May 24, 1960 W. G. VAN DORN ET AL 2,937,944

XEROGRAPHIC LIGHT-SENSITIVE MEMBER AND PROCESS THEREFOR

Filed Nov. 20, 1957 4 Sheets-Sheet 1

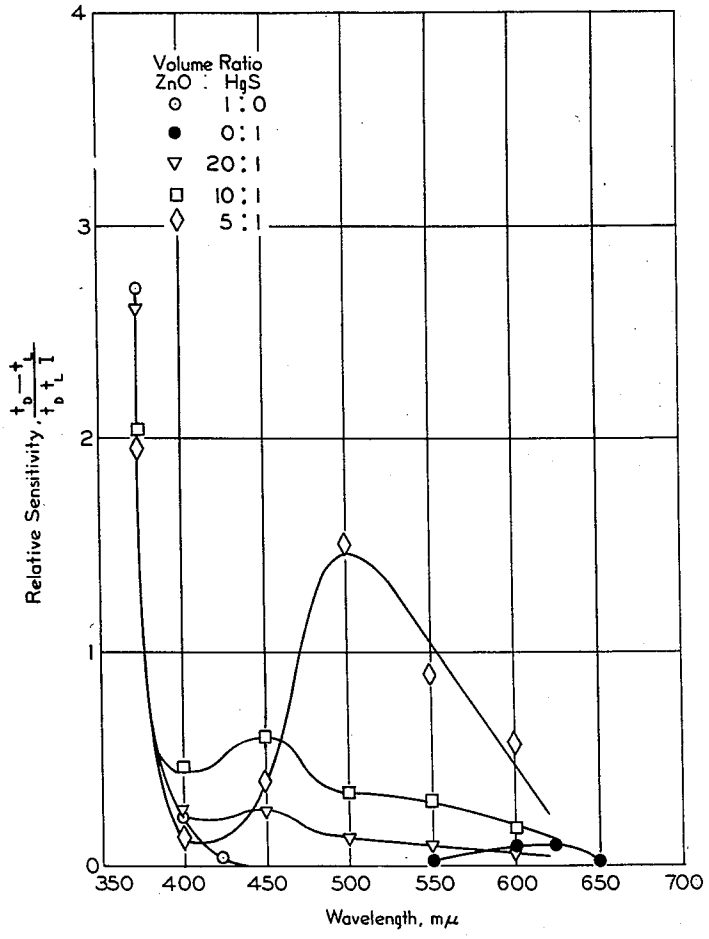


FIG. 1

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XEROGRAPHIC LIGHT-SENSITIVE MEMBER AND PROCESS THEREFOR

Filed Nov. 20, 1957 4 Sheets-Sheet 2

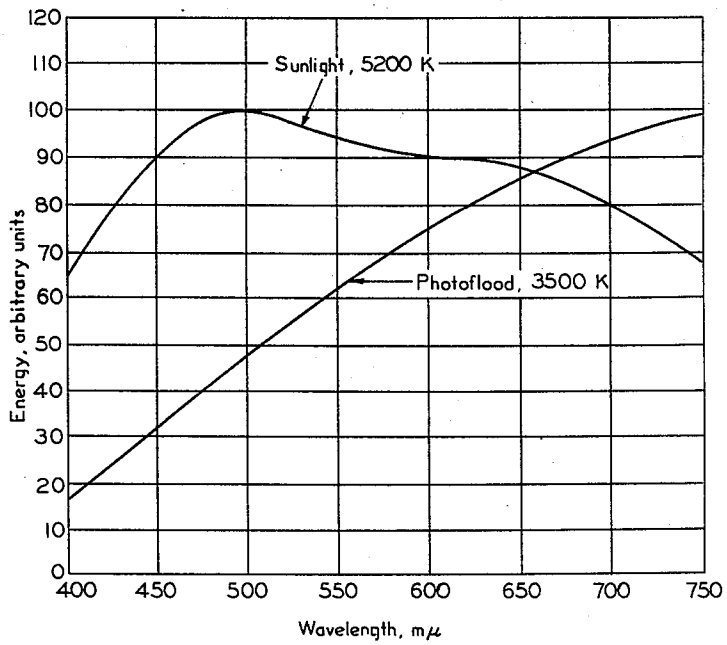


FIG. 2

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XEROGRAPHIC LIGHT-SENSITIVE MEMBER AND PROCESS THEREFOR

Filed Nov. 20, 1957 4 Sheets-Sheet 3

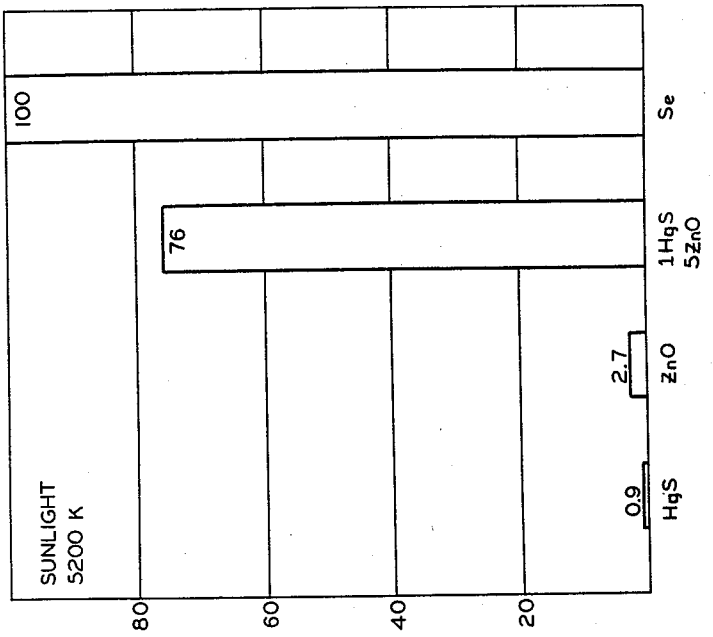


FIG. 3

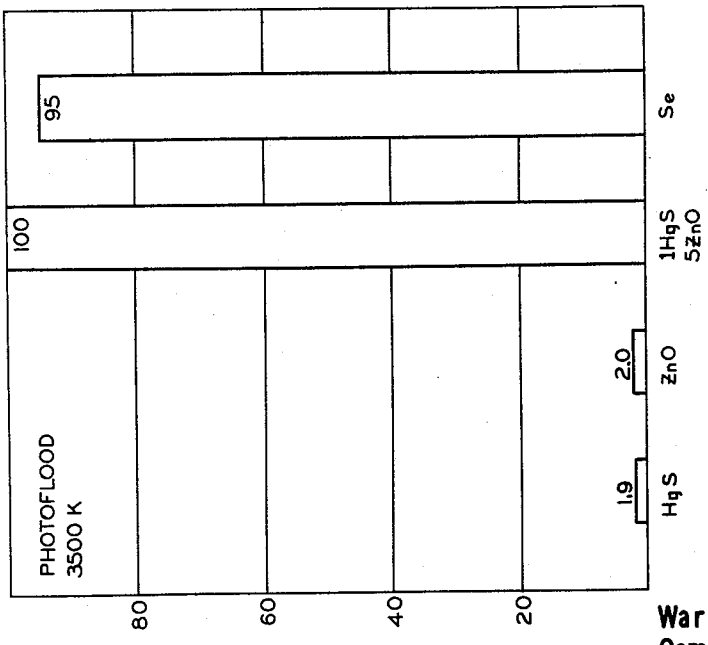


FIG. 4

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XEROGRAPHIC LIGHT-SENSITIVE MEMBER AND PROCESS THEREFOR

Filed Nov. 20, 1957 4 Sheets-Sheet 4

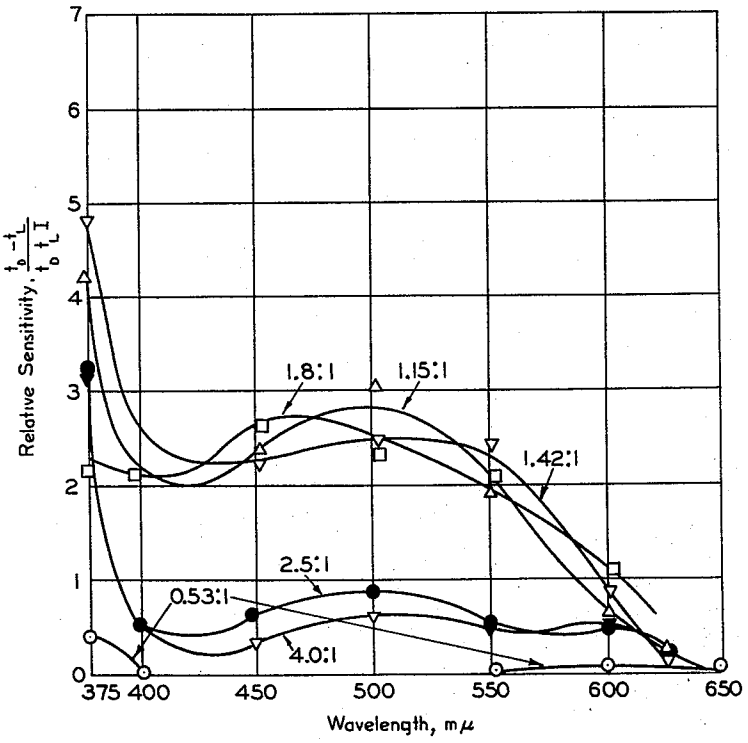


FIG. 5

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United States Patent Office 2,937,944 Patented May 24, 1960

2,937,944

XEROGRAPHIC LIGHT-SENSITIVE MEMBER AND PROCESS THEREFOR

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Filed Nov. 20, 1957, Ser. No. 697,601

15 Claims. (Cl. 96—1)

This invention relates in general to xerography and in particular to xerographic plates and a xerographic process using such plates. More specifically, the invention relates to a new xerographic member comprising a relatively conductive backing having on at least one surface thereof a coating of finely ground zinc oxide and mercuric sulfide dispersed in a high electrical resistance binder.

In the xerographic process as described in U. S. 2,297,691 to C. F. Carlson, a base plate of relatively low electrical resistance such as metal, paper, etc. having a photoconductive insulating surface thereon is electrostatically charged in the dark. The charged coating is then exposed to a light image. The charges leak off rapidly to the base plate in proportion to the intensity of light to which any given area is exposed. After such exposure the coating is contacted with electrostatically charged marking particles in the dark. These particles adhere to the areas where the electrostatic charges remain forming a powder image corresponding to the electrostatic image. The powder image can then be transferred to a sheet of transfer material resulting in a positive or negative print, as the case may be, having excellent detail and quality. Alternatively, where the base plate is relatively inexpensive, as of paper, it may be desirable to fix the powder image directly to the plate itself.

As disclosed in Carlson, suitable photoconductive insulating coatings comprise anthracene, sulfur or various mixtures of these materials as sulfur with selenium, etc. to thereby form uniform vitreous appearing coatings on the base material. These materials have a sensitivity largely limited to the green, blue or near ultraviolet and have a further limitation of being only slightly light sensitive. Consequently, there has been an urgent need for improved photoconductive insulating materials.

The discovery of the photoconductive insulating properties of highly purified vitreous selenium has resulted in this material becoming the standard in commercial xerography. The photographic speed of this material is many times that of the prior art photoconductive insulating materials. However, vitreous selenium suffers from two serious defects: First, its spectral response is very largely limited to the blue or near ultraviolet; and, second, the preparation of uniform films of vitreous selenium has required highly involved and critical processes, particularly vacuum evaporation. Furthermore, vitreous selenium by its nature requires a relatively firm and uniform support such as a continuous plastic or metal base. This, together with the high cost of selenium itself has rendered impractical the development of a disposable xerographic plate such as a paper base plate using this material.

The next advance in xerographic plates occurred with the discoverey of the "binder" plate as described in U.S. 2,663,636 to A. E. Middleton. As described therein, it was found that a xerographic sensitive member could be prepared by intimately mixing and grinding together a photoconductive insulating material and a high electrical

resistance binder. Such a mixture is suitable as the photoconductive insulating layer in the xerographic plate and may be coated on any suitable support material offering a relatively lower electrical resistance such as metal, paper, suitable plastics or conductively coated glass, plastics, etc.

Xerographic plates having photoconductive insulating layers prepared in accordance with the teachings of Middleton (which plates are hereinafter referred to as binder plates) have generally been characterized by relatively low photographic speed and relatively limited spectral response for any particular pigment. However, the variety of materials available makes possible the selection of any desired specific spectral sensitivity.

The material which has become the standard in the preparation of commercial binder plates has been zinc oxide. This material is readily available in the desired particle size at a very moderate cost. However, the light sensitivity is relatively low and the spectral response is limited to the far blue. The art has long sought for means to improve both the photographic speed and spectral response of zinc oxide while at the same time retaining zinc oxide as the bulk photoconductor thereby taking advantage of its cheapness and ready availability.

Now, in accordance with this invention, it has been found that a xerographic plate can be prepared by intimately mixing and grinding together both zinc oxide and mercuric sulfide in a high electrical resistance binder. Mercuric sulfide by itself in a binder plate has a very low sensitivity limited to a small area in the red. When combined in minor amounts with zinc oxide, the photographic sensitivity of the resulting binder plate is far, far greater than that which would be predicted on the basis of adding separately the sensitivities of the mercuric sulfide plate and the zinc oxide plate. Thus, the mercuric sulfide appears to have a major effect on the energy relations in the conduction band structure of the zinc oxide. As a result, the novel plates of the instant invention have a total light sensitivity approximating that of vitreous selenium and are virtually panchromatic over the visible spectrum.

The plates of the instant invention may be prepared by any of the processes used to prepare binder plates in the prior art. Thus, the pigment binder composition dissolved in a suitable solvent may be flowed on the base material or otherwise coated on the base as by dipping, whirling, spraying, the use of a doctor blade, dip roll, etc. Alternatively, the composition may be rendered flowable using a thermoplastic resin as the insulating binder and heated to render the composition plastic. In this form, the composition may be applied to the base material without the necessity for a solvent. Yet again, a solvent solution of the coating composition may be emulsified or dispersed in water and the aqueous emulsion or dispersion coated on the base material.

The function of the base or backing material used in preparing the binder plates is to provide physical support for the photoconductive insulating layer and to act as a ground thereby permitting the photoconductive insulating layer to receive an electrostatic charge in the dark and permitting the charges to migrate when exposed to light. It is evident that a wide variety of materials may be used, for example, metal surfaces such as aluminum, brass, stainless steel, copper, nickel, zinc, etc.; conductively coated glass as tin- or indium-oxide coated glass, aluminum coated glass, etc.; similar coatings on plastic substrates as on polyethylene terephthalate, cellulose acetate, polystyrene, etc. or paper rendered conductive as by the inclusion of a suitable chemical therein or through conditioning in a humid atmosphere to insure the presence therein of sufficient water content to render the material conductive. To act as a ground plane as described here-

in, the backing material may have a surprisingly high resistivity such as 10^6 or 10^8 ohm-cm.

Where the composite layer of binder and photoactive compound has sufficient strength to form a self-supporting layer (termed "pellicle"), it is possible to eliminate a physical base or support member and substitute therefor any of the various arrangements well known to the art in place of the ground plane previously supplied by the base layer. A ground plane, in effect, provides a source of mobile charges of both polarities. The deposition on the other side of the photoconductive insulating layer (from the ground plane) of sensitizing charges of the desired polarity causes those charges in the ground plane of opposite polarity to migrate to the interface at the photoconductive insulating layer. Without this the capacity of the insulating layer by itself would be such that it could not accept enough charge to sensitize the layer to a xerographically useful potential. It is the electrostatic field between the deposited charges on one side of the photoconductive layer and the induced charges (from the ground plane) on the other side that stresses the layer so that when an electron is excited to the conduction band by a photon thereby creating a hole-electron pair, the charges migrate under the influence of this field thereby creating the latent electrostatic image. It is thus obvious that if the physical ground plane is omitted a substitute therefor may be provided by depositing on opposite sides of the photoconductive insulating pellicle simultaneously electrostatic charges of opposite polarity. Thus, if positive electrostatic charges are placed on one side of the pellicle as by corona charging as described in U.S. 2,777,957 to L. E. Walkup, the simultaneous deposition of negative charges on the other side of the pellicle also by corona charging will create an induced, that is, a virtual, ground plane within the body of the pellicle just as if the charges of opposite polarity had been supplied to the interface by being induced from an actual ground plane. Such an artificial ground plane permits the acceptance of a usable sensitizing charge and at the same time permits migration of the charges under the applied field when exposed to activating radiation. Where the composite layer of binder pigment does not form a self-supporting layer but rather is coated on a truly insulating backing as polyethylene terephthalate, the use of artificial ground planes as described herein, makes possible the use of the xerographic member in the xerographic process. In addition to inducing a ground plane as described herein, a ground plane may also be supplied by positioning the pellicle or insulating backing on a removable conductive backing during the critical charging step. As used hereafter in the specification and claims, the term "conductive base" includes both a physical base and an "artificial" one as described herein.

The binder material which is employed in cooperation with the zinc oxide-mercuric sulfide mixture is a material which is an insulator to the extent that an electrostatic charge placed on the layer is not conducted by the binder at a rate to prevent the formation and retention of an electrostatic latent image or charge thereon. The binder material is adhered tightly to the base material and provides an efficient dispersing medium for the pigment particles. Further, the binder should not react chemically with the pigment materials. Satisfactory binder materials for the practice of the invention are acrylic and methacrylic ester polymers, particularly polymerized butyl methacrylates, vinyl polymers such as polystyrene, polyvinyl chloride, polyvinyl acetate, copolymers of these materials; alkyd resins; silicone resins, etc. In addition, mixtures of such resins with each other or with plasticizers so as to improve adhesion, flexibility, blocking, etc. of the coatings, may be used.

The physical shape or conformation of the xerographic binder plate may be in any form whatsoever as desired by the formulator such as flat, spherical, cylindrical, etc. The plate may be flexible or rigid.

The spectral sensitivity of plates prepared in accordance with the instant invention may, as is obvious to those skilled in the art, be modified through the inclusion of photosensitizing dyes therein. The dyes useful for this purpose are those commonly used in photographic sensitization. The basic mechanism of dye sensitization in xerographic binder plates is believed to be the same as in photographic sensitization. By using such dyes singly or in combination it is possible to further modify and, in effect, tailor-make the resulting binder plate.

Two factors have been found to be critical in obtaining the desired synergism through the combination of mercuric sulfide with the zinc oxide. These are: First, the ratio of zinc oxide to mercuric sulfide (all ratios given herein are by volume unless otherwise specified); and, Second, the ratio of total pigment to binder. In general, the desired synergism is observed over the range of ratios of zinc oxide to mercuric sulfide of from about 1:1 to about 30:1. The range from 2:1 to 10:1 is particularly preferred. To obtain synergism, it has generally been found essential to have a total pigment to binder ratio of at least about 0.6:1. The upper limit of pigment to binder ratio is not nearly so critical. As the pigment to binder ratio increases there is observed a general increase in dark decay rate, residual potential, and a falling off in the physical properties of the photoconductive insulating film (that is, as the amount of binder becomes less there is necessarily a loss in cohesion and adhesion in the resulting coatings). As a practical matter, a convenient upper limit would be about 4.0:1 pigment to binder ratio.

The general nature of the invention having been set forth, the following examples are now presented as illustrations but not limitations of the methods and means of carrying out the invention. All HgS used herein was in the form of red, hexagonal crystals. Unless otherwise specified, the electrostatic charges used in sensitizing (i.e., charging) the plates in the following examples were of negative polarity.

Examples 1 through 8

A series of 8 xerographic plates were prepared by charging a porcelain ball-mill jar with pigment, resin and toluene and then ball-milling the mixture using porcelain balls about 0.5-inch in diameter. The mixture was whirl coated on a 4 x 5-inch aluminum plate rotating at about 120 r.p.m. In Example 1 the charge to the ball-mill consisted of 3.68 parts of C.P. grade HgS, 1.0 part of a polybutyl methacrylate obtained from E. I. du Pont de Nemours & Company under the trade name Lucite 44 and 2.3 parts of toluene (all parts by weight). The coating was 23 microns thick.

In Example 2 the charge to the ball-mill consisted of 2.5 parts by weight of zinc oxide obtained from the New Jersey Zinc Company under the trade name Florence Green Seal No. 8, 1 part by weight of a silicone resin obtained from the General Electric Company under the trade name SR–82 and sufficient toluene to give good grinding viscosity. The resulting coating was 23 microns thick.

In order to compensate for the greatly different densities of zinc oxide and mercuric sulfide in the following examples, all proportions are by volume. In each of the remaining examples the ratio of total pigment to binder was kept at 1.4:1 by volume and only the ratio of zinc oxide to mercuric sulfide was varied. In Example 3 the ratio was 1:3; in Example 4 the ratio was 1:1; in Example 5, 3:1; in Example 6, 5:1; in Example 7, 10:1; in Example 8, 20:1. In Examples 3–6, ball-milling time was 15 hours. In Examples 7 and 8 the ball-milling time was reduced to eight hours. All of the mercuric sulfide used in these examples was CP grade and all of the zinc oxide was Florence Green Seal No. 8. In each case the binder was a polybutyl methacrylate resin obtained from E. I. du Pont de Nemours & Co. under the trade name

Lucite 46 and toluene was the solvent used to obtain good grinding viscosity. The thicknesses of the coatings were, respectively, 40, 55, 55, 37, 35 and 20 microns.

Spectral sensitvity in the xerographic process was then determined by first placing an electrostatic charge on the plate using corona charging as described in U.S. 2,777,957 to L. E. Walkup. The electrically charged plate was then exposed to monochromatic light using a Beckman spectrophotometer at a light intensity of 0.12 microwatt per square centimeter. All plates were kept in the dark for several hours prior to testing and different portions of the plates were used for each of the exposures to the spectrophotometer. A vibrating probe electrometer was used to record the initial electrostatic charge on the plate prior to exposure and the charge remaining after exposure. The light sensitivity in the blue, the green and the red was then computed for the plates using the formula:

$$S=\frac{T_d-T_1}{IT_dT_1}$$

where T_d is the time in seconds for the potential on the plate to decay in the dark to one-half of some given value, T_1 is the time in seconds for the potential on the plate to decay under given illumination to one-half of the same initial value used in the determination of T_d, and I is the intensity of the light in microwatts per square centimeter.

The resulting values for the plates of Examples 3–7 are given in the table. The sensitivities of the plates of Examples 1, 2, 6, 7 and 8 are shown in Fig. 1.

Example	Sensitivity		
	375 mμ	500 mμ	600 mμ
3	0.02	0.03	0.13
4	0.52	0.21	0.32
5	0.86	0.78	0.86
6	1.98	1.50	0.58
7	2.10	0.33	0.18

For comparison purposes, a commercial xerographic plate obtained from The Haloid Company, Rochester, New York, under the trademark Xerox plate and comprising a layer of vitreous selenium on an aluminum backing was tested for light sensitivity as described above. The relative white light sensitivity of the plates of Examples 1, 2, 6 and the selenium plate were then calculated for sunlight and photoflood light by numerical integration of the emission curve of the light source and the spectral sensitivity curve of the photoactive material. The curve for sunlight was averaged from data given by Abbott, "Progress Committee Report," Journal of the Optical Society of America, 10, 234 (1925) and by Bulletin LD–1, published by the Nela Park Engineering Division, General Electric Co., 1946. The curves used for these light sources are shown in Fig. 2. The results are shown in bar-graph form in Figs. 3 and 4 with the number normalized to 100 for the most sensitive plate.

Examples 9 and 10

Two xerographic plates were prepared by ball-milling together in a porcelain ball-mill, as in Examples 1–8, 1.07 parts by volume of total pigment to 1 part by volume of Lucite 46 together with sufficient toluene to give good grinding viscosity. The pigment consisted of 6 parts of zinc oxide to 1 part of mercuric sulfide by volume. The mercuric sulfide was C.P. grade. In Example 9 the zinc oxide was Florence Green Seal No. 8 while in Example 10 the zinc oxide used was C.P. grade. The mixtures were whirl coated on 4 x 5-inch aluminum plates as described in Examples 1–8. The resulting coatings were, respectively, 36 and 28 microns thick. The light sensitivities were determined for the two plates as in Examples 1–8 and were found to be substantially identical.

Examples 11 through 16

A series of 6 xerographic plates were prepared as in Examples 1–8. The ratio of zinc oxide to mercuric sulfide was 5:1 by volume in each case. The zinc oxide was Florence Green Seal No. 8 and the mercuric sulfide was C.P. grade. The binder was Lucite 46 for Examples 11–14 and Lucite 44 for Examples 15 and 16. In each case the mixture was ball-milled for 15 hours. The thicknesses of the resulting films were 50, 33, 33, 60, 30 and 20 microns respectively. The plates differed from each other only in total ratio of pigment to binder. These ratios (pigment:binder by volume) were, respectively: 0.53:1, 1.15:1, 1.42:1, 1.8:1, 2.5:1, and 4.0:1. The spectral sensitivities were then determined for each plate as described in Examples 1–8. The resulting sensitivities are plotted in Fig. 5. The data for Example 11 show, at a low ratio of pigment to binder that mercuric sulfide, rather than having a synergistic effect on the zinc oxide, actually quenches the sensitivity which the zinc oxide would have by itself in the near ultraviolet. However, as the concentration of zinc oxide and mercuric sulfide (i.e., total pigment) increases there is obtained a tremendous increase in over-all sensitivity. While the value was too slight to be shown in the figure, there was a faintly detectable but definitely present light sensitivity over the range of 400 to 500 millimicron wavelength for the plate in Example 11, thus indicating that this plate is near the borderline of the pigment to binder ratio necessary for obtaining synergistic light sensitivity.

Example 17

A xerographic plate was prepared as in Examples 1–8 using 5:1 parts by volume of zinc oxide to mercuric sulfide and 1.4:1 parts by volume of pigment to binder. The zinc oxide was Florence Green Seal No. 8, the mercuric sulfide was C.P. grade and the binder was Lucite 46. Sufficient toluene was added to give good grinding viscosity. There was also added to the ball-mill a 2.4% solution of rose bengal dye in methanol sufficient to give a concentration of 100 milligrams of rose bengal to 100 grams of zinc oxide. Ball-milling time was 15 hours and the resulting coating on the aluminum backing was 50 microns thick. The light sensitivity of the resulting plate was then determined as set forth in Examples 1–8 after the plate had been conditioned for several hours at 83° F. and 50% relative humidity. Using the formula previously given for light sensitivity, the following sensitivities were obtained: 5.8 at 375 millimicrons wavelength of light, 1.4 at 400 millimicrons, 2.8 at 500 millimicrons, 4.2 at 550 millimicrons and 2.3 at 600 millimicrons. The plate had a residual potential of less than 5 volts.

The effect of decreasing the concentration of mercuric sulfide in the plates of the instant invention is to cause a decrease in sensitivity in the red coupled with a vastly greater light sensitivity in the far blue. As the effect of dye sensitization is to shift a peak sensitivity to a longer wavelength, it is believed that dye sensitization would be particularly effective in those plates containing a larger amount of zinc oxide than mercuric sulfide,

The thickness of the photoconductive insulating layer is not critical, In general, the layer may be anywhere from 10 to 200 microns thick. For best operation it is preferred that the layer not be over about 100 microns thick.

The xerographic member of the instant invention may be used as the light-sensitive member in any of the regular xerographic processes. The method of electrically charging the zerographic member is not at all critical. In addition to corona charging already described, any other sensitizing technique known to those skilled in the art may be used. Thus, a potential may be applied between the xerographic member and a radioactive source supplying ions whereby the ions are drawn to the xerographic plate; the plate may be charged by electrostatic induction

as described in U.S. 2,297,691 to C. F. Carlson; charging may be by contact with a conductive rubber roller bearing a potential of several hundred volts while being rolled in contact with the plate and so on.

The electrostatic image formed on the plate of the instant invention may be made visible by any of the means known to those skilled in the art, as carrier cascade development described in U.S. 2,638,416 to Walkup and Wise; the use of a magnet to control the movement of the carrier-toner mixture (called magnetic brush development) as described in U.S. 2,791,949 to Simmons and Saul; fur brush development; powder cloud development as described in U.S. 2,784,109 to L. E. Walkup, etc. The electrostatically charged marking particles may have either the same polarity of electrostatic charge as the image areas on the xerographic member (in which case they are deposited on the background to yield a reversible or negative print) or they may have the opposite polarity of electrostatic charge to that of the image areas (whereby they deposit on the charged areas of the xerographic member to yield a positive reproduction). These and other modifications and variations will be apparent to those skilled in the art.

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

We claim:

1. A xerographic member comprising an electrically conductive backing and a thin photoconductive insulating layer thereon comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being at least about 0.6:1.

2. A xerographic member comprising an electrically conductive backing and a photoconductive insulating layer thereon from about 10 to about 200 microns thick, said layer comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being at least about 0.6:1.

3. A xerographic member comprising an electrically conductive backing and a photoconductive insulating layer thereon from about 10 to about 200 microns thick, said layer comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1.

4. A xerographic member according to claim 3 wherein the conductive backing is paper.

5. A xerographic member according to claim 3 wherein the conductive backing is metal.

6. A xerographic member according to claim 3 wherein the conductive backing is a plastic film.

7. A xerographic member according to claim 3 wherein the resin binder is an acrylic resin.

8. A xerographic member according to claim 3 wherein the resin binder is a polybutyl methacrylate.

9. A xerographic member comprising an electrically conductive backing and a photoconductive insulating layer thereon from about 10 to about 200 microns thick, said layer comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 2:1 to about 10:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1.

10. A process for producing an electrostatic image corresponding to a pattern of light and shadow said process comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a thin photoconductive insulating layer thereon of an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being at least about 0.6:1 thereby creating an electrostatic field across said layer, and exposing the electrically charged surface to a pattern of light and shadow to be recorded whereby electrostatic charges migrate through said layer in the areas irradiated by light so that an electrostatic image is formed corresponding to said pattern.

11. A process for producing an electrostatic image corresponding to a pattern of light and shadow said process comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a thin photoconductive insulating layer thereon of an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1 thereby creating an electrostatic field across said layer, and exposing the electrically charged surface to a pattern of light and shadow to be recorded whereby electrostatic charges migrate through said layer in the areas irradiated by light so that an electrostatic image is formed corresponding to said pattern.

12. A process for recording a pattern of light and shadow comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a thin photoconductive insulating layer thereon comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being at least about 0.6:1, exposing the thus charged surface to a pattern of light and shadow to be recorded whereby an electrostatic image is formed corresponding to said pattern and depositing electrically atractable finely-divided marking material selectively in conformity with the electrostatic image thus produced.

13. A process for recording a pattern of light and shadow comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a thin photoconductive insulating layer thereon comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and mercuric sulfide, the ratio by volume of zinc oxide to red hexagonal mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1, exposing the thus charged surface to a pattern of light and shadow to be recorded whereby an electrostatic image is formed corresponding to said pattern and depositing electrically atractable finely-divided marking material selectively in conformity with the electrostatic image thus produced.

14. A process for recording a pattern of light and shadow comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a

thin photoconductive insulating layer thereon comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1, exposing the thus charged surface to a pattern of light and shadow to be recorded whereby an electrostatic image is formed corresponding to said pattern and contacting the surface bearing said electrostatic image with finely-divided marking material electrostatically charged to the same polarity as the electrostatic charges of said electrostatic image.

15. A process for recording a pattern of light and shadow comprising in the absence of activating radiation placing sensitizing electrostatic charges of one polarity on the photoconductive insulating surface of a xerographic member comprising a conductive backing and a thin photoconductive insulating layer thereon comprising an insulating resin binder and dispersed therein finely-divided particles of zinc oxide and red hexagonal mercuric sulfide, the ratio by volume of zinc oxide to mercuric sulfide being from about 1:1 to about 30:1 and the ratio by volume of total particles to binder being from about 0.6:1 to about 4.0:1, exposing the thus charged surface to a pattern of light and shadow to be recorded whereby an electrostatic image is formed corresponding to said pattern and contacting the surface bearing said electrostatic image with finely-divided marking material electrostatically charged to the opposite polarity as the electrostatic charges of said electrostatic image.

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