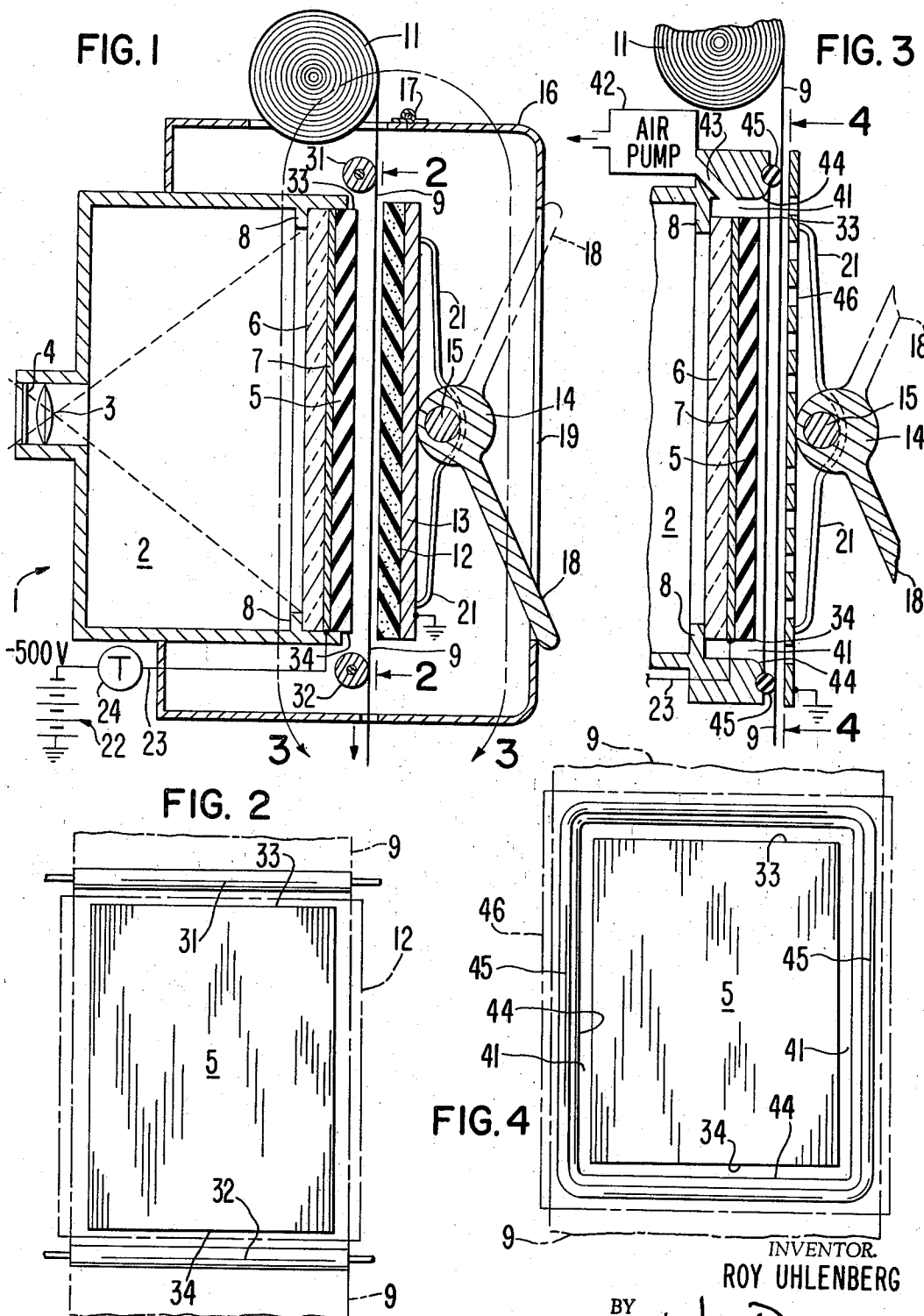


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ELECTROPHOTOGRAPHIC STRIP FILM DEVICES WITH MEANS FOR HOLDING
THE FILM AWAY FROM THE PHOTOCONDUCTOR DURING FILM TRANSPORT
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ELECTROPHOTOGRAPHIC STRIP FILM DEVICES WITH MEANS FOR HOLDING THE FILM AWAY FROM THE PHOTOCONDUCTOR DURING FILM TRANSPORT

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ABSTRACT OF THE DISCLOSURE

An electrophotographic strip film apparatus having a photoconductive imaging plate onto which is focused a photon image to be reproduced. A strip of electrographic recording paper is positioned overlaying the photoconductive plate. A potential is applied across the photon image illuminated photoconductive plate and a charge retentive film layer of the electrographic paper. Under the influence of the applied potential, a charge image, corresponding to the photon image, is deposited upon the charge retentive surface of the electrographic recording paper for subsequent development by conventional powdered pigment techniques. During transfer of the charge image to the electrographic paper, the dielectric charge retentive surface of the paper is pressed into nominal contact with the photoconductive plate. After the charge image is deposited, the pressure on the paper is removed and a length of the paper is pulled past the photoconductive plate for development in accessory equipment and to position an undeveloped area of the paper strip over the photoconductive plate. A raised structure, such as a roller or a lip, is positioned at the leading and trailing edges of the photoconductive plate to prevent the paper from rubbing against the photoconductive plate during transport of the paper.

DESCRIPTION OF THE PRIOR ART

Heretofore, electrophotographic devices have employed strip film paper. In such devices, it has been found that, during the formation of the charge image on the charge retentive surface of the electrographic recording paper, it is desirable to have the charge retentive surface pressed into nominal contact with the photoconductive plate. This assures uniformity in the formation of the charge image. However, the photoconductive plate is very thin, on the order of 0.002" thick, and it has been discovered that the dielectric film layer, forming the charge retentive surface of the electrographic paper (film) is very abrasive. Consequently, when the paper is transported past the photoconductor, to remove the exposed film and to position an unexposed area of the film over the photoconductive plate, it was found that rubbing of the film on the photoconductive plate produced excessive wear and unwanted scratching of the plate. This scratching and wear reduces the thickness of the photoconductor and interferes with a uniform charge transfer characteristic for the photoconductive plate.

SUMMARY OF THE PRESENT INVENTION

The principal object of the present invention is the provision of an improved electrographic apparatus employing strip film.

One feature of the present invention is the provision, in an electrophotographic device employing strip film, of structure such as a lip or a roller positioned at the leading

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and trailing edges of the photoconductive member and rising above the surface of said member for holding the film away from the surface of the photoconductive member during transport of the film, whereby undue abrasion of the photoconductive plate is prevented in use.

Another feature of the present invention is the same as the preceding feature including means such as a soft pressure pad or partial vacuum drawing means disposed between said hold-off structures for pressing the charge retentive surface of the film into nominal contact with the photoconductive member during the transfer of the charge image to the film (paper).

Other features and advantages of the present invention will become apparent upon a perusal of the following specification taken in connection with the accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic sectional view of an electrophotographic camera employing features of the present invention,

FIG. 2 is a sectional view of a portion of the structure of FIG. 1 taken along line 2—2 in the direction of the arrows,

FIG. 3 is a fragmentary view of an alternative structure to that part of FIG. 1 delineated by line 3—3, and

FIG. 4 is a view of a portion of the structure of FIG. 3 taken along line 4—4 in the direction of the arrows.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to FIGS. 1 and 2, there is shown an electrophotographic camera 1 employing features of the present invention. The camera 1 includes a dark box 2 having a lens 3 and shutter 4 at one end and a photoconductive plate 5 disposed in the focal plane of the lens 3 at the other end of the box 2.

The photoconductive plate 5, as of selenium, is relatively thin, as of 0.002" thick, and is supported from a glass plate 6 via the intermediary of an optically transparent conductive electrode 7. The plate assembly, which comprises the glass plate 6, electrode 7 and photoconductive plate 5, is cemented at its marginal edges to a lip 8 of the dark box 2.

A strip of electrographic recording paper 9 is passed over the photoconductive plate 5 from a supply roll 11. The electrographic recording paper 9 comprises a conductive paper backing or web onto which is formed a thin film of dielectric, as of 4 microns thick, which forms the charge retentive surface of the paper 9. The paper 9 is disposed in overlaying relation to the photoconductive plate 5 with the charge retentive surface of the paper disposed adjacent the plate 5.

A soft elastic pressure pad 12, as of sponge/rubber, is disposed at the backside of the recording paper 9 for pressing the charge retentive surface of the paper 9 into nominal contact with the photoconductive plate 5. The pressure pad 12 is cemented to a relatively rigid backing plate 13, as of 0.125" thick steel, and the pad 12 is coated with a flexible conductive paint, such as silver paint, to provide electrical contact between the backing plate 13, which is grounded, and the conductive backing of the recording paper 9.

A cam 14 is eccentrically mounted on a shaft 15. The shaft 15 is fixed at its ends to the side walls of a rear housing cover 16. The cover 16 is hinged to the dark box structure at 17. The cam 14 is rotated by a cam lever 18 which extends outside of the rear housing 16 through a slot 19 therein. The backing plate 13 is affixed to the shaft 15 via

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leaf springs 21. Moving the cam lever 18 to the upper position, as indicated by dotted lines, causes the cam 14 to move the backing plate 13 toward the photoconductive plate 5, thereby pressing the pressure pad against the paper 9 and the paper against the photoconductive plate 5. As a result, nominal contact is obtained between the paper and the plate 5 over substantially the entire mutually opposed surface area of the photoconductive plate 5 and the paper 9.

A source of potential 22, as of -500 v., is connected across the photoconductive plate 5 and the paper 9 by lead 23 being connected to the transparent conductive electrode 7. The other terminal of the supply 22 is grounded as is the backing plate 13 and conductive paint on the pressure pad 12. A timer switch 24 is connected in lead 23 for controlling the closed circuit time, and thus, the interval of time during which the potential is applied across the photoconductive plate 5 and paper 9.

In operation, the cam lever 18 is moved to the upper position, thereby pressing the paper 9 into nominal contact with the photoconductive plate 5. The shutter 4 is opened and the timer switch 24 closed to apply the potential across the photoconductive plate 5 and paper 9. The photon image, falling upon the photoconductive plate 5, produces a conductive image therein and permits the applied voltage to transfer a charge image, in accordance with the photon image, to the charge retentive surface of the paper 9. After the charge image has been formed, the timer switch 24 opens the circuit 23 and the shutter 4 is closed. The cam lever 18 is then moved to the lower position to release the pressure on the paper 9. The paper 9 is then pulled past the photoconductive plate 5 by hand or by motor driven friction wheels, not shown. Enough paper is pulled to remove the exposed portion of the paper strip 9 from the camera 1 and to position an unexposed area of the paper strip 9 over the photoconductive plate 5. The exposed paper 9 (film) is developed by conventional electrographic toner methods and apparatus not shown.

A pair of rollers, 31 and 32, as of steel, are mounted on shafts at the leading and trailing edges 33 and 34, respectively, of the photoconductive plate 5. The rollers 31 and 32 provide a film (paper 9) hold-off structure which rises above the surface of the photoconductive plate 5 to prevent the paper 9 from rubbing on the plate 5 as the paper 9 is pulled from the supply roll 11 over the plate 5. Also it is preferred that the soft pressure pad 12 be retracted a sufficient distance from the paper 9 in order to prevent the paper 9 from rubbing off the conductive paint on the surface of the pad 12.

The pressure pad 12 moves into the space between the rollers 31 and 32 when it is pressed against the photoconductive plate 5. The rollers 31 and 32 have been found to effectively reduce abrasion of the photoconductive plate 5 without adversely affecting proper operation of the pressure pad 12. The soft pressure pad feature forms the subject matter of and is claimed in copending U.S. application 615,257, filed Feb. 10, 1967, and assigned to the same assignee as that of the present invention.

Referring now to FIGS. 3 and 4, there is shown an alternative paper hold-off structure of the present invention. In this embodiment, the structure is essentially identical to that of FIGS. 1 and 2 except that the pressure pad assembly is replaced by a partial vacuum type paper hold down structure. More specifically, a groove 41 encircles the marginal edges of the photoconductive plate 5. An air pump 42 has its suction side connected to the groove 41 via passageway 43. The outer lip 44 of the groove 41 rises above the surface of the photoconductive plate 5 and includes a rubber O-ring 45 sealed thereto which also encircles the plate 5 and groove 41.

A relatively flexible perforated plate 46, as of steel, overlays the photoconductive plate 5, lip 44, O-ring 45 and paper 9. The perforated plate 46 is affixed to the cam shaft 15 via leaf springs 21. When the cam lever 18 is moved to the upper position, indicated by dotted lines, the per-

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forated plate 46 is pushed toward the photoconductive plate 5 making contact with the paper 9 and sealing same to the O-ring around the marginal edges of the groove 41. The air pump 42 draws a partial vacuum, as of 20 inches of water, on the space between the paper 9 and the photoconductive plate 5. As a result, atmospheric pressure pushes on the backside of the paper 9 and presses the paper 9 flat against and into nominal contact with substantially the entire mutually opposed surface area of the photoconductive plate 5, thereby assuring uniform charge transfer to the paper 9. The cam 14 deflects the grounded plate 45 sufficiently to provide adequate electrical contact with the conductive backside of the paper 9.

The rubber O-ring serves the dual function of serving to seal the groove 41 to the paper 9 and also serving as a paper hold-off structure to prevent the paper from rubbing the photoconductive plate 5 when the paper 9 is pulled from the roll 11 across the plate 5. The partial vacuum paper hold-down feature forms the subject matter of and is claimed in copending U.S. application 615,134, filed Feb. 10, 1967, and is assigned to the same assignee as the present invention.

Although the embodiment of FIGS. 3 and 4 was described as employing the O-ring 45, the O-ring 45 is not necessary. Alternatively, the O-ring may be left out and the raised lip 44 will serve both to seal the paper 9 to the groove 41 and to prevent rubbing of the paper 9 on the photoconductive plate 5.

Moreover, the paper hold-off feature of the present invention has been described, for simplicity of explanation, as it is employed in an electrophotographic camera 1. Its use is not limited to such cameras and is employed to advantage, in the same manner, in other types of electrophotographic devices such as, for example, radiographic cameras, copiers and microfilm printers.

Since many changes could be made in the above construction and many apparently widely different embodiments of this invention can be made without departing from the scope thereof it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. In an electrophotographic apparatus, means forming a photoconductive member for transferring a charge image to an electrographic recording web in accordance with a photon image illuminating said photoconductive member, means for transporting a strip of the electrographic recording web over said photoconductive member for depositing a succession of charge images on the strip of electrographic recording web, means for pressing the electrographic recording web into nominal contact with said photoconductive member during the time the charge image is being formed on the electrographic web, the improvement comprising, means holding the recording web away from the surface of said photoconductive member during transport of the web over said photoconductive member for preventing abrasion of said photoconductive surface by the recording web during transport of said web.

2. The apparatus of claim 1 wherein said means for holding the recording web away during transport is a structure rising above the surface of said photoconductive member at the leading and trailing edge of said photoconductive member.

3. The apparatus of claim 2 wherein said web hold-off structure rises above the surface of said photoconductive member and includes a roller for engaging the web.

4. The apparatus of claim 2 wherein said web hold-off structure includes a lip which rises above the surface of said photoconductive member for engaging the web.

5. The apparatus of claim 2 wherein said means for pressing the recording web into nominal contact with said photoconductive member includes a soft elastic pressure pad for engaging the web and pressing same against the surface of said photoconductive member.

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6. The apparatus of claim 5 wherein said web hold-off structure which rises above the surface of said photoconductive member comprises, rollers disposed at the leading and trailing edge of said photoconductive member, and said pressure pad is confined to the region of space adjacent said photoconductive member and between said rollers.

7. The apparatus of claim 4, wherein said means for pressing the recording web into nominal contact with said photoconductive member includes, means for drawing a partial vacuum on the space between the recording web and said photoconductive member, whereby atmospheric pressure on the other side of the web presses the web into nominal contact with said photoconductive member.

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