side thereof, said means for producing a corona discharge being located between said shield and a chargeable member supported by said first named means, magnetic particles clinging to said magnet and extending along the flux lines produced by said magnet and extending toward said shield whereby to provide a cluster of magnetic particles projecting from said magnet, and said cluster contacting a chargeable member supported by said first named means on a side thereof opposite the side of said chargeable member exposed to said corona discharge device.

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