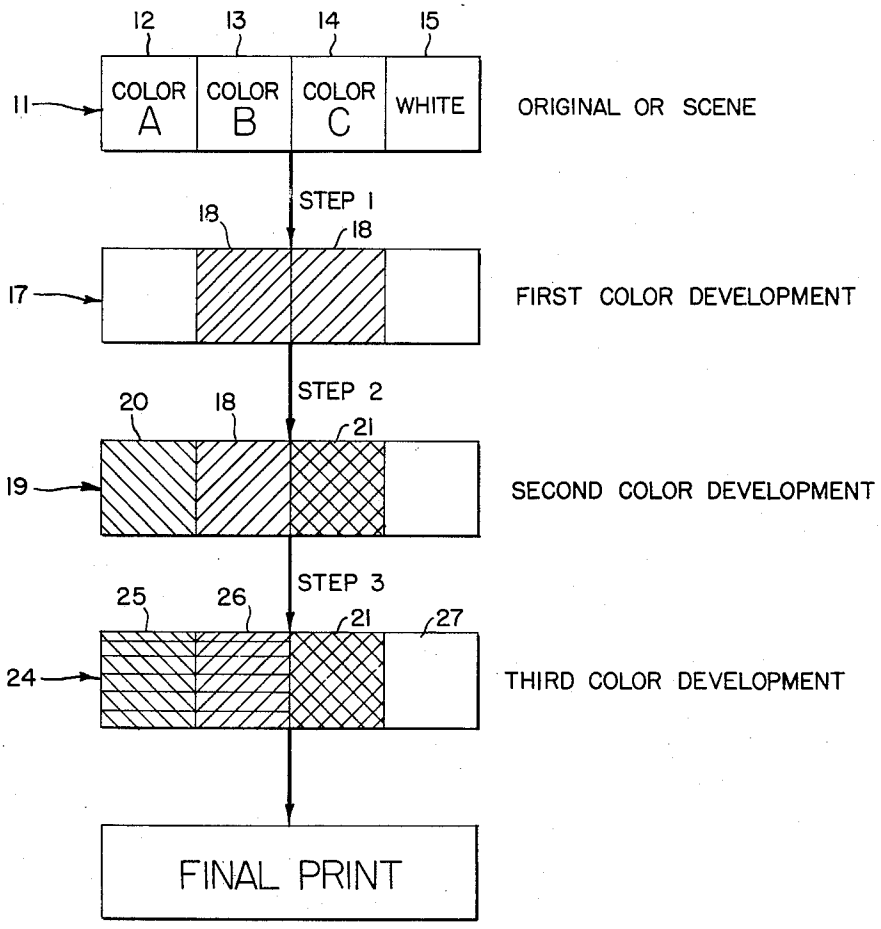
Oct. 9, 1962 R. E. HAYFORD ET AL 3,057,720

XEROGRAPHIC COLOR REPRODUCTION

Filed May 4, 1959



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United States Patent Office 3,057,720 Patented Oct. 9, 1962

3,057,720

XEROGRAPHIC COLOR REPRODUCTION

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Filed May 4, 1959, Ser. No. 810,964
2 Claims. (Cl. 96—1)

This invention relates in general to xerography and in particular to the production of color reproductions by xerography and is a continuation-in-part of my application Serial No. 484,536, filed January 27, 1955, and entitled "Color Reproduction."

According to xerography as orignally illustrated by Carlson U.S. 2,297,691, it is possible to make pictures by an electrical reproduction process. Basically, these reproductions or photographs are prepared by the combined action of light and an electric field acting on a photoconductive insulator to form an electrostatic latent image which may be utilized or developed by the deposition of a finely divided material. If, for example, a xerographic plate or film is prepared by placing a photoconductive insulating layer in a position overlying a conductive backing, as may be accomplished by directly coating or fixing such a layer on a metal or other conductive surface, such xerographic plate or film may be sensitized by depositing ions or other electric charge on the surface of the photoconductive insulating layer. Exposure of this layer to a pattern of light and shadow to be recorded will cause selective dissipation of the charge to result in the electrostatic pattern or electrostatic latent image.

Historically speaking, this Carlson invention has by now been advanced to the stage where xerography has been commercially utilized for the reproduction of documents or the like and to the point where black and white continuous tone reproductions or photographs have been produced in extremely good quality. It is a purpose of this invention, and therefore an object thereof, to provide means, methods, and apparatus for xerographic reproductions in multiple colors. Specifically, since so-called three-color and four-color reproductions can accommodate the colors detected by the human eye, it is a more exact purpose of the present invention, and therefore an object thereof, to provide a xerographic method and means for the production of three-color and four-color photographic prints and other reproductions.

In the making of multiple color reproductions in the photographic and printing industries, and in related graphic arts fields, one of the primary problems confronting the art is the problem of obtaining proper register of each of the individual printing operations. This is true in xerography as in the other graphic arts processes and, therefore, a further object of the present invention is to provide methods and means for the formation of color reproductions by xerography in which the problems of register are maintained at a minimum.

It is an additional object of the present invention to provide means and methods for successively forming a plurality of developed xerographic images in different colors on a single xerographic photosensitive surface, and subsequently transferring the successively formed colored images in a single transfer operation to a single print-receiving surface to form a complete xerographic color print.

Additional objects of the invention will in part be obvious to those skilled in the art and will in part become apparent from the following specification and drawings in which:

The FIGURE is a diagrammatic flow sheet of the operations of a three-color xerographic process or machine according to one embodiment of the present invention.

As was disclosed previously, the conventional form of xerography involves the use of a xerographic plate comprising a photoconductive insulating layer overlying a metal plate or the like which is prepared for use through the deposition of an electrostatic charge on the surface of the photoconductive insulating layer from an adjacent corona discharge device or other source of gaseous ions. After charging, a light pattern is projected onto the photoconductive insulating layer to form an electrostatic charge pattern thereon which is then developed or made visible through the selective electrostatic deposition of finely divided charged powder particles. After the powder image has been removed, whether by transfer to a permanent support or otherwise, the xerographic plate is then ready for reuse. The art, as exemplified, for example, by U.S. Patent 2,808,328 and Canadian Patent 573,773 has taught the necessity of removing the powder image before further images may be formed, except, of course, where no powder image exists. There were many and convincing reasons leading to this teaching. Thus, one of the preferred xerographic developers for high quality images has been powdered charcoal which is known to be highly conductive. Where, for example, a thin charcoal coating has been placed on a metal plate and an electrostatic charge applied to the metal plate through a corona device or the like, it has been found that the charge instantaneously leaks off the charcoal layer. Accordingly, it was believed that when a xerographic plate carrying a pattern of charcoal or the like were charged and selectively exposed to a light pattern that the lateral conductivity in the powder layer would prevent the formation of a locally varying electrostatic charge pattern. The art also taught the difficulty of uniformly charging a xerographic plate other than one with a completely clean and uncontaminated surface. Photoconductive insulating materials of which an xerographic plate is comprised evidence a volume resistivity which is dependent on the surface condition of the material. Such materials are insulators in the dark, not because they are incapable of conducting electric charge, but because they normally contain no charges to be conducted. When, however, such charges are introduced, as by surface contamination, the photoconductive insulator acts as a reasonably good conductor which is incompatible with its utility in a xerographic system. It continues to be noted in the art that various forms of surface contamination as well as surface abrasion seriously interfere with the charge retaining ability of the xerographic plate, whether by preventing charge retention at all, or by causing charge to be retained in a non-uniform pattern resulting in non-uniform image development. As a further point, it was noted that the reuse of a xerographic plate carrying a powder image involved exposure through an existing powder layer which was believed to be impractical.

In spite of all the foregoing, we have found that it is, in fact, possible to form and develop a xerographic powder image on top of an already developed image. While the powder layers generally behave as conductors in their thickness direction, they apparently act as insulators in a longitudinal direction. As should be apparent from this discussion, a requirement of the present invention is that the developer materials employed have, when in the form of a thin film on a xerographic plate, sufficient lateral resistivity to prevent the spreading or loss of an electrostatic charge pattern before the next development can be effected. Most xerographic developer materials meet this requirement. We have also found that xerographically formed powder layers including charcoal are at least partially transparent. We have also found that there are various significant advantages inherent in the formation

of superposed xerographic images on a xerographic plate as will be set forth hereinafter.

The color xerographic system envisioned according to the embodiment of the invention illustrated in FIG. 1 is based on the well-known subtractive principle of mixing primary colors. According to this principle, the three primary colors, namely green, red and blue, are reproduced by mixtures of three complementary colors, here referred to as subtractive primary colors, namely magenta, cyan, and yellow. According to this subtractive system, a magenta-colored material is characterized by a substantially complete absorption of the primary color, green, and thus may be designated as green-negative; cyan material is characterized by substantially complete absorption of the color red; and a yellow material is characterized by substantially complete absorption of the primary color blue.

In the figure there is illustrated a four-step system, the last step being a single transfer, in which each of the subtractive primary colors is in turn deposited on or developed on an electrostatic image-bearing surface. Thus, step 1 conforms to the development of a first primary color, say, for example, a cyan material image deposited in conformity with a red primary component image. The second step corresponds to a second color development such as, for example, a magenta development corresponding to a green primary color image, and a third color development corresponding to a yellow material deposition for a blue original image.

Illustrated in the figure is an original multicolored original image or scene generally designated **11** having certain areas **12** in a first color designated as color A which may, for example, be red; a second color **13** designated as color B which may, illustratively, be green; a third color **14** designated as color C which may, for example, be blue; and a fourth area **15** designated as "white" which is a suitable mixture of the colors A, B and/or C.

Step 1, as illustrated in the figure, thus corresponds to a xerographic process step in which a suitable xerographic plate, film or the like is processed by exposure to a suitable filtered or separation color repoduction of the original **11** whereby there is deposited in areas **13** and **14** the subtractive color component corresponding to color A. If, as illustratively presented, color A is red, then the xerographic plate has been processed to deposit a cyan-colored developing material in the darkened area **18** and **18***a*.

According to step 2, the same xerographic plate, film or the like has been subjected to xerographic process steps designed to deposit on areas corresponding to color areas **12** and **14**, the second subtractive primary color corresponding to the primary color B. Thus, for example, if color B is green, as provisionally illustrated, then the result of step 2 is to produce a second color development product generally designated **19** including areas **20** and **21** in which magenta developing material has been deposited. Thus, at this stage, area **20** contains solely magenta depositing material, area **18** still contains solely cyan developing material, and area **21** contains both cyan developing material and magenta thereover.

The third set of xerographic processing steps illustrated as step 3 is similarly designed to form a development product generally designated **24** in which the third subtractive primary color has been deposited on areas **25** and **26** corresponding to an exposure to primary color C of original area **14**. Thus, at this stage, there have been three subtractive primary color developments, a first area **25** containing the subtractive primary colors corresponding to color B and color C, namely, in this case, magenta and yellow developer material. These subtractive colors, therefore, absorb green and blue incident light and when viewed by white light are seen to be red to correspond with the original red color A. Similarly, area **26** has received the subtractive colors corresponding to colors A and C, namely, in this case, cyan and yellow, to absorb red and blue incident light and to appear green. Likewise, area **21** still, after step 2, has received the subtractive primary colors corresponding to colors A and B, namely, cyan and magenta, to absorb appropriately red and green and to appear blue when viewed by white light. It is observed at the same time that area **27** corresponding to original white areas has received substantially no deposit of developer material and therefore still appears to be the color of the background on which it is placed.

By suitable methods and means, the composite image **24** may now be transferred to a suitable print material which may, for example, be a white-colored support such as white paper or the like whereon there is formed a photographic print corresponding in hue and density to the original being reproduced.

As an illustration of one embodiment of the invention, a three-color print was produced from a color transparency according to the following methods and procedures. For implementation of these methods and procedures, there were employed three color-separation positive transparencies and three developer materials; namely, a cyan powder, a magenta powder, and a yellow powder. Each of the color-separation transparencies was conventionally made by appropriate exposure of a photographic film to a filtered projection of the color transparency employing as the respective filters: red, blue and green. The thus-exposed separation films were developed by photographic reversal techniques to produce: first, for the red exposure, a red filter separation positive transparency; second, for the blue exposure, a blue filter separation positive transparency; and third, for the green exposure, a green filter separation positive transparency.

In some instances it is desirable to employ four color reproduction as is common in the graphic arts industries. Thus, a fourth step of exposure and development for black may be employed, preferably following the three primary color steps. The needs for such fourth color are in accordance with known graphic arts principles; method and apparatus for this fourth color, as for the other three colors may be in accord with present xerographic principles as shown, for example, in Carlson 2,297,691, Carlson 2,357,809 and in co-pending patent applications such as Walkup Serial No. 185,387, filed September 18, 1950, and other applications. For the cyan powder there was employed a cobalt blue oil paint pigment mixed with a small quantity of a green pigment. For the magenta powder there was employed a vermilion paint powder which was a substantial match for a standard photographic magenta. The materials were capable of being blown into a fine air cloud by the action of a jet of air on the loose pigment material to form a pigment aerosol.

In xerography for black and white reproduction as for color reproduction, the xerographic plate comprises functionally a photoconductive insulating layer such as vitreous or amorphous selenium overlying a conductive backing such as a metallic plate or the like. Plates of this sort are disclosed in Carlson U.S. 2,297,691 or may be made by vacuum evaporation of selenium onto a suitable surface such as, for example, a metal plate such as aluminum, brass or the like. It will be understood that it is desirable for certain embodiments of the invention, and wholly unnecessary for others, to have a xerographic plate that is substantially panchromatic. Thus, for example, when there is employed exposure to filtered light projected through a color transparency it is necessary that the xerographic plate have at least a certain degree of sensitivity to each of the primary colors. On the other hand, when employing separation transparencies adequate results can be achieved with monochromatic xerographic plates. In this connection it is observed that selenium plates generally have a peak sensitivity near the blue end of the spectrum but with adequate sensitivity at the red end of the spectrum, particularly when prepared with certain added elements such as, for example, tellurium. Similarly, photoconductive insulating materials other than selenium may

be employed with different spectral sensitivities. Thus, for example, sulphur and anthracene are known photoconductive insulators as are compositions containing photoactive crystalline materials such as certain oxides, sulphides, and selenides of zinc, cadmium and calcium.

The plate is appropriately charged by suitable methods, particularly by a corona discharge electrode such as, for example, is disclosed in Mayo Patent 2,628,865. The charged plate is then exposed and developed according to the present invention to deposit thereon the colored image.

For development of the image, the appropriate developer powder may be charged by any desired technique or apparatus and is then presented to the electrostatic, latent image-bearing surface to cause deposition of the material theron. Many different approaches to the problem of development may be employed, and generally satisfactory results can be achieved by various such methods, including those disclosed in Carlson 2,221,776, Carlson 2,297,691, Wise 2,618,552, and other methods as known to the art. In the production of high quality xerographic copies, pictures and the like, such as will be contemplated in general in color reproductions according to the present invention, it has been found highly preferred to employ so-called "powder cloud techniques" as illustrated, for example, in the Walkup application named above. According to these techniques, a mass of finely divided developer material is mixed or blown into a gas suspension such as a suspension in air or a gas under pressure, and the resulting cloud of the developer material is charged and then presented to the image surface in a confined development space wherein a closely adjacent development electrode is employed. According to these techniques, a xerographic plate is mounted in extremely close, parallel spaced relationship with a conductive surface conforming with the shape of the xerographic plate. These two members, namely the xerographic plate and the development electrode, should be less than ⅛ inch apart, preferably less than 1/40 inch apart, with uniform spacing therebetween and uniform passage of air or gas therebetween so as to avoid substantially completely any flow patterns of air or the other gas-containing suspended developer material. In the specific examples described herein a spacing of 1/60 inch was employed between the development electrode and the xerographic plate. According to this operation, the development electrode and xerographic plate are mounted in the appropriately spaced relationship, and the backing member of the plate and the development electrode are appropriately held at the same electric potential or biased at a slight potential with respect to one another as may be found appropriate for proper control of developer deposition. Here again a bias of 6 volts positive polarity was employed on the development electrode in these specific examples.

For best preparation of a developer powder cloud, it has been found desirable first to blow the developer into a cloud suspension and subsequently to charge it by any of several suitable means. One means that has been found satisfactory for developer charging is the passage of the suspended particles through a zone of ionized air as may be generated by a corona discharge electrode. Another method of cloud charging comprises passing a cloud suspension through a fine orifice under turbulent conditions of flow to form a cloud of particles substantially free from agglomeration.

The superposed images may be transferred if desired to a suitable surface and one illustrative mechanism and material is disclosed in Mayo et al. U.S. 2,661,289. It will be understood that numerous other methods of transfer may be employed such as, for example, transfer by electrostatic charge as in accordance with Schaffert U.S. 2,576,047, or the above-mentioned Mayo U.S. 2,626,865. In the specific example illustrated here, however, transfer was accomplished to a sheet of gelatin coated paper available in the photographic art as dye transfer paper. The paper was premoistened with water and the excess moisture was removed by passing the paper through wringer-type rollers after which the paper was placed, gelatin surface down, against the image-bearing plate, and rolled into firm contact. On removal of the dye transfer paper from the image surface substantially all of the developer image was carried by the dye transfer paper.

In accordance with these techniques, a color picture represented by three primary separation positive transparencies was printed according to the present invention. A xerographic plate having a vitreous selenium layer about 50 microns thick on a polished brass surface was charged to a potential of about 150 volts by means of a corona discharge electrode. The plate was then placed in a keyed position in a photographic enlarger and was exposed to white light projected through the red filter separation positive transparency. This exposure caused charge dissipation in the light-struck areas of the plate while the darkest areas of the plate were maintained at substantially 150 volts positive polarity. The resulting image-bearing plate was placed in a powder cloud development assembly spaced 1/60 inch from a development electrode. The development electrode was biased at 6 volts positive with respect to the backing of the xerographic plate, and the image was developed by passing between the electrode and the plate a powder cloud of the cyan developer material which had been charged to positive polarity by passing through a positive polarity corona discharge. In this manner, the cyan powder was selectively deposited in the unexposed or background areas of the plate corresponding to those portions of the separation positive which were light opaque.

The xerographic plate bearing the cyan powder image was charged and returned to its keyed position and was exposed to white light project through the blue filter-separation positive transparency. The plate was then returned to the developer apparatus and was developed by passing therethrough the yellow developer material; thus again in the dark or unexposed areas, the yellow developer powder was deposited by repetition of the voltage and control techniques employed in the first development step.

The xerographic plate was again charged and returned to the keyed position in the projection apparatus and was exposed to white light through the green filter-separation positive transparency. After exposure, the plate was again returned to the developer apparatus and was developed under the same conditions as before with magenta powder to deposit on the plate surface, the third color image corresponding to the third exposure.

The powder image was then transferred to a print support member by pressure contact. For the print support member, there was selected a photographic dye transfer paper containing a gelatin emulsion on one surface, which was immersed in water, squeezed dry, and then pressed face down against the image-bearing surface. When the print material was removed from the xerographic plate, it carried with it the three-color image to yield a finished xerographic print. The image quality, or photographic quality, was generally comparable with a three-color photographic print. The primary colors, red, green and blue, appeared at the correct portions of the image. In one print, flesh colors appeared slightly green, but this was correctable by process adjustments.

In the exposure and development of the xerographic plate for the three-color separations, there are certain good photographic techniques that must be observed. It is necessary to obtain the proper balance of exposure between the three, different, color-separation transparencies; in effect, this is accomplished by exposure to substantially equal light intensities for balanced periods of time in each of the three exposures, taking into account any variation in sensitivity of the plate of different spectral ranges. To a certain extent, however, this is

modified by a slightly increased exposure in the second and third exposure steps further to compensate for mild light absorption by the previously developed material and by taking into consideration the strength and weakness of the developer colors. For example, the particular yellow powder was excellent in detail, but slightly weak in intensity, and this intensity was balanced in exposure and development to cause a heavier deposition of yellow powder to correspond with the blue separation positive exposure.

As a second illustrative example, a three-color xerographic print was made from a color transparency without the production of separation filter transparencies. In this case, the general procedure of the previous example was employed. In this case, instead of first making color separation transparencies, comparable results were achieved by exposure of the xerographic plate directly to the primary color filter projections of the original color transparency. At the first step, the xerographic plate was charged as before and placed in its keyed position in a photographic projector. Using a green filter with the three-color transparency, the xerographic plate was exposed to a green filter projection component of the original transparency. This caused selective dissipation of the charge on the xerographic plate in the blue and white areas of the original. The plate was then placed in the developing apparatus and developed with negatively charged magenta powder while the development electrode was biased at 6 volts positive polarity to cause deposition in the green-negative image areas. Next, the plate was again charged and placed in its keyed position and exposed to the red filter component projection of the original transparency. It was then developed as above with cyan or red-negative powder. Finally, the plate was again charged, returned to its keyed position, and exposed to the blue filter component and developed with yellow powder. The result was a three-color developer deposition, which was then transferred, as in the preceding case, to moistened, dye transfer paper. Emphasis and outline may be imparted to this picture by an additional step of charging, exposing the plate to unfiltered light projected through the transparency or a black and white positive transparency corresponding to the original three color transparency. The resulting electric range is now partially developed with black powder, to deposit thereon just black material to add the desired emphasis to the image.

Again, in this example, care was taken to balance the appropriate light intensities. Because of the reduced sensitivity of the xerographic plate to red and green light, it is necessary in this case to employ a substantially longer exposure during the red and green filter projection steps. Again, it is observed that deposition of the yellow powder was reserved for the third development step in order to minimize distortion of the image, and the filters employed for each exposure step were so selected in sequence as to achieve greatest non-absorption of the filtered light by previously deposited developer material.

It is also to be observed that by known xerographic techniques, the development electrode may be placed at a bias potential substantially equivalent to the highest potential in the dark image areas and the image developed by deposition thereon of developer material charged to the same polarity as the latent image on the plate. This technique, known to the art as reversal development, may usefully be employed with filter separation negatives or full color negatives. According to this modification, image material is deposited selectively in accordance with the amount of charge dissipation as illustrated, for example, in Walkup, Serial No. 185,387.

Where reversal development techniques are employed, it is uniquely advantageous to deposit the cyan powder first followed by the magenta powder and finally by the yellow powder. When this sequence is followed, the second exposure is made through the cyan image and is partially absorbed by it. Thus, the amount of magenta powder deposited is reduced in the areas where cyan powder is present which is precisely the masking effect desired to compensate for the undesirable, yet unavoidable, red light absorption of magenta pigments or powders. Similarly, the third exposure is made through the cyan and magenta powers and light absorption by these powders results in masking the yellow powder image to compensate for unwanted absorption of red and green. There is thus provided a color reproduction system which provides all the color correction which the color art teaches as necessary or desirable and yet requires a total of only three exposures and the use of only a single sensitive surface. It will be appreciated that corresponding masking techniques in color photography generally require the making of at least five exposures on five different sensitized materials.

Where a positive type of development is employed, such masking effects as occur are in the direction opposite to that required for color correction. Maximum color purity is therefore obtained by depositing first the yellow, then the magenta and finally the cyan powders as this sequence provides the least amount of color masking.

The present invention has numerous advantages, some of which are readily apparent and some of which are not obvious. For example, one of the problems in three or four color reproductions is proper register. With a system involving xerography in which the ultimate print support surface may be dimensionally unstable, register is most effectively achieved in the exposure operation rather than in a transfer step. Similarly, in a xerographic process employing a reusable photosensitive member, there is only a fraction of the wear on the member when each color picture calls for only one transfer operation, with the consequent cleaning for reuse only once per cycle. Furthermore, complexity of processing, contamination of the print-receiving surface, processing time and like factors are improved. Moreover, by this invention and with rapid processing steps it is entirely reasonable that the three exposures might be made in a total elapsed time short enough to permit direct color picture taking of many scenes and subjects.

The utility of the present invention is not limited to the reproduction of color images, since it can also be used for the reproduction of superposed or overlapping images in a single color such as black. Accordingly, composite images or the like can be produced. In one particular application a light image is projected onto a xerographic plate and developed and the plate is then recharged, re-exposed slightly out of register to the same image and re-developed. One of the two developments should be of the positive and the other of the reversal type. In accordance with known photographic principles, there is thus produced an image having the appearance of a bas-relief without the necessity of employing more than a single photosensitive member.

What is claimed is:

1. The method of xerographic color reproduction wherein a xerographic picture is produced by deposition of a plurality of colored materials on charge patterns formed by the combined action of an electric field and a positive color transparency on a photoconductive insulating layer on a conductive backing, said method comprising applying a uniform electric charge of given polarity to the free surface of the photoconductive insulating layer, exposing said surface to blue light projected through a positive color transparency onto said surface, positioning said surface in close parallel spaced relation to a conductive electrode, bringing said electrode to a potential substantially equal to that of the conductive backing of the photoconductive insulating layer, electrostatically charging a suspension of finely divided blue powder adapted to form a laterally resistive layer to a polarity opposite that of the photoconductive surface, passing said suspension between the photoconductive in-

sulating layer and the adjacent conductive electrode, reapplying by corona a uniform electric charge of said given polarity to the surface of the photoconductive insulating layer, re-exposing said surface in register to green light projected through the positive color transparency onto said surface, repositioning said surface in close parallel spaced relation to said conductive electrode, bringing said electrode to a potential substantially equal to that of the conductive backing of the photoconductive insulating layer, electrostatically charging a suspension of finely divided magenta powder adapted to form a laterally resistive layer to a polarity opposite that of the photoconductive surface, passing said suspension between the photoconductive insulating layer and the adjacent conductive electrode, reapplying by corona a uniform electric charge of said given polarity to the surface of the photoconductive insulating layer, re-exposing said surface in register to red light projected through the positive color transparency onto said surface, repositioning said surface in close parallel spaced relation to said conductive electrode, bringing said electrode to a potential substantially equal to that of the conductive backing of the photoconductive insulating layer, electrostatically charging a suspension of finely divided cyan powder to a polarity opposite that of the photoconductive surface, passing said suspension between the photoconductive insulating layer and the adjacent conductive electrode and subsequently transferring the first, second and third images of said three colors in a single transfer operation to an image receiving surface thereby forming on said image receiving surface a full color image having a minimum amount of undesired masking effect.

2. The method of xerographic color reproduction wherein a xerographic picture is produced by deposition of a plurality of colored materials on charge patterns formed by the combined action of an electric field and a negative color transparency on a photoconductive insulating layer on a conductive backing, said method comprising applying a uniform electric charge of a given polarity to the free surface of the photoconductive insulating layer, exposing said surface to red light projected through a negative color transparency onto said surface, positioning said surface in close parallel spaced relation to a conductive electrode, bringing said electrode to a potential substantially equal to the highest potential remaining on the photoconductive insulating layer, electrostatically charging a suspension of finely divided cyan powder adapted to form a laterally resistive layer to the same polarity as that of the photoconductive surface, passing said suspension between the photoconductive insulating layer and the adjacent conductive electrode, reapplying by corona a uniform electric charge of said given polarity to the surface of the photoconductive insulating layer, re-exposing in register said surface to green light projected through the negative color transparency onto said surface, repositioning said surface in close parallel spaced relation to said conductive electrode, bringing said electrode to a potential substantially equal to the highest potential remaining on the photoconductive insulating layer, electrostatically charging a suspension of finely divided magenta powder adapted to form a laterally resistive layer to the same polarity as that of the photoconductive surface, passing said suspension between the photoconductive insulating layer and the adjacent conductive electrode, reapplying by corona a uniform electric charge of said given polarity to the surface of the photoconductive insulating layer, re-exposing in register said surface to blue light projected through the negative color transparency onto said surface, positioning said surface in close parallel spaced relation to said conductive electrode, bringing said electrode to a potential substantially equal to the highest potential remaining on the photoconductive insulating layer, electrostatically charging a suspension of finely divided yellow powder to the same polarity as that of the photoconductive surface, passing said suspension between the photoconductive insulating layer and the adjacent conductive electrode, and subsequently transferring the first, second and third images of said three colors in a single transfer operation to an image receiving surface thereby forming on said image receiving surface a three color image wherein the amount of magenta powder is reduced in the areas where cyan powder is present and wherein the amount of yellow powder is cumulatively reduced in areas where cyan and magenta powder is present thus compensating for the red light absorption of the magenta powder and the red and green light absorption of the yellow powder.

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UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,057,720 October 9, 1962

Richard E. Hayford et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 2, line 36, for "an" read -- a --; column 6, line 36, for "project" read -- projected --; column 7, line 44, for "range" read -- image --; line 46, after "just" insert -- enough --; column 9, line 27, after "electrode" insert a comma; line 28, after "first" strike out the comma; column 10, line 28, after "first" strike out the comma.

Signed and sealed this 24th day of September 1963.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents