Oct. 11, 1960 F. A. STEINHILPER 2,955,938

XEROGRAPHY

Filed Aug. 1, 1955 2 Sheets-Sheet 1



Fig. 1



Fig. 2

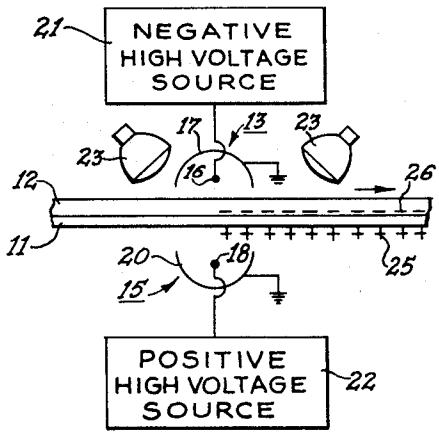


Fig. 3

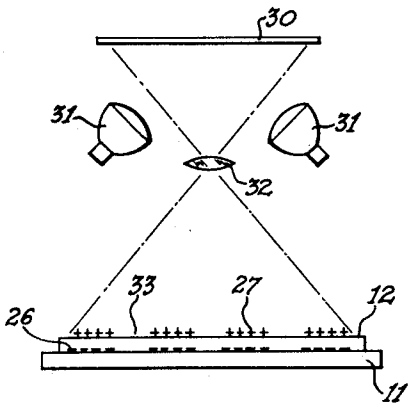


Fig. 5

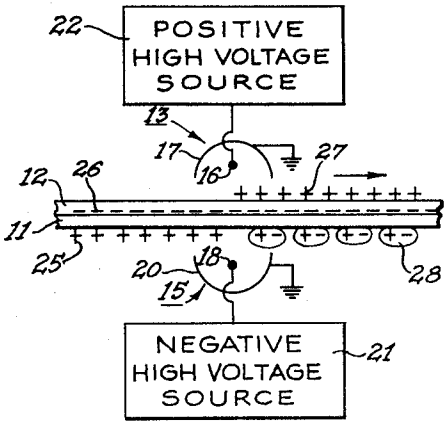


Fig. 4

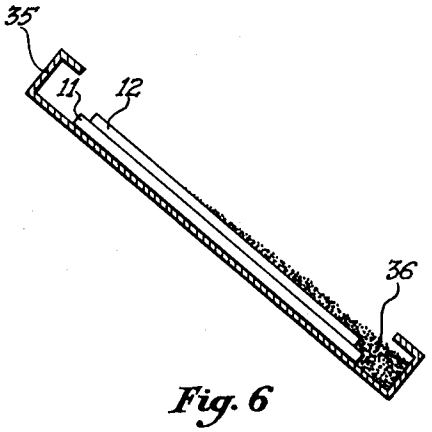


Fig. 6

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XEROGRAPHY

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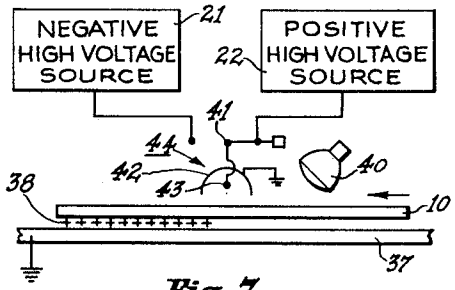


Fig. 7

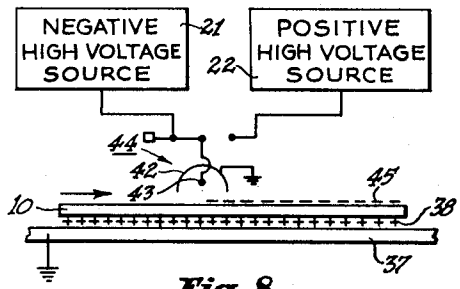


Fig. 8

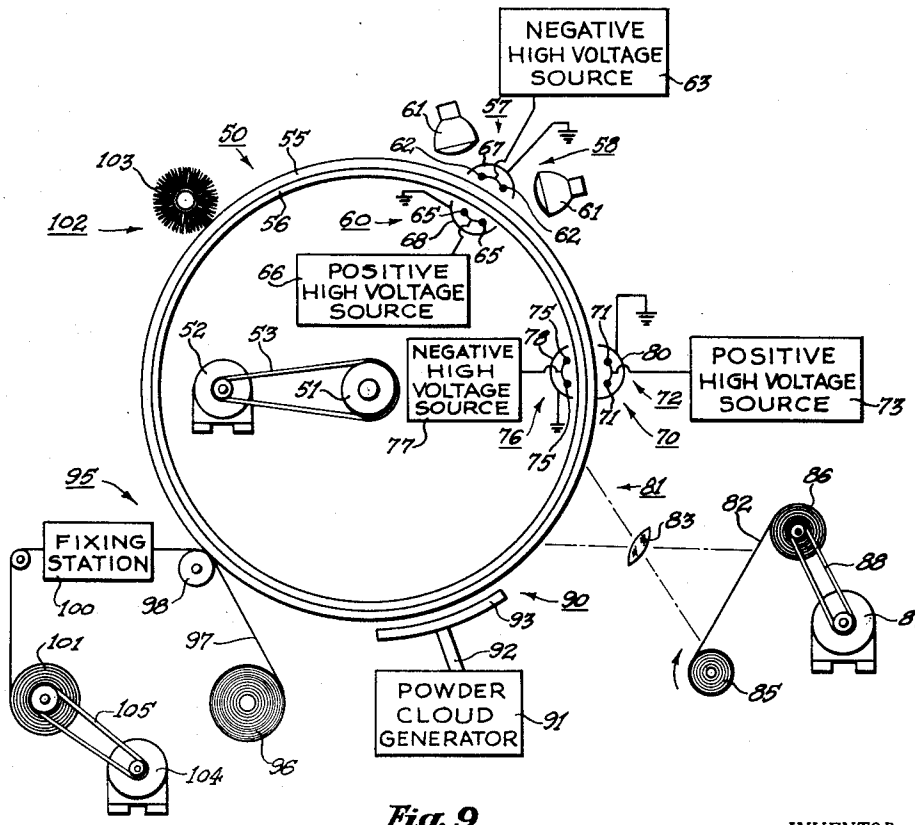


Fig. 9

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United States Patent Office 2,955,938 Patented Oct. 11, 1960

2,955,938

XEROGRAPHY

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Filed Aug. 1, 1955, Ser. No. 525,496

6 Claims. (Cl. 96—1)

This invention relates to xerography.

In xerography, it is usual to form an electrostatic charge pattern on the surface of a xerographic plate composed of a photoconductive insulating layer on a conductive backing member. The pattern is formed by first sensitizing the plate by placing an electrostatic charge on the surface of the photoconductive insulating layer. While in a sensitized condition, the plate is exposed to an activating radiation pattern such as a light image or the like. The activating energy such as light causes dissipation of charge whereas areas not affected by exposure, i.e. areas for example not struck by light remain in their charged condition. Thus, after exposure to a pattern of activating radiation, an electrostatic image of electrostatic charges exists on the surface of the xerographic plate. This pattern may be developed or otherwise utilized. If developed, usual xerographic development techniques such as cascade or powder cloud development may be used to make the electrostatic image pattern visible. A developed image on the plate surface may be viewed, photographed or the like or may be transferred to a transfer base where it may be permanently affixed.

Charging to about 100 to 800 volts or sensitization of the photoconductive insulating layer of the xerographic plate, is generally accomplished through the deposition of ions created by a corona discharge electrode moving at a uniform rate above the plate surface. The ions deposit due to the electrostatic fields of force, which exist between the corona electrode and the backing member of the plate which is held at a grounded potential.

It has now been found that the art of xerography may be extended through the use of a photoconductive insulating layer which is not on a conductive support base. Specifically, xerography is carried out in this invention using plates comprising photoconductive insulating layers on insulating support bases and also self-supporting films of photoconductive insulating material.

It is therefore an object of this invention to devise a new xerographic plate comprising a photoconductive insulating layer on an insulating support base.

It is a further object of this invention to devise novel methods of applying a uniform electrostatic field through a photoconductive insulating layer.

It is a still further object of this invention to devise novel methods of sensitizing a self-supporting film of photoconductive insulating material.

It is yet another object of this invention to devise novel methods of sensitizing a photoconductive insulating layer backed by an insulating layer.

It is another object of this invention to devise novel methods of image formation in the art of xerography.

It is a further object of this invention to devise methods of xerography for image formation on a xerographic plate comprising a photoconductive insulating layer not backed by a conductive backing layer.

It is a still further object of this invention to devise novel methods of xerographic image formation on the surface of a photoconductive insulating layer on an insulating support base.

It is a further object of this invention to devise new means and apparatus in the art of xerography.

It is still further an object of this invention to devise an automatic xerographic machine using a plate member comprising a photoconductive insulating layer on an insulating support base.

In the drawing:

Fig. 1 is a transverse sectional view of an embodiment of a xerographic plate comprising a photoconductive insulating layer supported on an insulating support base;

Fig. 2 is a transverse sectional view of an embodiment of a xerographic plate comprising a self-supporting film of photoconductive insulating material;

Fig. 3 is a diagrammatic representation of an embodiment of a first charging step of the xerographic plate illustrated in Fig. 1;

Fig. 4 is a diagrammatic representation of an embodiment of the second charging step following charging as illustrated in Fig. 3 to create a sensitive plate;

Fig. 5 illustrates exposure of a sensitive plate;

Fig. 6 is a flow step illustrating development of an electrostatic image bearing plate;

Fig. 7 is a diagrammatic illustration of another embodiment of the first charging step of either the plate illustrated in Fig. 1 or the plate illustrated in Fig. 2;

Fig. 8 is a diagrammatic illustration of another embodiment of the second charging step following charging as illustrated in Fig. 7 resulting in a sensitive plate according to this invention;

Fig. 9 is an embodiment of an automatic machine according to this invention.

For a better understanding of this invention, together with other further objects thereof, reference is now had to the following description taken in connection with the accompanying drawings, and the scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, in Figure 1 there is illustrated one embodiment of a plate to which this invention is directed. The plate is composed of a photoconductive insulating layer **12**, overlying a support member **11** of insulating material. The photoconductive insulating layer **12** may be any of a number of materials, as for example, amorphous or vitreous selenium, anthracene, sulphur, tellurium, various mixtures of these materials or photoconductive insulating materials in insulating binders as for example zinc oxide in a resin binder. Other photoconductive insulating materials include, but are in no way limited to, zinc-magnesium oxide, zinc sulfide, zinc cadmium sulfide, cadmium sulfide, cadmium strontium sulfide, zinc silicate, calcium tungstate, selenides and mixed selenides of cadmium and zinc, anthracene, titanium dioxide, and the like. These materials are, in some instances, coated directly on the surface and in other instances they are coated in a resin binder on the surface of the material. Desirably, they are activated with small amounts, that is 0.01% to 0.001% of metallic impurities, as is well known to those skilled in the art.

The base member **11** is composed of insulating material whether rigid or flexible and desirably comprises a layer of equal thickness throughout having smooth surfaces. Materials which may be used are mica, plastics, glass, rubber, insulating cloth materials and other insulating materials generally known to the art. Photoconductive insulating layer **12** may be placed on insulating support member **11**, using conventional coating techniques such as dipping, spray coating, evaporation, casting or the like.

In Fig. 2 there is illustrated a plate comprising a self-supporting film of photoconductive insulating material **10**. The photoconductive material may comprise any of

the various material described in connection with Fig. 1. These materials are in some instances prepared immediately as a self-supporting film, whereas in other instances they are coated on a surface and then stripped from the surface. One which is presently preferred has been made using the stripping technique by forming a layer of zinc oxide in a resin binder on a polyethylene coated surface and then stripping it therefrom. Desirably, the self-supporting film is uniform in thickness throughout and has smooth surfaces.

In Fig. 3 there is illustrated an embodiment of the first step of plate sensitization according to this invention. The plate composed of photoconductive insulating layer **12** overlying insulating backing member **11**, is passed between corona electrodes **13** and **15** in a direction as illustrated by the arrow. Positioned in close proximity to corona electrode **13** are lamps **23**. The lamps **23** are illuminated during charging. Although in this embodiment lamps are illustrated, any form of uniform radiation may be used as for example a beta source or the like and such modifications are intended to be included herein. Corona electrode **13** comprises corona discharge wire or wires **16** surrounded by shield **17** held at a ground potential. The corona discharge wire or wires **16** are biased to a negative high voltage which is supplied from negative high voltage source **21**. Corona discharge electrode **15** comprises shield **20** held at ground potential and corona discharge wire or wires **18**. Corona discharge electrode **15** is biased to a positive high voltage which is supplied from positive high voltage source **22** to corona discharge wire or wires **18**. The positive high voltage on corona wire or wires **18** of corona electrode **15** supplies positive ions to the exposed surface of support member **11** whereas the negative potential applied to the discharge wire or wires **16** of corona electrode **13** creates negative ions for deposition on the photoconductive insulating layer **12**. Since the photoconductive insulating layer is illuminated by lamps **23**, this layer is conductive and thus the negative ions which reach the surface of photoconductive insulating layer **12** are drawn through the layer to the interlayer area between photoconductive insulating layer **12** and insulating support member **11**. The negative charges **26** deposit at the interlayer area, it is believed, due to electrostatic fields created by the combined effect of the positive ions sprayed by corona electrode **15**, some of which deposit as positive charges **25** on the surfaces of insulating support member **11**, and the positively biased corona electrode **15**.

In Fig. 4 there is illustrated an embodiment of the next step in sensitizing a photoconductive layer when such a layer is supported on an insulating base. In this figure as in Fig. 3, the plate composed of photoconductive insulating layer **12** overlying insulating support base **11** is again passed between corona electrodes **13** and **15**. As in the previous figure corona electrode **13** comprises a grounded shield **17** and a corona discharge wire or corona discharge wires **16** and corona discharge electrode **15** comprises a grounded shield **20** and a corona discharge wire or corona discharge wires **18**. Corona discharge wire or wires **16** of corona electrode **13** are now connected to the positive voltage source **22** and thus spray positive ions whereas corona discharge wire or wires **18** of corona electrode **15** are now connected to the negative high voltage source **21** and thus corona discharge electrode **15** sprays negative ions. The plate is being moved in this figure from left to right as is illustrated by the arrow and thus the left portion of the plate has not as yet passed between corona discharge electrodes **13** and **15**. Those portions of the plate not yet exposed to the charging mechanism carry negative charges **26** at the interlayer area and positive charges **25** on the exposed side of the insulating support member **11**. Negative charges **26** and positive charges **25** were deposited during the charging operation discussed in connection with Fig. 3. Those portions of the plate exposed to the charging mechanism of this figure carry positive charges **27** from the positive sprayed corona discharge electrode **13** on the upper surface of the photoconductive insulating layer **12** whereas the charges on the exposed or lower surface of the insulating support base **11** are neutralized by the negative spraying corona discharge electrode **15** which deposits negative charges in an amount equal to the positive charges which were deposited during the operation illustrated in Fig. 3, and the negative and positive charges **28** on the exposed or lower surface of the insulating support member **11** combine and neutralize each other. Thus, there is created, following the two charging operations shown in Figs. 3 and 4, a layer of charge **26** at the interlayer area and a layer of charge **27** on the exposed surface of the photoconductive insulating layer **12**. An electrostatic field exists between charges **26** and charges **27**. This field would normally draw the charges to one another. However, charges remain bound in place due to the insulating characteristics of photoconductive insulating layer **12** while the layer is kept in darkness.

In Fig. 5 there is illustrated exposure of a sensitized xerographic plate composed of a photoconductive insulating layer **12** overlying an insulating support base **11**. However, it is to be realized that the plate used during exposure in this figure is for illustrative purposes only and that the self-supporting film of photoconductive insulating material may be used as well. Just prior to exposure a layer of charge **26** exists at the interface between the photoconductive insulating layer **12** and support base **11** and a layer of charge **27** exists throughout the top surface of photoconductive insulating layer **12**. During exposure, areas of photoconductive insulating layer **12** struck by light, become conductive and in those areas the bound charges of charged layer **27** and of charged layer **26** becomes unbound and migrate toward one another to become neutralized or dissipated resulting in discharged areas **33**. There is illustrated in this figure the projection of the light pattern of copy **30** which is illuminated by lamps **31**. The light pattern is projected through lens **32** to the surface of photoconductive insulating layer **12**. It is to be realized that although projection exposure is illustrated in this figure there is no intent to be limited thereto, instead it is intended that the various means of exposure known to those in the art as for example contact exposure or the like may be used and are intended to be included herein. It is also to be realized that although exposure only to a light pattern is shown, there is intended to be included herein exposure to all forms of activating radiation as for example X-rays or the like.

The time of exposure will depend on various factors such as the intensity of the lamps, whether contact exposure or projection exposure is being used, the potential of charge on the xerographic plate, the speed of the photoconductive insulating layer **12**, and the like. Depending on the various combinations of elements used, exposure may vary from a fraction of a second to many minutes and there is no intent in this application to be limited to any particular time of exposure.

It is also to be realized that when the backing member or the support layer is transparent, exposure may be made through the backing member instead of directly to photoconductive insulating layer **12**. It is also to be realized that depending on the particular material and characteristics of photoconductive insulating layer **12**, if the backing member is transparent reflex exposure is also possible and is intended to be included herein.

Reference is now had to Fig. 6 wherein is illustrated one technique of development of charged patterns. The xerographic plate being developed is composed of a photoconductive insulating layer **12** overlying an insulating backing support **11**. However, it is to be realized that the particular plate is included for illustrative purposes only and development may be carried out in a similar fashion with self-supporting films of photoconductive in-

sulating material. The technique of development illustrated in this figure is generally known in the art as cascade development. This form of development and various developing materials are described in Wise U.S. Patent 2,618,552, Walkup and Wise U.S. Patent 2,638,416, Walkup U.S. Patent 2,618,551 and various other patents. Cascade type of developer comprises finer particles adhering, due to electrostatic attraction, to larger particles.

In this figure there is illustrated a developing tray **35** with a plate against the bottom thereof. The developer **36** is illustrated as cascading across the surface of the plate which carries the electrostatic charge pattern and image development takes place through depositing of the finer particles on the charged area of photoconductive insulating layer **12**. Generally it is desirable when using cascade development to cascade the particles back and forth across the surface a few times to assure dense development. Since areas as yet undeveloped which carry charge are sensitive to light, it is desirable to carry out development in the dark. This may be accomplished in using a tray similar to tray **35** by placing a shield or dark slide across the open area of the tray following positioning of the plate in darkness against the base thereof. Other means that keep the plate in darkness are intended to be included herein.

Although cascade development of the image is illustrated there is no intent to be limited thereto, instead it is intended that the various means of development known to those in the art may be used. For example, a technique known as powder cloud development is described in Carlson 2,221,776 and could be used to develop charge patterns formed according to this invention. It is also to be realized that development techniques other than those illustrated which are known to those in the art are also intended to be included herein as for example magnetic development or the like.

In Figs. 7 and 8 there is illustrated another embodiment of sensitization of a plate according to this invention. In these figures a plate comprising a self-supporting film of photoconductive insulating material **10** is positioned on a conductive grounded electrode **37**. A corona electrode comprising a grounded conductive shield **42** and a corona wire or wires **43** is positioned over the plate surface and the plate is moved in the direction of the arrow. During the first charging pass as is illustrated in Fig. 7 a lamp **40** is illuminated thus making the photoconductive insulating layer **10** conductive. In Fig. 7 switch **41** connects corona discharge wire or wires **43** of corona discharge electrode **44** to positive high voltage source **22** and thus there is deposited positive charges **38** at the lower surface of photoconductive insulating layer **10**. The negative high voltage source **21** may be connected through switch **41** to the corona discharge wire or wires **43** but is not so connected in Fig. 7. Following positive electrostatic charging of the plate switch **41** is thrown to the position illustrated in Fig. 8 and negative high voltage is sprayed from corona discharge electrode **44** supplied with negative high voltage to corona discharge wire or wires **43** of the discharge electrode from source **21** through switch **41**. Thus, in the second pass of the electrode over the surface, there is sprayed negative corona to the surface of the photoconductive insulating layer **10** positioned on conductive grounded electrode **37**. The plate in Fig. 8 is moved in the direction indicated by the arrow and the shield **42** is again grounded. Following passage of corona discharge electrode **44** as indicated in Figs. 7 and 8 there is deposited a layer of negative charge **45** on the upper surface of photoconductive insulating layer **10** and a layer of positive charge **38** at the lower surface of photoconductive insulating layer **10**. There is thus created a sensitive xerographic plate which is ready for exposure and then development as discussed in connection with Figs. 4 and 5.

Optionally, and in accordance with this invention development of the image may be omitted, and instead the electrostatic charge pattern may be used for image formation as for example by scanning, transfer, or the like as is well known in the art.

Although the plate used in Figs. 7 and 8 comprises a self-supporting film of photoconductive insulating material, it is to be realized that the particular plate has been used for illustrative purposes only. The plate illustrated in Fig. 1 comprising a photoconductive insulating layer on an insulating layer may also be used. When charging is carried out as is illustrated in Fig. 7 using a plate comprising a photoconductive insulating layer on an insulating support base the positive charges sprayed to the plate will deposit at the interface of the photoconductive insulating layer and the insulating support base. When charge is sprayed as illustrated in Fig. 8, negative charges will deposit on the surface of the photoconductive insulating layer resulting in a charge sensitive xerographic plate similar to the charged plate created following charging in Fig. 4.

When using the plate illustrated in Figs. 7 and 8 charging in Fig. 7 results in charge deposition at the lower surface of the self-supporting film **10**. The charges remain in position on the plate and do not travel to electrode **37** due to a minute air gap which will separate plate **10** from electrode **37** when these elements are in normal surface contact. This air gap provides a sufficient insulating dielectric layer to prevent charge transfer and dissipation. By preventing charge movement to the electrode, the air gap or other gas gap aids in creating the surface charge desired at the lower surface which brings about the surface charge desired on the upper surface by creating the fields of force necessary to cause charge deposition as is illustrated in Fig. 8.

Reference is now had to Fig. 9 wherein there is shown an embodiment of an automatic machine according to this invention. A drum **50** driven at its axis by motor **52** through belt **53** rotates through various stations in a clockwise direction as is indicated by the arrow. Drum **50** comprises an outer layer of photoconductive insulating material **55** overlying an inner layer of insulating material **56** which acts as a support base for the photoconductive insulating layer. At the station generally designated **57** a charge is placed at the interface between photoconductive insulating layer **55** and insulating layer **56** by the combined action of corona discharge electrodes **58** and **60** and lamps **61**. During the charging operation at stage **57** negative high voltage is supplied to corona discharge wires **62** of corona discharge electrode **58** by negative high voltage source **63**, and positive high voltage is supplied to corona discharge wires **65** of corona discharge electrode **60** by positive high voltage source **66**. As in the previous embodiments, the shields **67** and **68** are held at ground potential. At the second charging station, generally designated **70**, positive high voltage is supplied to corna discharge wires **71** of corona discharge electrode **72** from positive high voltage source **73**, and negative high voltage is supplied to corona discharge wires **75** of corona discharge electrode **76** from negative high voltage source **77**. Shield **78** of corona discharge electrode **76** and shield **80** of corona discharge electrode **72** are held at ground potential. Following charging at stations **57** and **70**, the potential at the uncoated surface of insulating layer **56** is neutralized, and the potentials at the interface and at the outer surface of the photoconductive layer are, substantially equal in amount but opposite in sign.

Exposure takes place at exposure station **81** whereat copy **82** to be reproduced is projected through lens **83** of the surface of the photoconductive insulating layer **55**. The copy **82** in this embodiment is fed from a supply spool **85** through the area of projection and then to a wind-up spool **86**. The wind-up spool is driven by motor **87** through belt **88**. Motor **86** is timed to drive copy at a synchronizing pace with the speed of rotating drum **50**. Various other known techniques of exposing copy to a

moving drum may be used and are intended to be included within the scope of this invention.

Following exposure, the drum is next rotated to development station **90**. In this embodiment a powder cloud generator **91** generates an aerosol of xerographic developer particles and passes the aerosol through conduit **92** to the surface of the photoconductive insulating layer **55** to be developed. Also there is diagrammatically shown in this figure a development electrode **93** and development takes place as is well known in the art on the surface of the photoconductive image bearing layer beneath development electrode **93**. Next in the path of movement of the rotating drum **50** is a transfer station **95**. Various techniques of transferring a developed electrostatic image may be used, as for example, electrostatic transfer or the like, transfer to single sheets or the like, and the like. In this embodiment there is illustrated what has generally become known as "adhesive transfer." A supply spool **96** provides a web of material **97** carrying an adhesive coating on one surface thereof. The adhesive coating is pressed against the surface of the photoconductive insulating layer **55** by a pressure roller **98** and the web **97** is then fed through a fixing station **100** wherein the image on the surface of web **97** is made permanent as, for example, through heat fusing, vapor fusing, by applying a protective coating, or the like. The web **97** may be cut up following fixing into individual copies or prints or, as illustrated, may be wound up on take-up spool **101**. A motor **104** is illustrated in this figure as driving take-up spool **101** through belt **105**. The movement of web **97** is synchronized with the movement of drum **50** and optionally may be driven by motor **52** which may also be used to drive copy **82**. Drum **50** is next fed to a cleaning station generally designated **102** whereat a rotating brush **103** wipes clean the surface of the photoconductive insulating layer. The material removed from the surface may be drawn away from the surface with vacuum cleaning means or the like. Following cleaning, drum **50** is ready for re-cycling through the various stations or stages described.

Although the charging grid described throughout has been of the same type, it is to be realized that there is no intention to limit this invention thereto. For example, the corona discharge device may be of the type described in Walkup application Serial No. 154,295, filed April 6, 1950, for "Charging Device." This comprises a grid of fine wires which is held at several thousand volts potential with respect to a grounded shield similar to the one shown and a control grid of coarser wires than the discharge wires located between the corona discharge wires and the surface to be charged. The grid of coarser wires is held at an intermediate potential of several hundred volts above ground potential and serves to control or limit the potential placed upon the surface being charged. Also, there may be used stationary corona charging grids as is known to the art, or radioactive charging means, or the like.

The high voltage power supply may comprise known circuits such as a transformer-rectifier circuit and a voltage dividing resistance for supplying the required potentials, or the like.

The potential supplied to the corona discharge wires should be in the order of several thousand volts as, for example, 6,000 to 8,000 volts. Although there is no intent to limit this invention to any particular theory of operation, it is presently believed that, when a layer of charge exists at the interface between the photoconductive insulating layer and the insulating support base when using plates comprising photoconductive layers overlying an insulating support base or when a layer of charge exists at the lower surface of the photoconductor when using self-supporting films, and an opposite charge exists on the outer surface of the photoconductive insulating layer, complete discharge of charges in areas exposed to light takes place. Development of such a charge pattern results in copy having high contrast and very little background.

Following charging, as illustrated in Figs. 3 and 4, the potential on the uncoated surface of the insulating base **11** is substantially neutralized and thus the plate may be positioned on substantially any surface as, for example, a ground metallic conductor, a table top, or the like. Similarly, in connection with the embodiment illustrated in Figs. 7 and 8 if a photoconductor supported on an insulator is being used substantially no potential is found on the uncoated surface of the support base; thus, no problems are encountered during exposure or subsequent development whether the surface of the support base is or is not in contact with a grounded or conductive electrode. If a slight potential exists on the rear or uncoated surface of the support base, the potential would tend to increase as the support base is separated from the grounded conductor **37**. A point in separation would likely be reached, in such an instance, at which the potential would become sufficient to bring about a form of air breakdown and transfer of charge to the surface of the support base. However, breakdown if it takes place would be substantially uniform and charges transferred would not distort image formation or a formed image on the photoconductive insulating layer.

When dealing with the self-supporting film of photoconductive insulating material of Fig. 2, it is to be realized that charging as illustrated in Fig. 3 results in discharge of the charge through the illuminated and thus conductive photoconductive layer. Also, it is to be realized, that a charged and sensitive plate comprising a self-supporting film of photoconductive material according to this invention carries a surface charge on the bottom and top surfaces. Since it is desirable to maintain the charge through to exposure and since it is desirable to form the charge pattern during exposure and maintain the formed pattern for development without distortion by stray charge deposition, it is preferred that the steps of exposure and development are carried out when using a self-supporting film of photoconductive insulating material without contacting the plate to an electrode. This may be accomplished keeping the plate in air during the various steps of image formation, by positioning the plate on an insulating support surface, or the like.

The use of the term "ground" throughout this application is intended to have the usual conventional meaning of a relative reference point. There is no desire for "ground" to limit this invention in any way to a specific value such as "zero potential" although in some instances "ground" may indicate zero potential. Instead, "ground" is intended to indicate a reference point from which other potential values vary upward when positive or downward when negative.

While the present invention as to its objects and advantages, as has been described herein, has been carried out in specific embodiments thereof, it is not desired to be limited thereby, but is intended to cover the invention broadly within the spirit and scope of the appended claims.

What is claimed is:

1. The method of sensitizing a xerographic plate comprising a self supporting film of photoconductive insulating material prior to exposure and image formation in xerography, said method comprising applying a first polarity corona generated electrostatic charge to a first surface of the photoconductive insulating film while said photoconductive insulating layer is uniformly illuminated by radiation which causes said film to become electrically conductive and while an electric field is applied through said film in a direction to move electrostatic charge directed to said first surface to the opposite and second surface of said photoconductive insulating film, said charge moved to said second surface being maintained at said second surface through the absence of any electrode in electrical contact therewith, and then in the

absence of illumination of said photoconductive insulating film applying a second and opposite polarity corona generated electrostatic charge to said first surface of said photoconductive insulating film forming a sensitive xerographic plate with said first polarity charge at said second surface and said second polarity charge at said first surface of said photoconductive insulating film.

2. The method of sensitizing a xerographic plate comprising a layer of photoconductive insulating material overlying an insulating support member prior to exposure and image formation in xerography, said method comprising applying a first polarity corona generated electrostatic charge to the outer and first surface of the photoconductive insulating layer of said xerographic plate while said photoconductive insulating layer is uniformly illuminated by radiation which causes said layer to become electrically conductive and while an electric field is applied through said plate in a direction to move electrostatic charge directed to said first surface to the opposite and second surface of said photoconductive insulating layer in contact with the insulating member, said charge moved to said second surface being maintained at said second surface through the absence of any electrode in electrical contact therewith, and then in the absence of illumination of said photoconductive insulating layer applying a second and opposite polarity corona generated electrostatic charge to said first and outer surface of said photoconductive insulating layer forming a sensitive xerographic plate with said first polarity charge at said second surface and said second polarity charge at said first surface of said photoconductive insulating layer.

3. The method of image formation in xerography in which a developable electrostatic charge pattern is formed on the surface of a xerographic plate comprising a self supporting film of photoconductive insulating material, said method comprising applying a first polarity corona generated electrostatic charge to a first surface of a photoconductive insulating film while said photoconductive insulating film is uniformly illuminated by radiation which causes said film to become electrically conductive and while an electrostatic field is applied through said film in a direction to move electrostatic charge directed to said first surface to the opposite and second surface of said photoconductive insulating film, said charge moved to said second surface being maintained at said second surface through the absence of any electrode in electrical contact therewith, then in the absence of illumination of said photoconductive insulating film applying a second and opposite polarity corona generated electrostatic charge to said first surface of said photoconductive insulating film forming a sensitive xerographic plate with said first polarity charge at said second surface and said second polarity charge at said first surface of said photoconductive insulating film, and exposing said sensitive xerographic plate to an image pattern of information to be recorded.

4. The method of claim 3 in which said developable electrostatic charge pattern formed on said xerographic plate is developed with electroscopic marking material forming a visible pattern of the recorded information.

5. The method of image formation in xerography in which a developable electrostatic charge pattern is formed on the surface of a xerographic plate comprising a layer of photoconductive insulating material overlying an insulating support member, said method comprising applying a first polarity corona generated electrostatic charge to the outer and first surface of the photoconductive insulating layer of said xerographic plate while said photoconductive insulating layer is uniformly illuminated by radiation which causes said film to become electrically conductive and while an electric field is applied through said plate in a direction to move electrostatic charge directed to said first surface to the opposite and second surface of said photoconductive insulating layer in contact with the insulating member, said charge moved to said second surface being maintained at said second surface through the absence of any electrode in electrical contact therewith, then in the absence of illumination of said photoconductive insulating layer applying a second and opposite polarity corona generated electrostatic charge to said first and outer surface of said photoconductive insulating layer forming a sensitive xerographic plate with said first polarity charge at said second surface and said second polarity charge at said first surface of said photoconductive insulating layer, and exposing said sensitive xerographic plate to an image pattern of information to be recorded.

6. The method of claim 5 in which said developable electrostatic charge pattern formed on said xerographic plate is developed with electroscopic marking material forming a visible pattern of the recorded information.

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