United States Patent [19]

Zweig

[11] **3,830,645**

[45] **Aug. 20, 1974**

[54] **METHOD AND APPARATUS FOR CREATING AN ELECTROSTATIC LATENT IMAGE BY CHARGE MODULATION**

[75] Inventor: **Gilbert Zweig,** Stamford, Conn.

[73] Assignee: **Pitney-Bowes, Inc.,** Stamford, Conn.

[22] Filed: **Sept. 1, 1972**

[21] Appl. No.: **285,573**

Related U.S. Application Data

[63] Continuation of Ser. No. 105,432, Jan. 11, 1971, Pat. No. 3,722,992.

[52] **U.S. Cl.** .... **96/1 R,** 96/1.4
[51] **Int. Cl.** **G03g 5/10**
[58] **Field of Search** .... 96/1 R, 1.4

[56] **References Cited**

UNITED STATES PATENTS

2,833,648	5/1958	Walkup	96/1 R
2,937,943	5/1960	Walkup	96/1 R
3,664,833	5/1972	Tanaka	96/1 R
3,666,364	5/1972	Marushima	96/1 R

Primary Examiner—Ronald H. Smith
Assistant Examiner—John L. Goodrow
Attorney, Agent, or Firm—William D. Soltow, Jr.; Albert W. Scribner; Donald P. Walker

[57] **ABSTRACT**

A transparent dielectric film is juxtaposed with the electrostatically charged surface of a photoconductive member. An optical image is projected onto the photoconductive member to create a corresponding first electrostatic latent image on the photoconductive member surface. The exposed dielectric film surface is charged by an AC scorotron; the first electrostatic latent image acting to modulate the charge deposition such as to produce a zero potential at the exposed film surface. The photoconductive member is flooded with light to dissipate the first electrostatic latent image, rendering the charge deposition on the exposed film surface effective as a second corresponding electrostatic latent image for ultimate development and image transfer to plain paper.

7 Claims, 7 Drawing Figures

FIG. 1

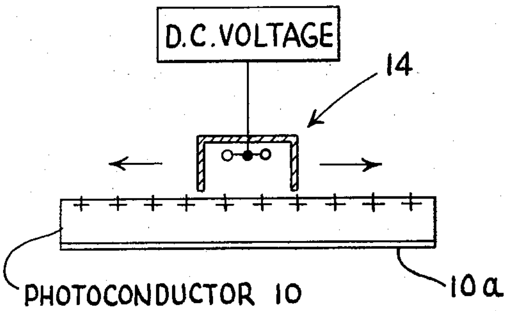
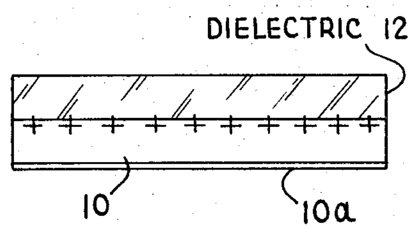


FIG. 2



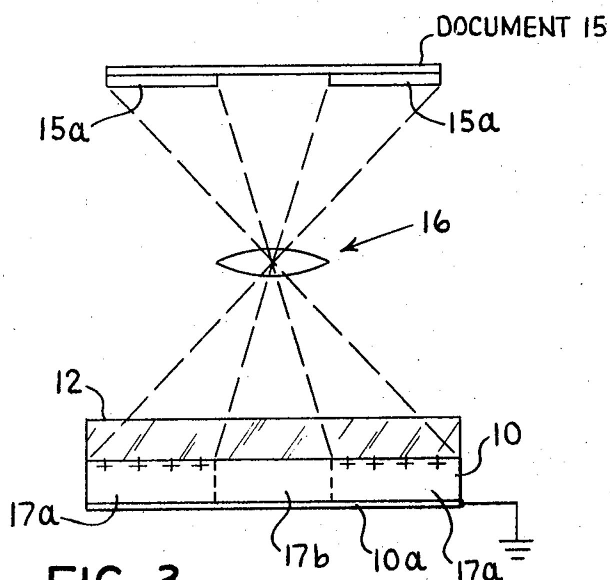
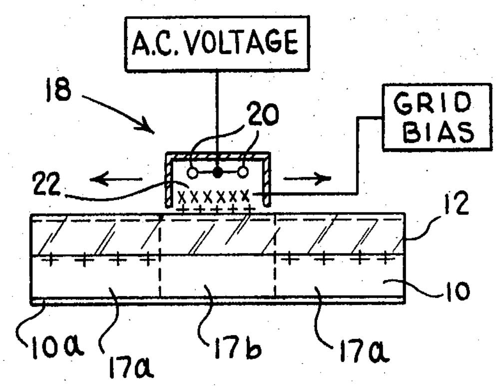


FIG. 3

FIG. 4



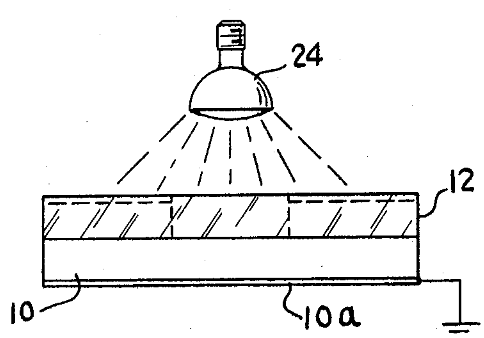
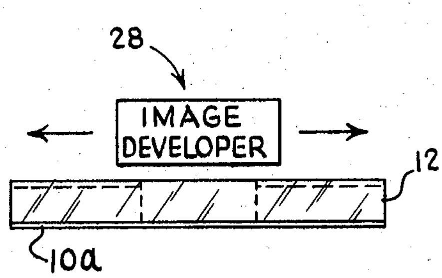


FIG. 5

FIG. 6



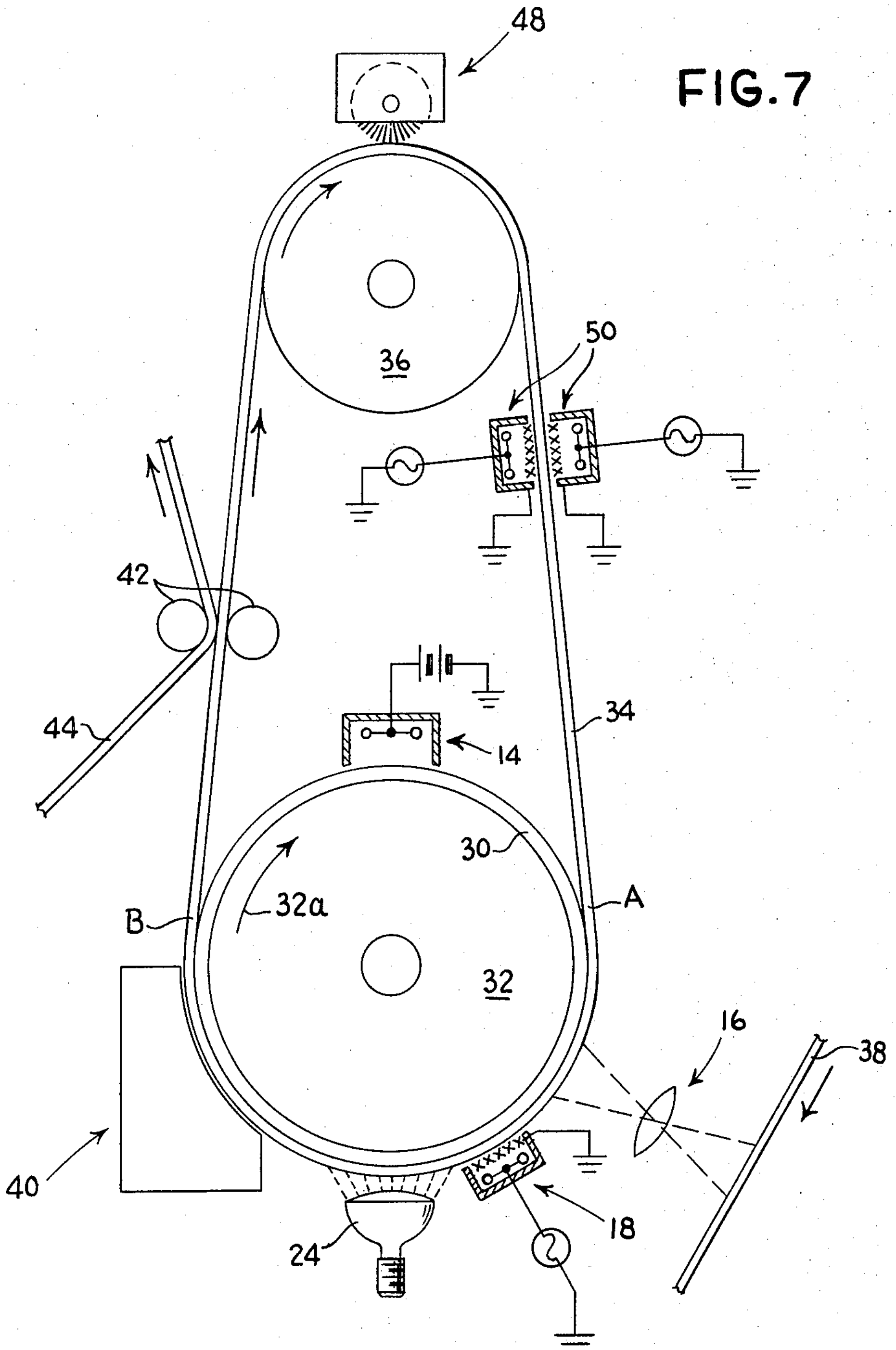


FIG. 7

METHOD AND APPARATUS FOR CREATING AN ELECTROSTATIC LATENT IMAGE BY CHARGE MODULATION

This is a division, of application Ser. No. 105,432 filed Jan. 11, 1971 now U.S. Pat. No. 3,722,992.

BACKGROUND AND OBJECTS OF THE INVENTION

The present invention relates to an improved method for creating electrostatic images useful in electrostatic photocopiers and to apparatus for carrying out the improved method.

In presently available electrostatic photocopiers, it is the usual practice to create an electrostatic latent image corresponding to the image to be copied on the surface of a photoconductive insulating member. This electrostatic latent image is then developed using electroscopic developer or toner particles. The developed image is then either fixed on the photoconductive member surface, typically zinc oxide coated paper, as in the direct imaging process, or the toner in image formation is transferred or offset printed onto plain paper and fixed, as in the indirect imaging process. In either the direct or indirect imaging processes, the electrostatic latent image carried by the photoconductive member surface must be preserved in absolute darkness until it is visibly developed, as it can be readily erased or dissipated by incident light radiation.

In the case of the indirect imaging process, the photoconductive member is typically formed of a relatively expensive xerographic plate or drum which is reused during each copy cycle. Thus the surface of this photoconductive member is constantly being subjected to the abrading action of the developing materials as they are cascaded or otherwise brought into contact with the electrostatic latent image borne by the photoconductive member. Moreover, the surface of the photoconductive member must be brought into contact with the surface of a paper sheet to which the developer particles in image formation are transferred. This too creates wear and errosion of the photoconductive member surface. Eventually the photoconductive member wears out and must be replaced at considerable cost to the user.

In addition, since the photoconductive member surface is subjected directly to the developer materials, the residue left after image transfer to the plain paper sheet should be scrupulously removed if the quality of subsequent copies is to be maintained. Unfortunately despite repeated automated cleaning of the photoconductive member surface, a film of contamination gradually builds up on the surface, ultimately requiring removal of the photoconductive member from the photocopy machine and manual cleaning of the drum with a suitable solvent. This produces more wear of the photoconductive member surface and thus further decreases its operating life.

Various methods have been advanced for translating an electrostatic latent image on the surface of a photoconductive member into a second corresponding electrostatic latent image on the surface of a dielectric insulating member or film in juxtaposition therewith. So long as the dielectric film is not photoconductive, the second electrostatic latent image can be preserved on its surface despite incident light radiation, and thus the image can be visibly developed under ambient light conditions even apart from the photoconductive member. The developed image can be fixed on the dielectric film surface or the developer particles in image formation can be transferred to plain paper and fixed. Thus, by this technique the photoconductive member surface is not subjected to the developer materials and is not contacted against a transfer sheet with the result that its operating life is materially increased. Moreover, the photoconductive member surface need not be mechanically cleaned, also contributing to longer operating life.

A number of such techniques for creating electrostatic latent images on non-photoconductive dielectric films are disclosed in Schaffert's reference book entitled, "Electrophotography" (1965), Chapter VI. Other disclosures of such methods may be found in Hall U.S. Pat. Nos. 3,084,061 and 3,234,019 and Walkup U.S. Pat. Nos. 2,825,814 and 2,833,648.

It is an object of the present invention to provide an improved method for creating an electrostatic latent image on the surface of a non-photoconductive member.

An additional object of the invention is to provide an improved method of the above character having particular application in electrophotography or photoreproduction as employed in electrostatic photocopiers.

Still another object of the invention is to provide a method of the above character which is particularly adapted to reproduce photocopy images on plain bond paper.

Yet another object of the invention is to provide apparatus for practicing the improved method of the above-noted character.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

SUMMARY OF THE INVENTION

In accordance with the present invention, a surface of a photoconductive insulating member, such as vitreous selenium, is uniformly electrostatically charged to a predetermined, suitable DC potential. A non-photoconductive insulating or dielectric film is then placed over the photoconductive member in virtual physical contact with the charged surface thereof. As an important feature of the invention, the overall uniform electrostatic charge on the photoconductive member surface is effective to create an attractive force on the dielectric film, holding it in intimate and uniform relation with the photoconductive member surface.

The photoconductive member is then exposed to an optical image effective to create a corresponding electrostatic latent image on the photoconductive member surface. Preferably, the dielectric film is transparent such as to permit the photoconductive member to be exposed to the optical image to be copied through the dielectric film. The exposed surface of the dielectric film is subjected to an electrostatic charge of a character to establish a substantially uniform electric potential plane adjacent the exposed film surface. Specifically, the influence of the underlying electrostatic latent image on the photoconductive member surface, acting through the dielectric film, serves to modulate the charge deposition on the exposed film surface such as to create thereon a charge pattern of a character to effectively cancel out the electrostatic latent image, leaving the exposed film surface at zero electrical potential.

In practice, the exposed film surface is subjected to an AC electrostatic charging source which is effective to establish the zero electric potential plane. As a result, the charge deposition pattern on the exposed film surface conforms but relatively oppositely charged, to the electrostatic latent image, thus, in effect, cancelling each other to produce the uniform zero electric potential plane at the film surface.

Due to the joint presence and close proximity of the charge pattern on the exposed film surface and the electrostatic latent image on the photoconductive member surface, neither can be visibly developed using electroscopic toner particles. Thus prior to development, the influence or effect of the electrostatic latent image at the exposed surface of the film must be eliminated. Preferably, in accordance with the invention, this is achieved by flooding the photoconductive member with light to dissipate the electrostatic latent image, rendering the charge deposition pattern on the exposed film surface effective as a second corresponding electrostatic latent image which is then capable of visible development.

After the second electrostatic latent image has been developed, the dielectric film and the photoconductive member are separated from each other, and the toner particles held by the second electrostatic latent image in image formation are transferred or offset printed onto plain paper. It is to be noted that the second electrostatic latent image is developed prior to the separation of the dielectric film and the photoconductive member, thus insuring that any charges created on the adjacent surfaces of these two dissimilar materials upon separation will have no effect on image development.

While the dielectric film and the photoconductive member are separated, residual toner and charges remaining on the dielectric film are removed and the exposed photoconductive member surface is recharged pursuant to repeating the process.

The invention accordingly comprises several steps and the relation of one or more such steps with respect to each of the others and apparatus embodying features of construction, combination of elements and arrangement of parts which are adapted to effect such steps, all as exemplified in the following detailed description, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention, reference should be had to the following detailed description taken in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic illustration of charging a surface of a photoconductive member to a uniform DC potential in accordance with the initial step in the process of the present invention;

FIG. 2 is a diagrammatic illustration of placing a non-photoconductive dielectric film in juxtaposition with the charged surface of the photoconductive member in accordance with the method of the present invention;

FIG. 3 is a diagrammatic illustration of imaging the photoconductive member through the dielectric film to create a corresponding electrostatic latent image on the photoconductive member surface;

FIG. 4 is a diagrammatic illustration of charging the exposed surface of the dielectric film with an AC scorotron to create a charge pattern on the dielectric film surface corresponding to the electrostatic latent image on the photoconductive member surface;

FIG. 5 is a diagrammatic illustration of flooding the photoconductive member through the dielectric film with light to remove the electrostatic latent image from the surface of the photoconductive member and render the charge pattern on the exposed surface of the dielectric film effective as a second corresponding electrostatic latent image;

FIG. 6 is a diagrammatic illustration of visibly developing the second electrostatic latent image on the exposed dielectric film surface; and

FIG. 7 is a schematic illustration of apparatus for practicing the successive method steps illustrated in FIGS. **1** through **6**.

DETAILED DESCRIPTION

In accordance with the embodiment of the invention illustrated in FIGS. **1** through **6**, the upper surface of a photoconductive insulating member **10** is charged to an overall uniform DC potential. While there are known numerous ways in which to charge the surface of an insulating member, the most practical method is to employ a corona charging unit such as generally indicated at **14** in FIG. **1**. The corona charging unit **14** is passed over the photoconductive member **10** or the photoconductive member is moved under the corona charging unit in order to uniformly deposit electrostatic surface charges. The polarity of these charges is indicated as being positive in FIG. **1**, however, it will be understood that a photoconductive member surface may be charged to a negative potential. The polarity of the electrostatic charges is determined by the type of photoconductor material used in member **10**.

It will be appreciated that the photoconductive member **10** may take a variety of forms, but typically in practice it comprises a photoconductive insulating layer coated on a conductive backing member. In FIG. **1**, the photoconductive member is illustrated as having a conductive substrate or electrode material **10***a* applied to its lower surface. The photoconductive insulating material used in member **10** may be, for example, vitreous selenium, anthracene, sulphur, tellurium or various organic compounds which are known to have photoconductive insulating properties.

As illustrated in FIG. **2** an insulating or dielectric film **12** is placed over the photoconductive member **10** with its lower surface in virtual physical contact with the charged photoconductive member surface. The preexisting charge on the surface of the photoconductive member **10** serves to attract the dielectric film **12** and thus insures an overall uniform and intimate relation between their juxtaposed surfaces; an important requirement as will be appreciated upon consideration of the method steps to follow. The dielectric film may be formed of any suitable non-photoconductive insulating material capable of supporting and retaining electric charges on its surface. Plastics such as Mylar, Kapton, Teflon, polyethylene, FEP, and the like have been found suitable.

It will be understood that the charging of the photoconductive member **10**, as illustrated in FIG. **1**, and the placement of the dielectric film **12** over the charged photoconductive member surface are carried out in the dark in order that the photoconductive member be insulative to preserve the electrostatic charges deposited by the corona charging unit **14**.

The next step in the process is to expose the photoconductive member **10** to an optical image to be reproduced as indicated in FIG. **3**. The optical image, illustrated as having dark image areas **15***a* and a light background area **15***b* borne by a document **15**, is projected by a lens system, schematically indicated at **16**, through the dielectric film **12** onto the photoconductive member **10**. Thus, the dielectric film is optically transparent. Alternatively, the electrode **10***a* applied to the bottom surface of the photoconductive member **10** may be made optically transparent and the optical image may then be projected onto the photoconductive member from below.

As is well understood in the electrophotography art, the areas of the photoconductive member struck by light lose their insulative properties and become conductive. The surface charges overlying these light struck areas are conducted through the semiconductive member body to the electrode **10***a*, which is illustrated as being electrically connected to ground in FIG. **3**. Those areas of the photoconductive member which are not illuminated by the optical image retain their insulative properties, thus preserving the surface charges overlying these dark areas. In FIG. **3**, the non-illuminated areas of the photoconductive member **10**, indicated at **17***a*, receive little or no reflected light from dark image areas **15***a*, and the light struck area is indicated at **17***b*, which receives reflected light from light background area **15***b* of document **15**. Thus, the surface charges overlying area **17***b* of the photoconductive member **10** have been conducted away, leaving the surface charges overlying the areas **17***a* on either side, which are not conducted away. There is thus created on the surface of the photoconductive member an electrostatic latent image corresponding to the optical image projected by lens system **16**.

The next step in the inventive process, illustrated in FIG. **4**, involves subjecting the upper or exposed surface of the dielectric film **12** to an AC electrostatic field. Preferably in accordance with my invention, the corona charging device, generally indicated at **18**, is a scorotron charging device such as disclosed in Walkup U.S. Pat. No. 2,777,957. The corona wires **20** are excited from an AC voltage source while the grid **22** is connected to a suitable grid bias potential, which in practice may be and preferably is ground potential. As the corona charging unit **18** passes over the upper surface of the dielectric film **12** or the dielectric film is passed under the corona charging unit, positive and negative electrostatic charges are deposited on the dielectric film surface in a manner such as to, in effect, cancel out the electrostatic latent image retained on the surface of the photoconductive member **10**. Stated another way, the electrostatic charges are deposited on the upper surface on the dielectric film by the corona charging unit **18** so as to establish an equal potential plane at the upper dielectric film surface. Specifically, the equal potential plane preferably has a zero electric potential. Thus, the charges carried by the surface of the photoconductive member **10** as a first electrostatic latent image act as a template to modulate the charge deposition on the upper surface of the dielectric film **12** so as to create a charge deposition pattern corresponding to the first electrostatic latent image and thus also to the optical image projected by lens system **16**.

Specifically as seen in FIG. **4**, if the first electrostatic latent image consists of positive charges, the corona charging unit **18** deposits negative charges on the dielectric film surface of the regions overlying the positive charges on the photoconductive member surface. Positive charges are not deposited, but instead are repelled by the underlying positive charges of the first electrostatic latent image. Over area **17***b* where the positive charges were conducted away through the photoconductive member body, as illustrated in the step of FIG. **3**, the corona charging unit deposits mutually cancelling positive and negative electric charges on the overlying dielectric film surface. Thus the resulting charge deposition pattern on the dielectric film surface consists of negatively charged areas over image areas **17***a* and an uncharged area over background area **17***b*, as is illustrated in FIG. **4**. This results in the creation of a zero electric potential plane at the exposed film surface.

At this point it will be appreciated that any non-uniformities in the contact relationship between the photoconductive member and the dielectric film will create inaccuracies in the formation of the charge deposition pattern since the influence of the first electrostatic latent image will not be accurately represented at the exposed film surface.

It will be understood that if the corona charging unit **14** in FIG. **1** deposits negative charges on the photoconductive member surface, then the corona charging unit **18** of FIG. **4** will deposit overlying positive charges in order to achieve a zero electric potential plane at the upper surface of the dielectric film **12**.

The next step in the process, illustrated in FIG. **5**, is to flood the photoconductive member **10** with light from a lamp **24**, rendering it overall electrically conductive, thus dissipating the first electrostatic latent image through the photoconductive member body to electrode **10***a* and ground. If the dielectric film **12** is transparent, the photoconductive member **10** is preferably flooded with light through the dielectric film, as illustrated in FIG. **5**. Alternatively, if the electrode **10***a* is transparent, the photoconductive member **10** may be flooded with light from below to dissipate the first electrostatic latent image borne on the upper surface thereof. At the conclusion of the method step illustrated in FIG. **5**, the charge deposition pattern on the film surface remains and is now rendered effective as a second, developable electrostatic latent image corresponding to the first.

Turning to FIG. **6**, the second electrostatic latent image is visibly developed, as schematically indicated at **28**, using any conventional development technique. Basically the development technique involves depositing electroscopic particles on the upper surface of the dielectric film **12**; the electric charges making up the second electrostatic latent image being effective to attract and hold the electroscopic particles or pigmented toner particles thus, in effect rendering the electrostatic image visible. Of course, those areas of the second electrostatic latent image which are unchanged do not attract and hold the toner particles.

The dielectric film **12** illustrated in FIGS. **2** through **6** is preferably quite thin, typically on the order of 1 to 5 mils thick, with 2 mils being a representative figure. Using a thin dielectric film serves to maximize the modulating effect of the first electrostatic latent image during deposition of the charge pattern on the film surface and also serves to insure good image resolution by minimizing the effects of fringing electrostatic fields produced by the first electrostatic latent image during the process step of FIG. **4** and also any problems of optical image distortion during the imaging step of FIG. **3.**

Apparatus for carrying out the method steps illustrated in FIGS. **1** through **6** is disclosed in FIG. **7.** The photoconductive member consists of a layer **30** of photoconductive insulating material coated on a drum **32** formed of electrically conductive material. The drum **32** is mounted for rotation in the clockwise direction as indicated by the arrow **32***a*. The transparent dielectric film is in the form of a belt which passes around drum **32** and an upper roller **36.** Thus the dielectric belt **34** moves around in the clockwise direction with rotation of the drum **32** coming in contact with the photoconductive coating **30** on the drum at point A and separating from the drum at point B. Going from point B in the clockwise direction around to point A, the surface of the photoconductive coating **30** on drum **32** is conveniently exposed in order that it may be charged by the corona charging unit **14** in the manner described in connection with FIG. **1.** As the drum **32** rotates around to point A, the uniformly charged surface of the photoconductive coating **30** converges with the dielectric belt **34,** achieving intimate contacting engagement between the charged surface of the photoconductive coating and the inner surface of the dielectric belt. The pre-existing overall uniform electrostatic charge on the photoconductive coating insures an overall uniform and intimate relation between the opposing surfaces of the drum coating and the belt.

Continuing in the clockwise direction beyond point A, the photoconductive coating **30** is imaged by an optical image derived from an original document **38** moving in synchronism with rotation of drum **32.** The image is projected by the lens system **16** through the dielectric belt **34** onto the charged surface of the photoconductive coating **30,** thereby producing the electrostatic latent image corresponding to the projected optical image. It will be observed that this operation corresponds to the method step illustrated in FIG. **3.**

Still referring to FIG. **7,** after formation of the first electrostatic latent image on the surface of the photoconductive coating **30,** the dielectric belt **34** moves passed the corona charging unit **18** to deposit a charge pattern on the dielectric belt surface effectively cancelling the underlying first electrostatic latent image on the photoconductive coating surface. As was described in connection with FIG. **4,** the corona charging unit **18** is an AC scorotron whose corona charging wires are excited from an AC source and its grid is grounded.

Upon continued rotation of the drum **32,** the first electrostatic latent image and the corresponding charge deposition pattern are moved to lamp **24** which acts to flood the photoconductive coating **30** with light transmitted through the dielectric belt **34** to discharge the first electrostatic latent image on the photoconductive coating surface. This corresponds to the method step illustrated in FIG. **5.** It will be appreciated that the lamp **24** in practice would be suitably enclosed such that its light output is supplied to a limited transverse segment of the drum coating, and thus the first electrostatic latent image is progressively erased as it moves passed the lamp.

As the dielectric belt **34** continues beyond lamp **24** the charge deposition pattern, now effective as a second corresponding electrostatic latent image, is presented at a development station, generally indicated at **40.** As was noted in connection with FIG. **6,** a variety of development techniques may be employed to visibly develop the second electrostatic latent image. For example, a cascade development technique may be employed wherein toner particles carried by developer beads are cascaded over the surface of a dielectric belt; the charges making up the second electrostatic latent image being effective to attract the electroscopic toner particles from their carrier beads. Alternatively, the development station **40** may employ a magnetic brush technique wherein the second electrostatic latent image is effectively brushed with the toner particles pursuant to visibly developing it. It is also contemplated that a liquid developer may be applied to the second electrostatic latent image carried on the surface of the dielectric belt **34.**

Regardless of which development technique is employed, it is preferable that development of the second electrostatic latent image take place before separation of the dielectric belt **34** from the photoconductive coating **30.** It has been found that, when the belt **34** is separated from the drum, electrostatic charges may be developed on the inner surface of the belt due to the dissimilarities of the belt material and the photoconductive coating material and the triboelectric relationship therebetween. The presence of these electrostatic charges during the development of the second electrostatic latent image degrades the quality of the developed image.

After development of the second electrostatic latent image, the dielectric belt **34** passes upwardly between transfer rollers **42,** which act to press the toner clinging to the dielectric belt surface in image formation against the surface of a plain paper sheet, indicated at **44** in FIG. **7.** The toner in image formation is transferred or offset printed onto the paper sheet **44** as both the dielectric belt and the paper sheet pass between the transfer rollers **42.** As is known in the art, suitable transfer electrodes may be positioned adjacent the transfer rollers to assist in toner transfer to the paper sheet. The image transferred to the paper sheet **44** is then fixed, typically by the application of heat, as is well known in the art.

The dielectric belt **34** continues upwardly around the upper roller **36** to a mechanical cleaning station, indicated at **48,** which typically consists of a rotating brush operating to remove any residue toner remaining on the dielectric belt surface. The dielectric belt **34,** as it leaves the upper roller **36,** passes between opposed scorotron units **50** which serve to remove any residue charges on the outer and inner belt surfaces. In the meantime, the surface of the photoconductive coating **30** on drum **32** is recharged by the corona charging unit **14.** The dielectric belt, completely devoid of any surface charges, arrives at point A for juxtaposition with the uniformly charged surface of the photoconductive layer and the operation repeats for ensuing copy cycles.

It will be appreciated that after repeated operation, the dielectric belt will become dirty and possibly have its outer surface marred or scratched, which degrades image reproduction quality. When this occurs the relatively inexpensive dielectric belt is replaced, a far less costly proposition than having to replace the photoconductive member.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above method and in the construction set forth without departing from the scope of the invention, 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.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A method of electrophotography comprising in the order set forth the steps of:

A. uniformly electrostatically charging a surface of a photoconductive insulating member to a DC potential;

B. placing a dielectric film on the charged surface of the member so as to dispose one of the surfaces of the film in virtual physical contact with the charged surface of the member;

C. exposing the member to an optical image effective to create on the surface of the member from the charge deposited thereon a first electrostatic latent image corresponding to the optical image;

D. subjecting the other surface of the film to electrostatic charge deposition under the influence of said first electrostatic latent image so as to deposit charge on said other film surface in a pattern effective to establish a substantially uniform electric potential plane adjacent to the other film surface;

E. dissipating the first electrostatic latent image from the surface of the member so as to eliminate the electrostatic influence thereof on the charge pattern deposited on said other film surface, thereby to render said charge deposition on said other film surface effective to be developed as a second electrostatic latent image corresponding to said optical image; and

F. developing the second electrostatic latent image with developer which renders said second electrostatic latent image visible.

2. The method defined in claim **1**, wherein the placing step includes convergently moving the charged surface of the photoconductive member into contact with said one surface of the dielectric film, and said subjecting step subjects the other film surface to AC electrostatic charge deposition effective to establish a substantially zero electric potential plane adjacent to the other film surface.

3. The method defined in claim **1**, wherein said dissipating step comprises flooding the member with the light to dissipate the first electrostatic latent image.

4. The method defined in claim **1**, which further includes the steps of:

A. after said developing step, separating the dielectric film from the photoconductive member; and

B. transferring the developer in image form from the other film surface to plain paper.

5. The method defined in claim **4**, which further includes the steps of:

A. recharging the photoconductor member surface; and

B. after said transferring step, removing residual developer and electrostatic charges from the film.

6. The method defined in claim **2**, wherein the dielectric film is optically transparent to permit the member to be exposed to the optical image through the film and to permit the first electrostatic latent image thereby formed on the member to be thereafter dissipated by exposure to light through the film.

7. A method for creating a developable electrostatic latent image on a surface of a non-photoconductive insulating member comprising the steps of:

A. uniformly electrostatically charging a surface of a photoconductive insulating member to a DC potential; then

B. placing the non-photoconductive insulating member over the photoconductive insulating member in its charged state so as to dispose one of the surfaces of the non-photoconductive member in virtual physical contact with the previously uniformly charged surface of the photoconductive member; and thereafter

C. exposing the charged surface of the photoconductive insulating member to an optical image effective to create on said surface of the photoconductive member an intermediate electrostatic latent image corresponding to the optical image;

D. subjecting the other surface of the non-photoconductive insulating member to charge from an AC electrostatic charging source, the electrostatic influence of the intermediate electrostatic latent image acting to modulate the charge deposition on the other surface of the non-photoconductive member so as to produce a substantially zero electric potential plane adjacent to the other surface of the non-photoconductive insulating member; and

E. dissipating the intermediate electrostatic latent image so as to eliminate the electrostatic influence thereof on the modulated charge deposited on the other surface of the non-photoconductive insulating member to render the modulated charge deposition effective to be developed as a final electrostatic latent image corresponding to said optical image.

* * * * *