

[54] **ELECTROPHOTOGRAPHIC MATERIAL AND PROCESS FOR PRODUCING SAME**

3,607,363 9/1971 Sadamatsu 96/1.5

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[58] Field of Search **252/62.1; 96/1, 1.4; 117/17.5**

References Cited

UNITED STATES PATENTS

2,924,519 2/1960 Bertelsen 96/1 R

FOREIGN PATENTS OR APPLICATIONS

38/22645 10/1963 Japan 96/1 R

43/14516 6/1968 Japan 96/1.5

1,082,912 9/1967 Great Britain 96/1 R

1,165,017 9/1969 Great Britain 96/1 R

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[57] **ABSTRACT**

An electrophotographic process utilizing a composite photoconductive powder comprising a closely adhered mixture of a photoconductive powder and a transparent non-photoconductive powder typically used for electrophotographic print marking.

12 Claims, No Drawings

ELECTROPHOTOGRAPHIC MATERIAL AND PROCESS FOR PRODUCING SAME

CROSS-REFERENCES TO RELATED APPLICATIONS

The instant application is a continuation in part of U. S. Pat. application 615,384, filed Feb. 13, 1967, now abandoned and is related to U. S. Pat. No. 3,607,363 and U. S. Pat. application Nos. 104,151 and 115,764.

BACKGROUND OF INVENTION

1. Field of Invention

This invention relates to an electrophotographic photosensitive powder material and a process for producing such material. In particular the invention relates to electrophotographic processes utilizing a photoconductive powder layer as a photosensitive element.

2. Description of the Prior Art

In the electrophotographic field there are several methods for obtaining images. One method uses a photoconductive powder material and an electrically conductive or photoconductive substrate. In this method there are several ways to obtain an image and one way comprises the following steps. First a uniformly charged layer of the photoconductive powder material is formed on the conductive or photoconductive substrate. Charging can be achieved by applying a corona discharge to the powder layer in the dark, or alternatively by dusting the powder on the substrate through a nozzle or a disk which is connected to a high voltage source. Thus, in the first step, the powder layer is endowed with photosensitivity. Then, the uniformly charged layer of the photoconductive powder material is exposed to a light image pattern, resulting in the formation of a latent electrostatic image corresponding to the light density or the light intensity of the image pattern. At the area irradiated with the light having a low intensity, the residual potential on the powder layer is high so that the electrostatic attractive force between the powder and the substrate is relatively large, while at the area irradiated with the intense light and the residual potential of the powder layer is decreased so that the electrostatic attractive force is relatively small. Then by applying any type of physical force to the powder layer to remove the less strongly attracted powder, a powder image is obtained on the substrate corresponding to the attractive force of the powder to the substrate. The developed powder image may be fixed by heating or treating with a solvent or a fixing agent.

The electrophotographic process described above has a wide potential field of application. For example, it is applicable to the print marking field in the ship building industry, aircraft manufacturing industry or other metal manufacturing, or in the business document copying field. There are several ways for marking lines or patterns of an original plan on a metallic material. For example, marking is made by hand directly on a metallic plate utilizing, if necessary, a wooden model. But they are all dependent upon manual labor and hence, in such a manner, it is impossible to increase productivity. Recently an electrophotographic process has been introduced in this field, in which a metallic material is first coated with a photoconductive paint and then treated according to the electrophotographic process comprising charging, exposing to a light image, development with toner and fixing agents, etc. This method has many superior characteristics and merits as

compared with the conventional marking methods, for example, in high dimension stability, simultaneous marking of lines and notes automatic processes, and high productivity. But on the contrary, it is disadvantageous in requiring a paint and is uneconomical, since, to provide consistent electrophotographic properties the paint must coat the entire surface of the material, including the non-image areas. On the other hand, in electrophotographic processes utilizing a photoconductive powder layer as a photosensitive layer, photoconductive powder material is consumed only at the imaged area, and the marking line is cut off so that there is almost no disadvantage as compared with the case previously described.

To carry out the above mentioned process a photoconductive powder material which is generally a mixture of photoconductive material and a resinous material is provided. The powder is prepared by dispersing a photoconductive powder material in a suitable insulating resinous material and then pulverizing into finely divided powder. The powder thus obtained, however, gives unsatisfactory electrophotographic properties of low photosensitivity, high background density, referred to as electrostatic noise, and poor sharpness of the developed powder image. Therefore it is difficult, in many cases, to get an image having excellent quality by using powder of this type. This is considered to be caused by the low relative electrostatic contrast due to a low photoconduction in the bottom of the layer, because most of the active light is absorbed and scattered in the surface part of the layer and is transmitted into the bottom of the layer to bring about photoconduction. Especially, the relatively high resistance at the contact points existing between the powder particles and the substrate is not lowered, so that in spite of exposing with light, the residual potential at the exposed area is not decreased. This residual potential causes high background density. If one attempts to eliminate the powder which forms the background density, the image density is also lowered. Therefore it is not important to increase the light sensitivity and the light transmission of the photoconductive powder material.

SUMMARY OF THE INVENTION

An object of this invention is to provide an improved electrophotographic process utilizing a photoconductive powder material and an electrically conductive or photoconductive substrate to obtain an image.

That is, this invention relates to an electrophotographic process utilizing a photoconductive powder composition comprising a photoconductive powder and a transparent powder. The photoconductive powder composition is a mixture or agglomerate comprising the photoconductive powder and the transparent powder, or a composition formed such that the photoconductive powder is adhered to the surface of the transparent powder, or these powders are bonded respectively to each other.

Almost any photoconductive material in powdered form may be used as the photoconductive powder in this invention. For example, a photoconductive material such as selenium, sulfur, cadmium sulfide, cadmium selenide, mercuric iodide, zinc oxide, titanium oxide, anthracene or photoconductive organic pigments can be used. Mixtures of several photoconductive materials may also be used. Further, a non-photoconductive further coated with a photoconduc-

tive material on the surface thereof may be used. Any photoconductive material in powdered form treated with dyes or color forming materials under the influence of heat or reagents, sensitizers, resins, or other materials may also be used. But treating agents which

dreadfully reduce the photoconductivity of the photoconductive material cannot be used. The transparent powder in this invention is not required to be photoconductive, but should be optically transparent to light in the main spectrum region at which the photoconductive powder is sensitive. It is desirable that the transparency of the transparent powder be sufficiently high such that in a thickness of 5 microns the light absorption rate of the transparent powder is less than 80 percent in the main spectrum region at which the photoconductive powder shows sensitivity. Almost any powdered material having sufficient transparency can be used as the transparent powder in this invention. For example, thermoplastic resins, solvent-soluble resins, thermosetting resins, glasses, inorganic salts, metal oxides, etc., and any transparent powder treated with dyes, color forming materials under influence of heat or reagents, resins, or other materials may also be used. Besides, from a practical point of view, it is desirable that they can be fixed by heating or treating with some suitable solvents, so that thermoplastic resins or solvent-soluble resins are most desirable for this invention.

As described above, the photoconductive powder composition of this invention includes any of the following compositions of the photoconductive powder and the transparent powder: (1) a mixture or an agglomerate of the photoconductive powder and the transparent powder, (2) a cohered or bonded composition where the photoconductive and transparent powders are bonded to each other at their surfaces.

Preparation of the photoconductive powder composition can be carried out by any of the following procedures: (1) mixing the photoconductive powder and the transparent powder, (2) previously or simultaneously mixing, dispersing the photoconductive powder and/or the transparent powder in a liquid, vapor or gaseous medium which does not dissolve or corrode any ingredient of the photoconductive powder and transparent powder, (3) previously or simultaneously mixing, dispersing the photoconductive powder and/or the transparent powder in a liquid, vapor or gaseous medium which moderately swells, dissolves or corrodes the surface of the photoconductive powder and/or the surface of the transparent powder, (4) mixing the photoconductive powder and the transparent powder at the temperature at which the surface of the photoconductive powder and/or the surface of the transparent powder moderately softens or melts.

The mixture of the photoconductive powder and the transparent powder is, if necessary, dried and/or pulverized. Spray drying is a superior method in case of a liquid medium system. It is possible to modify the prepared photoconductive powder composition by treating with a binding agent for the photoconductive powder and the transparent powder, or with a liquid, vapor or gas which moderately swells, dissolves or corrodes the surface of the photoconductive powder and/or the surface of the transparent powder, and/or by heating to a temperature at which the surface of the photoconductive powder and/or the surface of the transparent powder moderately softens or melts.

The terms "moderately swell, dissolve or corrode" or "moderately soften or melts" which are in the previous sentences mean a state which the photoconductive powder or the transparent powder remains in grain-like form. The term "light" means "light" in the broad sense which includes infrared ray, visible ray, ultraviolet ray, radioactive rays and particle rays. The term "photoconductive" means the phenomenon by which electric resistivity decreases upon irradiation with light in the broad sense.

DESCRIPTION OF PREFERRED EMBODIMENTS

EXAMPLE 1.

The following ingredients were mixed in a porcelain mortar with a mixing arm for 1 hour to prepare a photoconductive powder composition.

Photoconductive zinc oxide — 7 pbw (Sakai Chemical Ind. Co.)

Acrylbase MH-105 — 100 pbw (Fujikura Chemical Ind. Co.)

Acrylbase MH-105 is a polyethylmethacrylate resin powder with a mean particle size of about 135 microns.

The thus prepared photoconductive powder composition was sprinkled on a metal plate in an amount of 0.009 g/cm², and the powder layer was electrostatically charged by a corona charging device in the dark. A light image was projected on the charged powder layer and then an air blast with a suitable flow rate was applied onto the exposed powder layer. The thus developed powder image gave a clear electrophotographic image.

EXAMPLE 2.

The following ingredients were mixed in a V-type blender for 2 hours to prepare a photoconductive powder composition.

Photoconductive titanium oxide — 15 pbw (Sakai Chemical Ind. Co.)

Zeon 440 L₂ resin — 100 pbw (Nippon Zeon Co.)

Zeon 440 L₂ is a copolymer of vinyl chloride and vinyl acetate having an average particle size of about 105 microns.

The prepared photoconductive powder composition is sprinkled on a conductive plate in an amount of 0.008 g/cm², charged in darkness, exposed to a light image, and then developed by an air blast. The developed powder image was clear.

EXAMPLE 3.

The following ingredients were mixed in a porcelain pot by rotating it horizontally for 3 hours to prepare a photoconductive powder composition.

Photoconductive cadmium yellow orange — 8 pbw (Mitsubishi Metal Mining Co.)

Copolymer of styrene and n-butyl methacrylate — 100 pbw

The copolymer is a powder having a mean diameter of about 70 microns. The prepared photoconductive powder composition was sprinkled on a metal plate in an amount of 0.007 g/cm² by an electrostatic powder sparying and coating device in darkness. The charged layer was exposed to a light image, and then developed by an air blast and suction. An excellent powder image was formed.

EXAMPLE 4.

The following ingredients were kneaded by a ribbon-type blender for 3 hours.

Photoconductive zinc oxide — 100 pbw (Sakai Chemical Ind. Co.)

Silicone resin varnish FSR-107 — 15 pbw (Fuji High Polymer Ind. Co.)

Toluol — 55 pbw

The mixture was dried and pulverized to get a photoconductive component powder. Then the following ingredients were mixed in a porcelain mortar with two mixing arms for 1 hour to prepare a photoconductive powder composition.

Photoconductive component powder — 20 pbw (above prepared)

Acrylbase MH-105 — 100 pbw (Fujikura Chemical Ind. Co.)

Following the steps as described in Example 1, a faithfully reproduced powder image of the original was obtained.

EXAMPLE 5.

The photoconductive powder composition prepared in Example 1 was dropped through a vapor of trichloroethylene which was injected from the circumference to the center of a chamber at the temperature of 60°C. The powder was then dried and gathered in the lower part of the chamber. The surfaces of the Acrylbase MH-105 powder particles exposed to the vapor of trichloroethylene were moderately swelled and dissolved so that the adherent surfaces acted as a binding agent to the photoconductive zinc oxide powder. As a result the photoconductive powder composition thus treated was composed of zinc oxide strongly bonded to the surface of the acrylbase MH-150 particles, and was superior both in electrophotographic and mechanical properties.

EXAMPLE 6.

The following ingredients were kneaded by a ribbon-type blender for 3 hours.

Photoconductive zinc oxide — 100 pbw (Sakai Chemical Ind. Co.)

Silicone resin varnish — 15 pbw (Shin-Etsu Chemical Ind. Co.)

Toluol — 50 pbw

Diacetone alcohol — 10 pbw

The mixture was dried and pulverized in a finely divided photoconductive component powder. Then the following ingredients were mixed by a horizontal type porcelain ball-milling device for 5 hours to prepare a dispersing liquid for the photoconductive component powder.

Photoconductive component powder — 100 pbw (above prepared)

Methylethylketoxime — 2 pbw

Cyclohexane — 250 pbw

Then the following ingredients were mixed and dried with a hot air blast to prepare a photoconductive powder composition.

Photoconductive powder dispersion liquid — 60 pbw (above prepared)

Methylethylketone — 2 pbw

Zeon 440 L₂ resin — 100 pbw

Following the steps as described in Example 1, an excellent developed powder image was obtained. In this

example the photoconductive component powder bonded strongly to the surface of the 440 L₂ resin particles since silicone resin ES-1001 and 440 L₂ resin do not dissolve in cyclohexane but dissolve into methylethylketone, so that the surface of the resin was moderately dissolved with a small quantity of methylethylketone.

EXAMPLE 7.

The following ingredients were ball-milled for 5 hours to prepare a photoconductive zinc oxide dispersion liquid.

Photoconductive zinc oxide — 100 pbw (Sakai Chemical Ind. Co.)

Methylethylketoxime — 1 pbw

Toluol — 30 pbw

Cyclohexane — 270 pbw

Then the following ingredients were mixed and dried with an air blast to prepare a photoconductive powder composition.

Photoconductive powder dispersion liquid — 20 pbw (prepared above)

Acrylbase MH-105 — 100 pbw (Fujikura Chemical Ind. Co.)

A clear powder image was obtained following the steps as described in Example 1. Thus obtained photoconductive powder composition was composed of the photoconductive zinc oxide powder bonded strongly and uniformly to the surface of the Acrylbase MH-105 particles.

EXAMPLE 8.

A photoconductive phthalocyanine pigment dispersion liquid was obtained by ball-milling the following components for 5 hours.

Photoconductive phthalocyanine pigment — 100 pbw

Copper stearate — 0.4 pbw

Toluol — 480 pbw

Methylene chloride — 20 pbw

Then the following ingredients were mixed and dried in a polyethylene beaker to prepare a photoconductive powder composition.

Photoconductive powder dispersion — 100 pbw (above prepared)

Acrylbase M — 100 pbw (Fujikura Chemical Ind. Co.)

Acrylbase M is a polymethylmethacrylate resin powder with a particle size ranging from 30 microns to 110 microns. The prepared photoconductive powder composition was sprinkled, charged, exposed to a light image and developed to get a powder image.

EXAMPLE 9.

Five parts of finely divided photoconductive anthracene was mixed with 100 parts of Acrylbase MH-105 resin powder in a porcelain mortar with a mixing arm for 1 hour to prepare a photoconductive powder composition. Then the photoconductive powder composition was treated with a vapor of trichloroethylene as described in Example 5 to bond the anthracene powder strongly to the surface of the Acrylbase MH-105 particles. Good results were obtained using this treated photoconductive powder composition.

Example 10.

A photoconductive powder dispersion liquid was pre-

pared by ball-milling the following components for 6 hours.

Photoconductive component powder prepared — 100 pbw in Example 6

Copper stearate — 0.15 pbw

Cyclohexane — 320 pbw

Then the following ingredients were mixed in a beaker and dried with a hot air blast to obtain a photoconductive powder composition.

Photoconductive powder dispersion liquid — 60 pbw (above prepared)

Glass beads — 100 pbw (particle size ranging from 40 to 150 microns)

Diacetone alcohol — 5 pbw

The prepared photoconductive powder composition was sprinkled on a conductive plate in an amount of 0.21 g/cm² and then a high quality powder image was obtained applying the electrophotographic process to the powder layer.

EXAMPLE 11.

A vapor of trichloroethylene heated up to a temperature of 120°C containing dispersed photoconductive zinc oxide powder was circulated in a vaporizing device and was injected from a slit of the device over a fluidized bed of a copolymer of methylmethacrylate and styrene resin powder kept at a room temperature. The vapor of trichloroethylene condensed at the surface of the copolymer resin powder and moderately swelled and dissolved the surface so that the prepared photoconductive powder composition was composed of the photoconductive zinc oxide powder bonded strongly and uniformly to the surface of the copolymer resin particles. In use, an excellent powder image was obtained.

EXAMPLE 12.

A photoconductive powder dispersion liquid was prepared by ball-milling the following ingredients for 8 hours.

Photoconductive zinc oxide — 100 pbw (Sakai Chemical Ind. Co.)

Eosine Y — 0.05 pbw

Toluol — 10 pbw

Ethanol — 10 pbw

Cyclohexane — 130 pbw

Then the following ingredients were mixed in a slurry and the mixture was dried by spray drying device to prepare a photoconductive powder composition.

Photoconductive powder dispersion liquid — 50 pbw (above prepared)

Copolymer of methylmethacrylate and styrene — 100 pbw

Cyclohexane — 200 pbw

The prepared photoconductive powder composition was further dried in vacuum at a temperature of 50°C for four hours and then it was sprinkled on a conductive plate in an amount of 0.008 g/cm², exposed to a light image and then developed. Good results were obtained.

EXAMPLE 13.

A photoconductive component powder was prepared by kneading the following materials, and spray drying the mixture.

Photoconductive cadmium sulfide — 100 pbw (Mitsubishi Metal Mining Co.)

Silicone resin varnish ES-1001 — 20 pbw (Shin-Etsu Chemical Ind. Co.)

Diacetone alcohol — 10 pbw

Toluol — 120 pbw

Then 100 pbw of the prepared photoconductive component powder was ball-milled with 0.15 parts of copper stearate and 250 parts of cyclohexane for 3 hours to prepare a photoconductive powder dispersion liquid. Moreover, 100 parts by weight of glass beads with a mean particle size of 60 microns was added to 100 parts of the prepared dispersion liquid with 3 parts of diacetone alcohol. The mixture was dried by a spray drying device to obtain a photoconductive powder composition. Also a good powder image was obtained.

There has been described several examples of this invention. Thus the photoconductive powder composition according to the present invention is a mixture or an agglomerate of photoconductive powder and a transparent powder or is an adhered or bonded substance in which photoconductive powder particles are bonded to the surfaces of transparent powder particles. The photoconductive powder composition is satisfactory in electrophotographic properties. For example it shows high charging ability, small dark decay of potential in the charged state, high sensitivity, low residual potential in the illuminated state, as a result, high contrasted potential between a dark area and an exposed area so that powder images of high quality are easily obtained. Further, by selecting a process and a combination of component materials, i.e., photoconductive powder materials, modifying materials, transparent powder materials, etc., it is possible to obtain a photoconductive powder composition having some characteristic properties, for example, good fluidizing, fixing and mechanical properties, etc., for its intended use. By employing the production process explained in this specification, photoconductive powder compositions endowed with the above described excellent electrophotographic and mechanical properties are capable of being manufactured easily and at low cost.

As brought out hereinbefore the improved method of electrophotographic reproduction is characterized by the use of a composite photoconductive powder where the composite powder is dispersed on an electrically conductive substrate to form a composite powder layer, the composite powder comprising a mixture of photoconductive powder particles and transparent powder particles transparent to light in the sensitive region of said photoconductive powder particles. The composite powder layer is then uniformly charged. A physical force is then applied to the powder layer to remove the less strongly attracted composite powder to thereby obtain on the substrate a composite powder image corresponding to that portion where the electrostatic force between the composite powder and the substrate is high. The powder image is then fixed by heating or treating with a solvent or fixing agent as is also known in the art. The uniformly charged composite powder layer is then image exposed to thereby obtain a first electrostatic attractive force between the composite powder and the substrate wherever the composite powder layer is exposed to light of low intensity and a second electrostatic attractive force substantially less than said first electrostatic force between said composite powder and the substrate wherever the composite powder layer is exposed to light of high intensity as is known in the art.

The composite powders used in the improved method of this invention have been described hereinbefore in detail and it is to be emphasized that while the photoconductive particles may be coated or adhered to the transparent particles or vice versa, the particles nevertheless remain particulate. Further, the photoconductive particles are not dispersed in larger transparent particles or vice versa but rather the transparent and photoconductive powder particles are in a state of a simple mixture where the photoconductive powder particles may be coated or adhered into the transparent powder particles.

Typically and preferably a plurality of photoconductive powder particles are adhered into the surface of each transparent particle whereby not only are the light sensitivity and light transmission problems of the hereinbefore discussed prior art alleviated, but also the material handling capability is improved whereby the storage, transferring, sprinkling, developing, and removal of the composite powder is facilitated. Further, it is preferable that the transparent particles be spherical in shape.

As will be brought out below typically a number of the photoconductive powder particles are adhered to a transparent powder particle. Thus, in Example 1 discussed hereinbefore, there is employed zinc oxide having an average particle size of about 0.2 - 0.3 μ as the photoconductive powder particle and Acryl base MH-105 with an average particle size of about 135 μ as the transparent powder particle. Therefore, it is natural that a composite powder of both particle would have a structure in which the zinc oxide powder particles are gathered around and adhered to the surface of each of the Acrylbase MH-105 powder particles.

It has been further determined that the average particle size ratio of the photoconductive powder particles to the transparent powder particles should be within the range of approximately 1:3 through 1:3000 where the average particle size of the photoconductive powder particles is 0.05 - 50 microns and the average particle size of the transparent powder particles is 1 - 1000 microns. The following table I further illustrates the average particle sizes of the photoconductive and transparent powder particles employed in most examples of the invention. It should be noted in Example 4 that the photoconductive powder particle comprises 35 micron silicon resin particles having dispersed therein a large number of 0.2 - 1 micron zinc oxide particles. Similar considerations apply to Examples 6 and 13.

TABLE I

Example	Photoconductive Powder Particles	Transparent Powder Particles
1	zinc oxide 0.2-0.3 μ	Acrylbase MH-105 135 μ
2	titanium oxide 0.3 μ	Z on 440 L ₂ resin 105 μ
3	cadmium yellow orange 0.1 μ	copolymer 70 μ
4	[zinc oxide (0.2-1 μ) + silicon resin] 35 μ	the same as Example 1
5	the same as Example 1	the same as Example 1
6	[zinc oxide (0.2-0.3 μ) + silicon resin] 2.5 μ	the same as Example 2
7	the same as Example 1	the same as Example 1
8	phthalocyanine pigment 0.05-0.1 μ	Acryl Base M (30-100 μ)
9	anthracene 5 μ	Acrylbase MH-105 35 μ
11	same as in Example 1	the same as Example 1
12	same as Example 1	the same as Example 2
13	(cadmium sulfide+ES-1001) 12 μ	glass beads 60 μ

Numerous modifications of the invention will become apparent to one of ordinary skill in the art upon

reading the foregoing disclosure. During such a reading it will be evident that this invention provides a unique electrophotographic reproduction process for accomplishing the objects and advantages herein stated.

What is claimed is:

1. An electrophotographic reproduction process comprising the steps of:

1. dispersing a composite photoconductive powder on an electrically conductive substrate to form a composite powder layer, said composite powder comprising a mixture of photoconductive powder particles and transparent powder particles transparent to light in the sensitive region of said photoconductive powder particles, said photoconductive powder particles not being contained within said transparent powder particles;
2. uniformly charging said composite powder layer;
3. image exposing the uniformly charged composite powder layer to thereby obtain a first electrostatic attractive force between the composite powder and the substrate wherever the composite powder layer is exposed to light of low intensity and a second electrostatic attractive force substantially less than said first electrostatic force between the composite powder and the substrate wherever the composite powder layer is exposed to light of high intensity;
4. applying a physical force to the powder layer to remove the less strongly attracted composite powder to thereby obtain on the substrate a composite powder image corresponding to that portion where the electrostatic force between the composite powder and the substrate is high; and
5. fixing said powder image.

2. A process as in claim 1 where said photoconductive powder particles are adhered onto said transparent particles.

3. A process as in claim 1 where the average particle size-ratio of said photoconductive powder particles to said transparent powder particles is within the range of approximately 1:3 through 1:3000.

4. A process as in claim 3 where the average size of said photoconductive powder particles is 0.05 - 50 microns and the average size of said transparent powder particles is 1-1000 microns.

5. A process as in claim 3 where substantially all of said transparent powder particles are spherical shape.

6. A process as in claim 1 wherein said transparent powder particles are substantially non-photoconductive with respect to said photoconductive powder particles.

7. A process as claimed in claim 1 wherein said photoconductive powder is a material selected from the group consisting of selenium, cadmium sulfide, mercuric iodide, zinc oxide, titanium oxide and anthracene.

8. A process as claimed in claim 1 wherein said photoconductive powder is a photoconductive organic pigment.

9. A process as claimed in claim 1 wherein said photoconductive powder is a material which is treated with a dye.

10. A process as claimed in claim 1 wherein said transparent powder is a material selected from the group consisting of a thermoplastic resin, solvent-soluble thermosetting resin, glass, inorganic salt, and metal oxide.

11. A process as claimed in claim 10 wherein said transparent powder is dyed.

12. A process as in claim 1 wherein the light absorption coefficient of said transparent powder particles to light in the sensitive region of the photoconductive powder particles is less than 80 percent when said transparent powder particles are formed into a film of 5 microns thickness.

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