

[54] **ELECTROPHOTOGRAPHIC CHARGING APPARATUS**

[75] Inventors: **Seiji Matsumoto; Isoji Takahashi,**
both of Asaka, Japan

[73] Assignee: **Xerox Corporation, Stamford,**
England

[22] Filed: **Sept. 12, 1972**

[21] Appl. No.: **288,452**

[52] U.S. Cl. **250/326, 250/324, 250/325,**
317/262 A

[51] Int. Cl. **G03g 13/00**

[58] Field of Search **250/49.5 ZC, 49.56 C, 324,**
250/325, 326; 313/146, 148; 317/262 A

[56] **References Cited**

UNITED STATES PATENTS

2,157,718 5/1939 Mutsheller 313/148

3,358,289	12/1967	Polee	250/49.5 ZC
3,620,617	11/1971	Kelly	250/49.5 ZC
3,655,966	4/1972	Takimoto	250/49.5 ZC
3,603,789	9/1971	Prato	250/49.5 ZC
3,566,110	2/1971	Gillespie	250/49.5 ZC

Primary Examiner—Archie R. Borchelt

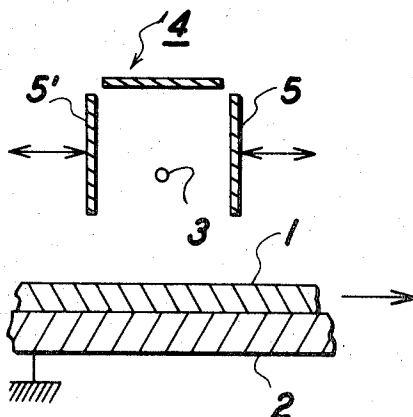
Assistant Examiner—B. C. Anderson

[57]

ABSTRACT

A corona shield is positioned about a corona wire to shield against radiation from the wire in all but the desired direction (onto a xerographic surface). The shield members are movable in various directions relative to the corona wire so as to control intensity and direction of the corona discharge, thus to control the density of the electrostatic image on the xerographic surface.

7 Claims, 7 Drawing Figures



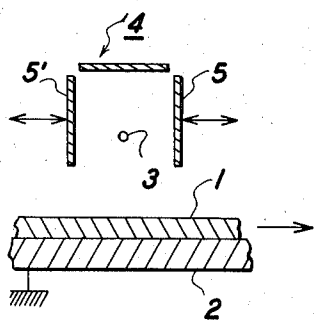


FIG. 1

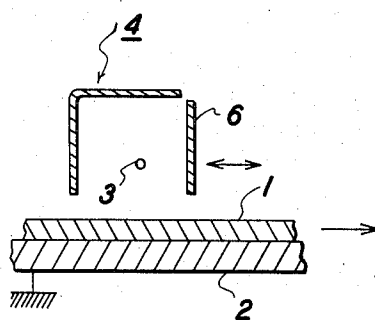


FIG. 2

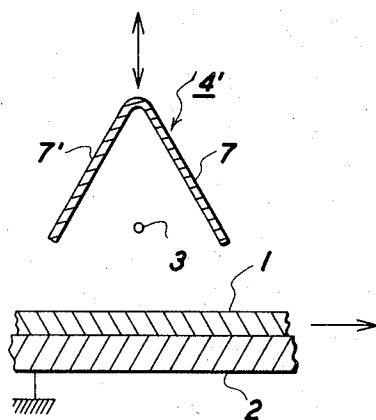


FIG. 3

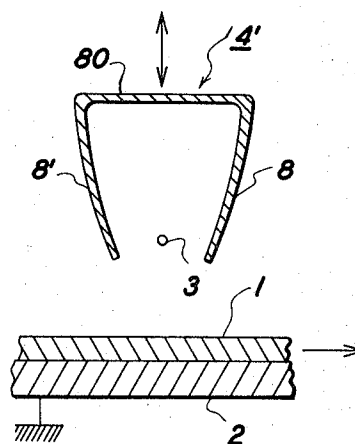
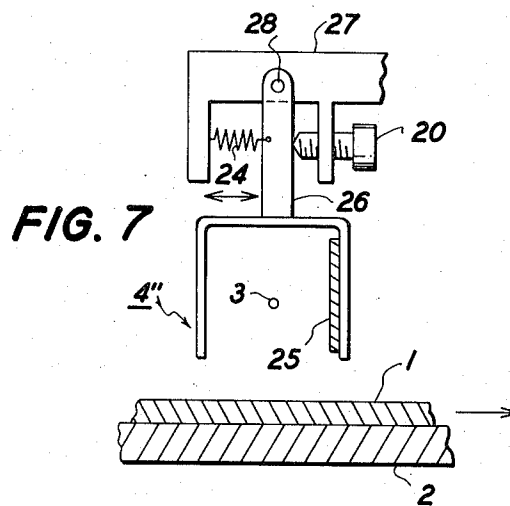
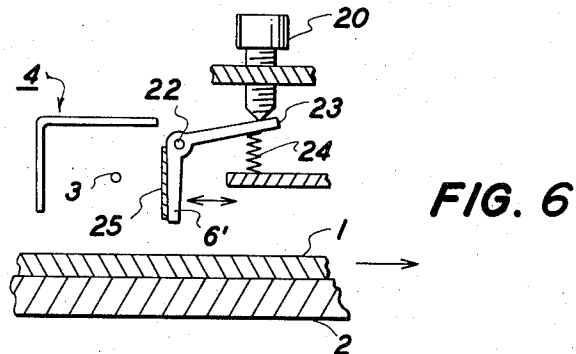
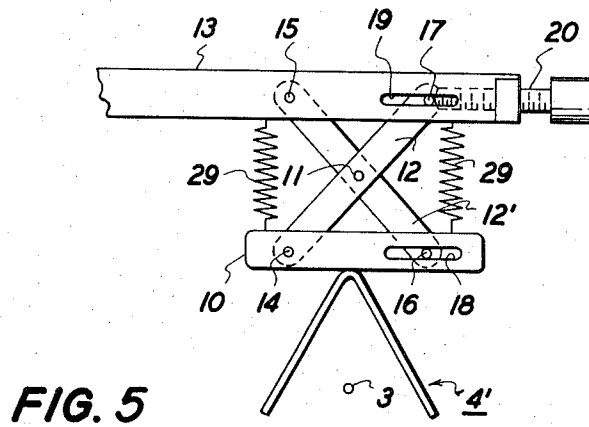


FIG. 4



ELECTROPHOTOGRAPHIC CHARGING APPARATUS

BACKGROUND OF THE INVENTION

This invention relates to a charging apparatus for a photoconductive surface in an electrophotographic or xerographic process. More specifically, it relates to a corona discharge apparatus for the purpose of charging or sensitizing such a photoconductive surface.

In the field of xerography, one known method by which a photoconductive surface, or photoreceptor, is sensitized is by the use of positive ions in a corona discharge. To effect the corona discharge, one or more corona wires is maintained at a high positive potential and the resultant electrical field strength at the surface of the wires causes air molecules to become ionized. The positive ions are drawn to the xerographic plate by the difference in potential between wire and plate and create a potential across the plate.

In general, a grounded shield is used in association with the corona wire so as to control and direct its discharge onto the photoreceptor.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a corona shield for an electrophotographic apparatus, which shield is capable of controlling the intensity of the corona discharge directed onto a photoreceptor.

Another object is to provide means for fine adjustments of a photoreceptor charging corona system in an electrophotographic apparatus.

Another object is to provide a photoreceptor charging system which can be adjusted to accommodate for variations in the condition of the toner, the photoreceptor, the corona wire, or the original document to be copied.

These and other objects are realized by employing a corona shield having a generally concave configuration extending along and partially surrounding a corona wire. The shield or parts thereof are adjustably mounted relative to the wire so as to control the size of the shield and the position of the shield relative to the corona wire. The adjustability of the shield is used to control the intensity of the electrostatic charge directed onto an adjacent photoreceptor.

DRAWING

FIGS. 1, 2, 3 and 4, are schematic representations of various corona shields according to this invention.

FIGS. 5, 6 and 7, are more detailed variations showing alternative embodiments of this invention.

DESCRIPTION

Referring now to FIG. 1, a photoconductive surface is shown at 1, and is mounted upon an electrically conductive and grounded substrate 2. A corona wire 3, is disposed parallel to the photoconductive surface 1, and at an appropriate distance above surface 1, to create a corona discharge. Corona wire 3, is partially surrounded by a grounded conductive concave shield 4. Shield 4 is open along a longitudinal aperture to permit communication between corona wire 3 and photoconductive surface 1. Corona shield 4 includes a pair of depending side walls 5 and 5', both of which are adjustably movable in the directions represented by the arrows.

In FIG. 2, a similar arrangement is shown except that in this arrangement, the top and one side member of the corona shield 4 are integral and the one remaining side member 6 is adjustably movable in the direction indicated.

Referring now to FIG. 3, the corona shield 4' is shown as an inverted V-channel member having a pair of side plates 7 and 7'. The adjustability of corona shield 4 in this arrangement is vertical along the direction indicated to open and close the corona discharge field as desired.

Referring now to FIG. 4, corona shield 4' is shown to include a pair of non-parallel side members 8 and 8', sloping away from each other upwardly, and connected by a top cross member 80. In this arrangement, the adjustment of the corona discharge field is effected by vertical adjustment of the shield 4' in the direction indicated by the arrow.

Referring now to FIG. 5, one form of adjustment mechanism which may be used in connection with the corona shield 4' is shown. This mechanism includes a movable plate 10 to which the shield 4' is mounted. Plate 10 is suspended from a stationary plate or frame 13 by a pair of tension springs 29. A pair of movable arms 12 and 12' is operatively connected between plates 10 and 13. One of the arms 12 is pivoted at plate 13 and one is pivoted at plate 10, about pivot points 15 and 14 respectively. In addition, arms 12 and 12' are pivoted at their centers relative to each other at pivot point 11. Opposite each of their fixed ends 14 and 15, the arms 12 include pins 17 and 16 respectively. Pin 16 is slidable within a longitudinal slot 18 in the movable plate 10. Pin 17 is likewise slidable within a longitudinal slot 19 in the stationary plate 13. Pin 17 bears against an adjusting screw 20 which is mounted relative to the frame 13. It will be appreciated that by turning the adjusting screw 20 in one direction or the other, the pin 17 and associated linkage are movable to effect the vertical adjustment of the corona shield 4'.

Referring now to FIG. 6, an adjusting mechanism is shown which might be used in connection with the corona shields of FIGS. 1 and 2. In this arrangement, one of the side plates, such as 6, of the shield 4 is swingably mounted relative to fulcrum 22 and connected to an arm 23. A frame-mounted adjusting screw 20 bears against the arm 23, the arm in turn being biased against the adjusting screw 20 by a suitable compression spring 24. By turning the screw 20 in one direction or the other, plate 6 is swung toward or away from the corona wire 3 to effect the desired adjustment. Plate 6 in this arrangement is insulated by an insulating layer 25.

Referring now to FIG. 7, an integral shield 4'', having insulation on one of its side members, is provided for lateral adjustability as shown by the arrow. In this arrangement, the shield 4'' is connected to a depending arm 26 which is pivoted at 28 to a frame 27. A frame-mounted adjusting screw 20 bears against arm 26 and a compression spring 24 biases the arm 26 against the adjusting screw 20. Turning of the screw 20 will swing the shield 4 relative to corona wire 3, about the pivot point 28 to vary its charging characteristics as desired.

By making adjustments in the geometry of the corona shield in various ways such as are shown above, the intensity of the corona discharge incident upon an associated photoreceptor can be controlled. By the use of such adjustability, certain variable characteristics of an

associated xerographic apparatus can be accommodated.

The foregoing description of certain embodiments of this invention is given by way of illustration and not of limitation. The concept and scope of the invention are limited only by the following claims and equivalents thereof which may occur to others skilled in the art.

What is claimed is:

1. A corona apparatus for use in charging a surface in an electrophotographic process, said corona apparatus including a corona wire and a grounded, conductive concave shield member partially surrounding said corona wire, at least a part of said surface being exposed to positive corona discharge from said corona wire when a positive electrical potential is applied to said wire,

adjustment means to control the intensity of the positive corona discharge from said corona wire relative to said surface, said adjustment means including means to move at least a part of said shield member relative to said corona wire.

2. A corona apparatus as defined in claim 1, wherein said means to move at least a part of said shield member relative to said corona wire comprises means to move at least part of said shield member in a direction

toward and away from said surface.

3. A corona apparatus as defined in claim 1, wherein said means to move at least a part of said shield member relative to said corona wire comprises means to move at least a part of said shield member in a direction generally parallel to said surface.

4. A corona apparatus as defined in claim 1, wherein said means to move at least a part of said shield member relative to said corona wire comprises means to expand and contract the concavity of said shield member relative to said corona wire.

5. The corona apparatus of claim 1, wherein said means to move at least a part of said shield member relative to said corona wire comprises means to move at least a first part of said shield member independently of the remainder of said shield member.

6. The corona apparatus of claim 1, further including insulating means located between said corona wire and a portion of said shield member.

7. The corona apparatus of claim 1, wherein said means to move at least a part of said shield member relative to said corona wire includes a spring biased, pivoting support member and an adjusting screw for causing pivotal motion of said support member.

* * * * *

30

35

40

45

50

55

60

65