March 11, 1952 C. F. CARLSON 2,588,699

ELECTROPHOTOGRAPHIC APPARATUS

Original Filed Aug. 27, 1943

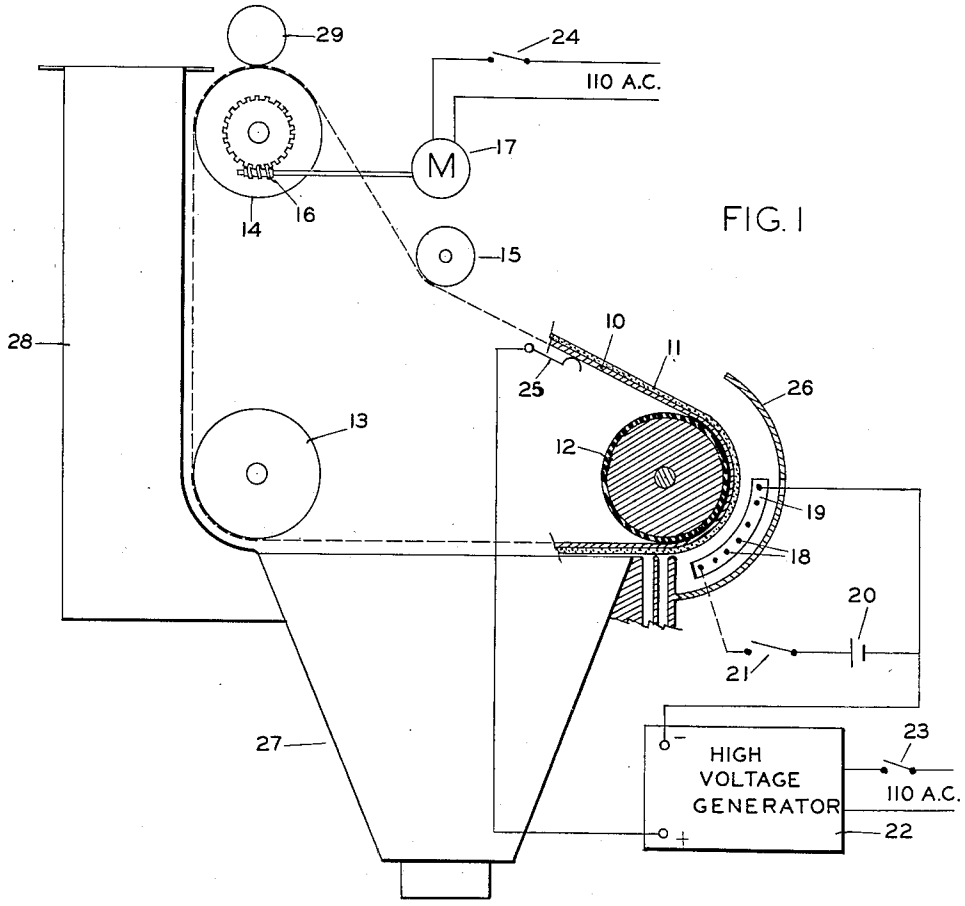
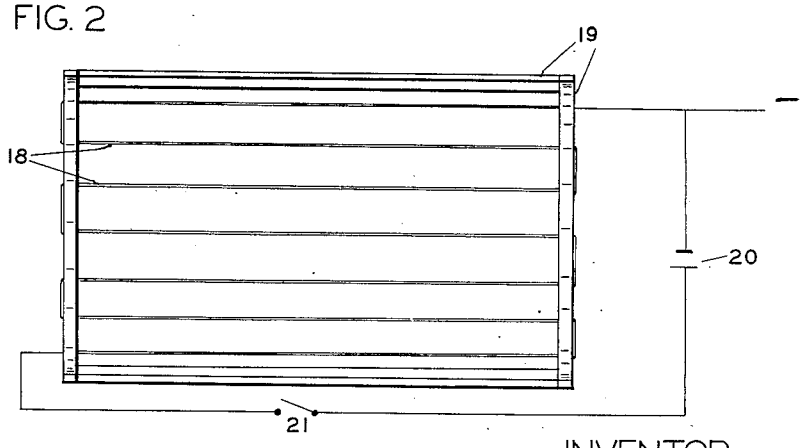


FIG. 1

FIG. 2



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ELECTROPHOTOGRAPHIC APPARATUS

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Original application August 27, 1943, Serial No. 500,207. Divided and this application February 26, 1951, Serial No. 212,812

6 Claims. (Cl. 95—1.9)

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This invention relates to electrophotographic apparatus, and particularly to charging apparatus for electrophotographic plates.

This is a division of my copending application Serial No. 500,207, filed August 27, 1943, now Patent No. 2,551,582.

In the process and apparatus for electrophotography disclosed in Carlson Patents 2,297,691 and 2,357,809 the electrophotographic plate is charged frictionally with a cloth or brush. With this means a sufficiently uniform charge can be produced on the plate to permit the production of acceptable images. However, this means is quite subject to humidity conditions, does not permit control of the voltage applied to the plate, produces a charge which is too weak for some purposes, and produces wear and some contamination of the plate surface.

The present invention contemplates an improved charging means for electrophotographic plates, and apparatus embodying the same, in which an ion-producing source, such as an array of emitting filaments is bridged across the plate, and means for applying an electric field, such as a high voltage source, is connected between the ion-producing source and the plate backing while the plate is advanced under the source to deposit an electric charge uniformly over the plate surface.

This arrangement is substantially independent of humidity conditions, permits approximate control of the potential applied to the plate surface, is capable of applying higher potentials to the plate, up to the breakdown potential of the plate coating, and applies the potential to the plate without physical contact with the plate coating.

Other features of the invention will be apparent from the following specification and the accompanying drawings, in which one embodiment of the invention is illustrated.

In the drawings:

Figure 1 is a sectional elevation of a portion of an electrophotographic camera showing one embodiment of the charging arrangement of the present invention; and

Figure 2 is a face view of the charging electrode assembly, as viewed from the position of the electrophotographic plate.

The charging arrangement illustrated in the drawing is indicated as part of the complete electrophotographic camera or copying unit which is more fully disclosed in my application Serial Number 500,207, now Patent No. 2,551,582 granted May 8, 1951, of which this is a division.

The electrophotographic plate comprises an endless belt 10 of conductive material such as

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metal foil coated on the outer surface with a thin layer 11 of photoconductive insulating material, for example sulphur or anthracene. The belt is mounted to run on four insulating rollers or cylinders 12, 13, 14 and 15. Roller 14 is arranged to be driven at a relatively slow speed by a worm 16 driven by electric motor 17 to advance the belt clockwise around its circuit, under control of an electric switch 24.

The plate charging arrangements are mounted adjacent to roller 12 and comprise a filament grid 18 of platinum or other filament having an electron emission coating. The grid 18 is strung on a sutable curved insulating frame 19, which follows the curature of the plate 10 as it passes around roller 12, so that uniform spacing of all the strands of the filament from the plate surface is maintained. The frame is shown more clearly in Figure 2. The filament is heated to emission temperature by battery 20 connected in series with the filament switch 21. The filament is also connected to the negative terminal of high voltage generator 22. Generator 22 may be a transformer-rectifier system capable of supplying a small current at a potential of 1000 to several thousand volts. It is supplied with A. C. input current through switch 23. The plate 10 is connected to the positive terminal of generator 22 by sliding contact spring 25. Grid 18 is enclosed in a curved metal shield 26 which extends around the outside of the grid.

In operation, with switches 21, 23 and 24 closed, the plate is advanced slowly under filament grid 18 and coating 11 is given a uniform electric charge over its surface by negative charges driven to it from the filament by the strong electric field produced by the high voltage generator. These charges may comprise both electrons and negative ions produced in the space between grid 18 and coating 11.

The charged area of plate 10 is advanced into camera portion 27 for exposure, after which it is advanced through a development chamber 28 to a transfer station where sheets of paper may be fed under roller 29 to transfer the developed image as described more fully in my co-pending application, Serial No. 500,207.

While the invention has been described as carried out in a specific embodiment it is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. Electrophotographic apparatus comprising, in combination, an electrophotographic element having a layer of photo-conductive insulating material on a conductive base, and means for ap-

plying a uniform electrostatic charge to the surface of said layer, said means comprising an ion producing source, means for moving said element relative to said source to bring all areas of said layer under said source, and means to apply an electric field between said source and said conductive base.

2. Electrophotographic apparatus comprising, in combination, an electrophotographic element having a layer of photoconductive insulating material on a conductive base, drive means for advancing said electrophotographic element in a direction substantially parallel to its own surface, an array of filaments overlying and substantially parallel to said surface, said filaments being transverse to the direction of advance of said surface, and a high voltage potential source connected between said filaments and said conductive base to apply an intense electric field between said filaments and said base through the intervening air space and said photoconductive layer.

3. Electrophotographic apparatus as claimed in claim 2, in which said array of filaments is enclosed by a conductive shield above said filaments.

4. Electrophotographic apparatus as claimed in claim 2, in which means are provided for heating said filaments to emission temperature.

5. Electrophotographic apparatus as claimed in claim 4, in which said filaments are coated with an electron emission coating.

6. Electrophotographic apparatus comprising, in combination, a cylinder, an electrophotographic element having a base sheet of conductive material extending around said cylinder and a coating of photoconductive insulating material carried thereby, a drive motor to advance said plate around said cylinder a frame mounted adjacent said cylinder and a plurality of filaments strung on said frame in spaced parallel relation, said filaments being parallel to the axis of said cylinder and substantially equidistant therefrom, and a high voltage power supply connected between said filaments and said base sheet to apply an intense electric field between said filaments and said base sheet through the intervening air space and said photoconductive coating.

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No references cited.