United States Patent [19]

Negishi et al.

[11] **3,874,942**

[45] **Apr. 1, 1975**

[54] **ELECTROPHOTOGRAPHIC PHOTOSENSITIVE MEMBER**

[75] Inventors: **Hirokazu Negishi,** Yokohama; **Takashi Saito,** Tokyo; **Takao Komiya; Tatsuo Masaki,** both of Yokohama; **Takashi Ihara,** Kawasaki, all of Japan

[73] Assignee: **Canon Kabushiki Kaisha,** Tokyo, Japan

[22] Filed: **Sept. 27, 1972**

[21] Appl. No.: **292,554**

Related U.S. Application Data

[63] Continuation of Ser. No. 11,520, Feb. 16, 1970, abandoned.

[52] **U.S. Cl.** ..... **96/1.5,** 117/132 R

[51] **Int. Cl.** **G03g 5/00**

[58] **Field of Search** ..... 96/1.5; 117/132 R

[56] **References Cited**

UNITED STATES PATENTS

2,886,434	5/1959	Owens	96/1.5

Primary Examiner—Ronald H. Smith
Assistant Examiner—John L. Goodrow
Attorney, Agent, or Firm—Fitzpatrick, Cella, Harper & Scinto

[57] **ABSTRACT**

An electrophotographic photosensitive member has an inorganic insulating layer laminated on the photoconductive layer thereof. This electrophotographic photosensitive member shows high dielectric strength and no deterioration against repeated use over a long period of time.

5 Claims, 9 Drawing Figures

FIG. 1

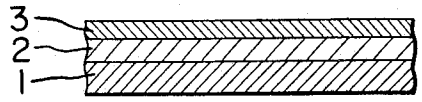


FIG. 2A

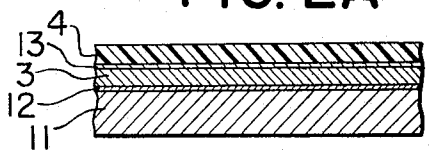


FIG. 2B

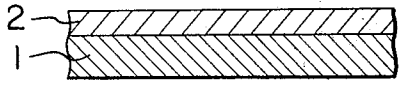


FIG. 2C

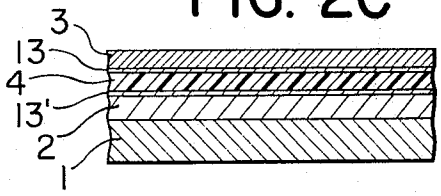


FIG. 2D

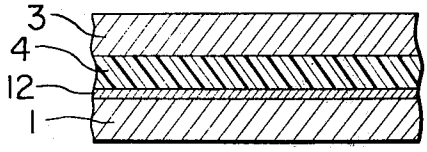


FIG. 3

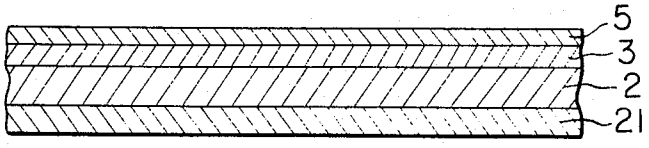


FIG. 4

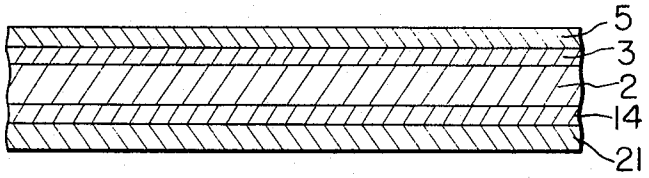


FIG. 5

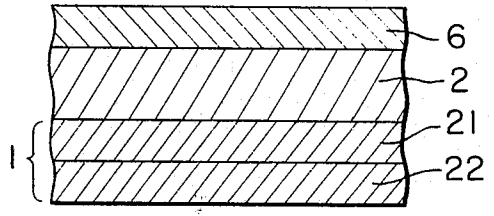
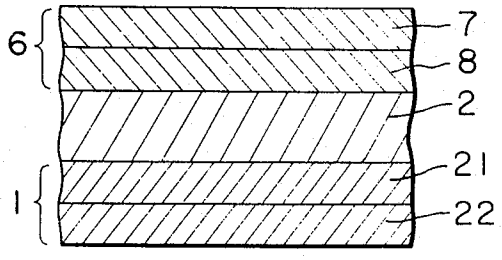


FIG. 6



ELECTROPHOTOGRAPHIC PHOTOSENSITIVE MEMBER

This is a continuation, of application Ser. No. 11,520, filed Feb. 16, 1970, now abandoned.

This invention relates to an eletrophotgraphic photosensitive member and more particularly to a photosensitive member comprising basically a base body, a photoconductive layer, and an insulating layer, in which the insulating layer comprises inorganic substances or inorganic and organic substances.

It is already widely known that in general electrophotographic processes, for example, in electrophotographic methods which comprises, in combination, steps of electrostatic image formation, development, and fixation, and transfer and fixation, a highly contrasty electrostatic image of high charge density must be formed when forming an electrostatic image, which corresponds to the original image to be copied, on a photosensitive member, in order to obtain a highly contrasty and sharp copy.

The formation of an electrostatic image having such a high contrast and charge density is attained by first applying a high voltage, at charging step for forming an electrostatic image, to the surface of the photosensitive member on which an electrostatic image is to be formed and by giving a high electric charge to the surface of the photosensitive member stated previously. As these electrophotographic system, there are known Xerography system, Electrofax system, etc.

Among them, as one of the excellent systems, a method, which, for example, is disclosed in U.S. applications of Ser. No. 563,899, filed July 8, 1966 and Ser. No. 571,538, filed Aug. 10, 1966 and which consists of three steps — primary corona discharge, secondary corona discharge with simultaneous exposure or AC discharge, and whole surface exposure, and which forms a highly contrasty electrostatic image, is offered.

The photosensitive member used in this process is characterized by the three layer structure comprising a conductive base plate, a photoconductive layer, and a surface insulating layer or the four layer structure having an insulating layer interposed between the base plate and the photoconductive layer in the abovementioned three layer stracture. These features are not observed in conventional Xerographic plate and Electrofax paper.

Since the surface of photosensitive member is covered with an insulating layer of high abrasion resistance, the fragile photoconductive layer, is protected against damage and the durability of the photosensitive member is improved.

Moreover, since the surface insulating layer responsible for maintaining electric charge and the photoconductive layer, which is sensitive to such radiations as the optical image at time of secondary charging like a kind of switching operation, assume the responsibilities separately, the photosensitive member can be made from wide variety of materials as compared with conventional photosensitive member comprizing a single photoconductive layer.

For example, highly sensitive photoconductors can not be used in conventional Xerography system and Electrofax system because they have, in general, a low resistance and a large dark decay.

These high sensitive materials have not become enabled to be used.

However, as the above-mentioned surface insulating layer, there are used, in general, organic insulating materials composing of polyethylene terephthalate (registered trade mark: Mylar) and other highpolymer films. The surface insulating layer maintains an electrostatic latent image of high contrast potential and, after developing the latent image, image transfer is preformed by applying a high external electric field. It shows a poor dielectric strength against impressed voltage and sometimes cause insulation breakdown of the surface insulating layer. For this reason it has been impossible to apply a voltage higher than a certain limit.

This means that, even if a voltage higher than the above-mentioned limit can be applied, the phenomenon of insulation breakdown of the photosensitive member or of production of pin holes, a form of insulation breakdown, which extremely deteriorates the photosensitive member, occurs jointly and gives image of poor guality.

An object of this invention is to eliminate the abovementioned defects and provide a photosensitive member having a high dielectric strength capable of forming electrostatic latent images of high contrast, and showing no deterioration against repeated use over a long period of time.

A further object of this invention is to provide a photosensitive member which can maintain a high density electric charge against charging process contained in the formation of the electrostatic image and which is quite free from the production of insulation breakdown or the pin holes, one form of insulation breakdown, against a high voltage application.

Another object of this invention is to improve drastically the mechanical strength of insulating layer, especially that of the surface thereof, and to strengthen the durability against electric stress compared with conventional insulating layers.

To be concrete, the insulating layer is composed of inorganic substance or of inorganic insulating layer combined with organic insulating layer.

Embodiment of each photosensitive member having the invented inorganic insulating layer will be described in the following referring to the drawings:

FIGS. **1, 3, 4, 5** and **6** are enlarged cross sectional views of embodiment of photosensitive member according to this invention; and

FIGS. **2A** – **2D** diagrammatically show an example for making the photosensitive member of this invention.

The most fundamental photosensitive layer according to this invention comprizes a base **1**, a photoconductive layer **2** laid thereon, and an inorganic insulating layer **3** formed further thereon as shown in FIG. **1.** For example, it is possible to improve drastically the mechanical strength of the surface and to strengthen the durability against electric stess compared with conventional insulating materials by applying a coat of inorganic insulating layer **3** consisting of such inorganic insulating matters as glass and ceramic materials on the photoconductive layer **2,**

When providing an inorganic insulating layer on the photoconductive layer as stated above, the insulating layer is sometime subject to restriction in the material or coating method for reasons of smoothness, heat resistivity, etc. of the photosensitive layer. In such case, it is considered to remove the restrictions and perform

lamination by, for example, employing the following method.

That is, the insulating layer and the photoconductive layer are separately formed and finally they are laminated as shown in FIG. 2.

In FIG. 2A, an inorganic insulating layer 3 is provided on the base 11, interposing a stripping layer 12 therebetween, and a polymer film 4 is made to adhere to the inorganic insulating layer 3 by way of an adhesive layer 13.

On the other hand, a photosensitive layer comprizing base 1 and photoconductive layer 2 is formed separately as shown in FIG. 2B and, the above-mentioned insulating layer is laminated on said photoconductive layer 2.

In other words, the insulating layer shown in FIG. 2A is peeled by means of the stripping layer 12 and is laminated on the photoconductive layer 2 shown in FIG. 2B.

As for the structure, the above-mentioned, stripped insulating layer is made to adhere to the photoconductive layer 2 in layer as is clearly shown in FIG. 2C.

The symbol 13' represents the adhesive layer used for adhesion of both layers.

In this way, an inorganic insulating layer is formed on the surface of the photosensitive member.

When using a polymer film 4 merely as the temporary protective layer of the inorganic insulating layer 3, the polymer film 4 is interposed in layer between the inorganic insulating layer 3 and the stripping layer 12 as shown in FIG. 2D, and, after adhering said inorganic insulating layer 3 to the photoconductive layer 2 shown in FIG. 2B, the polymer film 4 is stripped off.

As have been described above, by the employment of an inorganic insulating layer having an insulating characteristic of high dielectric strength, it is possible not only to prevent the occurrence of the phenomena which bring about deterioration of photosensitive member such as insulation breakdown or pin holes, but also to increase the mechanical and physical strength of the photosensitive member.

Furthermore, it is also effective to provide an organic insulating material on the surface of the insulating layer to increase such properties of above-mentioned photosensitive member as water non-absorbing property, moisture non-permeating property, and adhesiveness of developer grains.

When using such an organic insulating material, in the electrophotographic process following the formation of electrostatic latent image, it is possible, by the use of an organic insulating layer in order to obtain a visible transferred image that corresponds to the highly contrasty electrostatic image, to form a more excellent electrostatic image.

Therefore, in view of the above, it is possible to obtain a more effective photosensitive member by using both an inorganic insulating layer and an organic insulating layer simultaneously. This mode will be described hereinafter. The photosensitive element shown in FIG. 3 comprizes four layers, conductive layer 21, photoconductive layer 2, inorganic insulating layer 3, and organic insulating layer 5, in which either the layer composed of the inorganic insulating layer 3 and the organic insulating layer 5 which sandwiches the photoconductive layer 2 or the conductive layer 21 is permeable to radiations to which the photoconductive layer 2 is sensible and the inorganic insulating layer 3 and organic insulating layer 5 are used as the insulating section of the photosensitive member.

As another embodiment of photosensitive member, the one shown in FIG. 4 can also be considered. In this photosensitive member, the photosensitive member is composed of five layers, that is, conductive layer 21, insulating layer 14 consisting of either inorganic substance or organic substance, photosensitive layer 2, inorganic insulating layer 3, and organic insulating layer 5, in which either the inorganic insulating layer 3 and organic insulating layer 5 or the conductive layer 21 and insulating layer 14 is permeated to the radiations to which the photosensitive layer 2 is sensitive. Therefore, this photosensitive member like the photosensitive member shown in FIG. 3, has as its insulating section the two layers of inorganic insulating layer 3 and organic insulating layer 5 and the organic insulating layer 5 as the surface layer of the photosensitive member to build the layer formation to attain the same object as the photosensitive member of FIG. 3.

Moreover, this photosensitive member is characterized in that the two layers sandwiching the so-called photosensitive layer are two insulating layers, which, in charging process by means of high voltage applied thereto for forming an electrostatic image, the insulating layer 14 is charged in reverse polarity to the charge of the organic insulating layer 5, and, by maintaining high density charge with the organic insulating layer, succeeds in forming a high contrasty electrostatic image. Therefore, the insulating layer 14 preferably comprises the above-mentioned insulating inorganic substances having, as insulating characteristics, a high dielectric strength in order to maintain the high density charge. However, usual above-mentioned insulating organic substances can also attain the object of this invention.

The construction materials of each layer of the photosensitive member of this invention will be described in the following.

As inorganic insulating materials, they must meet the requirements that the dielectric constant is 2 or more at normal temperatures and humidities, volume resistivity is $10^{12}\Omega$ - cm or more, dielectric strength is 120 kv/mm, and the layer is 1~40 μ in thickness (the layer is weak when it is thinner than 1 μ and its flexibility is reduced when it is thicker than 40 μ). Suitable materials are glass materials and ceramic materials such as high silicate glass, crown glass, borosilicate glass, SiO_2, Al_2O_3, TiO_2, CaF_2, BN, Ti_2O_3 and mixtures of them. For reasons of manufacture, such substances as Se, PbO, CaO, B_2O_3, SrO and MgO may be contained in order to color the layer produce filter effect simultaneously.

As the materials for organic insulating layer substances having as insulating resistance of more than $10^{12}\Omega$-cm such as, for example, polyethylene, polypropylene, polyethylene terephthalate, polystyrene, polyester, polycarbonate, polyvinyl chloride, ethyl cellulose and cellulose acetate can be used.

As for photoconductive substances, they are required to form a layer of approximately 5~200 μ thick. Concretely, the photoconductive layer is composed mainly of, for example, sulfur, zinc oxide, zinc-cadmium alloy, sulfide fluorescent substances, amorphous selenium, selenium-tellurium alloy, cadmium sulfide activated by copper, CdS - CdSe, and other inorganic photoconductive substances in the form of single layer or binder dispersion system. Or the photoconductive layer is com-

posed mainly of anthracene, 3,6-dibromopoly-N-vinylcarbazole, nitrated poly-N-vinylcarbazole, brominated poly-N-vinylcarbazole, polyvinyl anthracene, and other organic photoconductive substances.

As for the base, metals such as copper, aluminum, iron, stainless steel, and tin, or conductive glass formed by depositing, tin oxide layer called Nesaglass (Trade mark) and other substances which allow to be used as the conductive layer of the photosensitive member can be used.

As the materials for the stripping layer used in the example shown in FIG. **2**, silicone resin oil which is heat resistant up to 250°C, for example, dimethyl siloxane (100~10,000 c.p.s.) or tetrafluoroethylene (Trade mark, Teflon) which is heat resistive to more than 300°C, FEP, etc. can be used. These substances are sufficiently effective with a minimum required amount.

As the adhesives, transparent solventless adhesives such as epoxy resin, polyester resin, vinyl acetate-polyethlene copolymer type hot melt adhesive can be used. When using them, it is resuired to apply them uniformly and keep the thickness within 5μ.

Materials for constructing each layer have been described so far. However, the materials described are only the representatives of the usable materials and, of course, materials applicable to this invention can all be used.

In the embodiments of this invention described so far, the numerical characteristic of the dielectric strength of the above-mentioned inorganic insulating layer is, for example, approximately 180 kv/mm or more when the above-mentioned inorganic substance is mica. On the other hand, in the case of polyethylene terephthalate, which is considered to be excellent in dielectric strength as the insulating organic substance used in above-mentioned organic insulating layer, the dielectric strength is 120 kv/mm. Therefore, in the layer formation of insulating section of the photosensitive member formed by the piling of the above-mentioned inorganic insulating layer and organic insulating layer, for example, in the case of a 20 micron thick inorganic insulating layer composing of mica and a 10 micron thick organic insulating layer composing of polyethylene terephthalate, the toal dielectric strength becomes approximately over 4,000V as is clear from simple arithmetical calculation based on the numerical values of dielectric strengths of the above-mentioned mica and polyethylene phthalate. This shows that the insulating layer of the photosensitive member has a higher dielectric strength than when only the insulating organic substance is used as the insulating layer. Furthermore, as to the dielectric constant in the system of insulating section of the photosensitive member, the dielectric constant of mica is approximately 9 and that of polyethylene phthalate is approximately 3, and that constant of the insulating section is approximately 5.4 Such values of dielectric constant are most preferable for the electrostatic image forming process in which a high voltage is applied to the photosensitive member.

Furthermore, the above-mentioned inorganic insulating substances and organic insulating substances are, of course, allowed to be selected and used freely depending on the operating environmental condition of the photosensitive member and, as a result, it is possible to form the insulating section of the photosensitive member having any dielectric strength and dielectric constant within optimum ranges.

The photosensitive member according to this invention is not limited to the one stated above, but the photosensitive members concerned with electrophotographic system in which an electrostatic image is formed in the insulating layer of the photosensitive member are all contained.

In composition, the photosensitive member of this invention refers to a photosensitive member compriz-ing as fundamental composition three layer of an insulating layer, a photosensitive layer, a conductive or insulating layer, or four layers of an insulating layer, a photosensitive layer, an insulating layer, and a conductive layer, in which each insulating layer is either composed of a single inorganic insulating layer or composed of above-mentioned two layers of organic insulating layer and inorganic insulating layer piled on upon another, or composed of above-mentioned inorganic insulating substance.

As stated above, the photosensitive member according to this invention is basically composed of three or four layers. However, in other case, for example, where the composition of the base is different, the photosensitive member may take more complicated composition.

To illustrate this, in FIG. **5**, when the insulating layer is a single layer of inorganic insulating layer, the base takes a two layer formation by the combination of conductive substances and insulating substances. In FIG. **5**, although the conductive layer is represented by **21** and the insulating layer by **22**, of course, the layer formation is not restricted to this layer formation.

When the insulating layer have a two layer formation, formed by the conbination of inorganic insulating layer and organic insulating layer, as shown, for example, in FIG. **6**, symbol **7** or **8**, the same thing can be applied to the composition of the base. In short, the layer formation of the base can be selected freely depending on the purpose.

As have so far been described, the photosensitive member according to this invention has a high dielectric strength, maintains a high density charge against the charging process of electrostatic image formation and, accordingly, forms an electrostatic image of high electrostatic contrast, and even upon application of high voltage, does not causes insulation breakdown or pin holes which are the main causes of the deterioration of photosensitive member, and shows no deterioration after repeated use over a long period of time. Furthermore, the photosensitive member according to this invention is enabled to visualize a high contrast electrostatic image faithfully and to obtain a copied image by making the surface layer from the above-mentioned organic insulating layer which is excellent in no-water-absorbing property, no-moisute premeating property, adhesiveness of developer powder, and mechanical strength.

Still further, by selecting and using the above-mentioned inorganic and organic layer composing materials freely depending upon the operating environmental conditions of the photosensitive member, it is possible to offer a photosensitive member having optimum dielectric strength and dielectric constant.

This invention is further illustrated by the following nonlimitative examples.

EXAMPLE 1

On an aluminum foil of 50 microns in thickness was coated electrophotographic photosensitive material solution composed in weight composition of

Cadmium sulfide activated by copper	100 parts
Vinyl chloride - vinyl acetate resin (as solid)	10 parts
Methyl ethyl ketone	100 parts

The foil was dried with air heated to 70°C, and a photosensitive layer of 80 microns in thickness was prepared.

On the other hand, a 12 micron thick polyethylene terephthalate (trade name: Diafoil, a product of MITSUBISHI JUSHI Co.) and a 20 micron thick mica were adhered to each other by using a polyacrylicvinyl adhesive (trade name: Esudai, a product of SEKISUI KAGAKU Co.). These layers were then adhered to the surface of the above-mentioned photosensitive layer by using an epoxyresin (Trade name a Epikote, a product of SHELL CHEMICAL Co.) to form a photosensitive plate. As for the thickness of the adhesive layer, the polyacrylic vinyl adhesive layer was 2 microns in thickness and the epoxy resin adhesive layer was 2–5 microns in thickness, and total thickness of the photosensitive plate was 145 microns in average.

Next, by using this photosensitive member, and according to the electrophotographic process applied for patent by this applicant and disclosed in U.S. application Ser. No. 571,538, filed Aug. 10, 1966, by corona discharge wire established 10mm above the surface of the photosensitive member, a +6KV corona discharge was applied to the surface of polyethylene terephthalate insulating layer of the photosensitive plate to charge the surface uniformly with positive (+) charge and, following this, an original image was projected for about 0.1 to 0.3 second by a tungsten lamp of about 10 lux onto the surface of the above-mentioned insulating layer and, contemporaneously, an AC 6KV corona discharge was applied. Further, the whole surface of the above-mentioned layer was exposed uniformly to the 10W tungsten lamp for 1~2 seconds to form an electrostatic image which conformed with the dark-bright pattern of the original image. Then, the resulting electrostatic latent images were developed by a magnet-brush method and excellent visible images of high fidelity to the original pattern were produced.

Moreover, this photosensitive plate was subject to above-mentioned charging process repeatedly in succession to test the electrical strength. Even after 70 thousand times of charging process, the result obtained by carrying out the above-mentioned electrophotographic process showed no degradation of image quality and a very good copied image was obtained.

EXAMPLE 2

Onto a 50 micron thick aluminum foil was adhered a 12 micron thick polyethylene terephthalate film by using epoxy resin. The thickness of epoxy resin was about 3 microns. Next, the photosensitive layer, mica, and polyethylene terephthalate layer were adhered, in this order, to the polyethylene terephthalate film in a similar way to Example 1 and a photosensitive plate of 160 microns in average total thickness was prepared. Next, using this photosensitive plate and according to the electrophotographic process filed by the present applicant and disclosed in U.S. application Ser. No. 563,899, filed July 8, 1966, a charging process similar to Example 1 was applied, and the surface of the polyethylene terephthalate insulating layer was uniformly charged with positive (+) charge. Next, an original image was projected to the photosensitive plate for about 0.5 second by a tungsten lamp of about 10 lux and contemporaneously a corona discharge having reversed polarity was applied thereto. Then, the surface of the above-mentioned insulating layer was exposed to a 10W tungsten lamp uniformly for 1~2 seconds and an electrostatic image that conformed with the dark-bright pattern of the original image was formed. Next, as a result of carrying out the electrophotographic process to develop the electrostatic image by cascade developing method, a visible image faithful to the original image and of good quality was obtained.

Moreover, upon testing the electric strength of this photosensitive plate under the same condition as Example 1, even after 70 thousand times of charging process, the result obtained after carrying out the above-mentioned electrophotographic process was an extremely excellent copied image showing no degradation in image quality.

EXAMPLE 3

On an aluminum base plate was formed a photoconductive layer comprising CdS fine grains bonded by epoxy resin. The plate was mounted to the anode of high frequency cathode spattering equipment and 96 percent silica glass was provided on the cathode.

The interior of the equipment was maintained at vacuum of 10^{-3} Torr, and the above-mentioned photosensitive member material was made to contact with a water-cooled plate by way of indium foil to control the temperature within the range of 100°C to 150°C during spattering. Moreover, in carrying out spattering, the efficiency was improved by joint application of magnetic filed. Thus a silica glass layer having the specified thickness of 8 μ was formed on the photoconductive layer in about 1 hour.

The surface insulating layer thus obtained was an insulating layer excellent in dielectric strength and surface characteristics.

What is claimed is:

1. An electrophotographic photosensitive member comprising a base, a photoconductive layer and a separate insulating layer on the photoconductive layer at least substantially transparent to actinic radiation and composed of a laminate of an inorganic insulating layer composed of inorganic insulating material having a dielectric constant of at least 2 and an organic insulating material having an insulative resistance of at least 10^{12} ohm-cm, said laminate having a thickness of 1 to 40 microns.

2. An electrophotographic photosensitive member as set forth in claim **1**, in which the base is composed of a conductive substance.

3. An electrophotographic photosensitive member as set forth in claim **1**, in which the base is a laminate of a conductive substance and an insulating substance and the conductive substance is in contact with the photoconductive layer.

4. An electrophotographic photosensitive member as set forth in claim **1**, in which the base is a laminate of a conductive substance and an insulating substance and the insulating substance is in contact with the photoconductive layer.

5. An electrophotographic photosensitive member as set forth in claim **1**, in which the base is composed of an insulating substance.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) HIROKAZU NEGISHI, ET AL

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover page, between items [21] and [63] on the left hand column, insert:

--[30] FOREIGN APPLICATION PRIORITY DATA

Feb. 22, 1969 Japan----------13418/1969
Mar. 26, 1969 Japan----------22940/1969--

Column 1, line 6, change "eletrophotgraphic" to read --electrophotographic--

line 24, "at charging" should read --at the charging--

line 29, "system" should read --systems--

line 32, "of" should be deleted

line 45, "stracture" should read --structure--

line 48, "surface of" should read --surface of the--

line 59, "from wide" should read --from a wide--

line 60, "member comprizing" should read --members comprising--

line 67, "high" should read --highly--

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Negishi et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 3, "composing" should read --composed--

line 7, "preformed" should read --performed--

line 10, "cause" should read --causes--

line 18, "gives image" should read --gives an image--

line 19, "quality" should read --quality--

line 29, "against charging" should read --against a charging--

line 32, "the" should be deleted

line 35, "of insulating" should read -- of the insulating--

line 39, "composed of" should read --composed of an--

line 40, "of inorganic" should read --of an organic--

line 41, "with organic" should read --with an organic--

line 42, "Embodiment" should read --Embodiments--

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Negishi, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 47, "embodiment" should read --embodiments--

and "member" should read --members--

line 52, "comprizes" should read --comprises--

line 57, "stess" should read --stress--

Column 3, line 11, "comprizing" should read --comprising--

line 22, "layer" should read --layers--

line 29, "in layer" should be deleted

line 34, "As have" should read --As has--

line 39, "of photosensitive" should read --of the photosensitive--

line 44, "of above-" should read --of the above- -

line 50, "of electrostatic" should read --of the electrostatic--

line 61, "comprizes" should read --comprises--

line 68, "sensible" should read --sensitive--

Column 4, line 12, "permeated" should read --permeable--

line 24, "which, in" should read --which, in a--

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Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Negishi, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 4, line 52, "layer produce filter" should read --layer and produce a filter--

line 53, "for organic" should read --for the organic--

line 54, "as" should read --an--

line 59, "for photoconductive" should read --for

line 60, "thick" should read --thickness--

Column 5, line 8, "allow to" should read --allow it to--

line 22, "resuired" should read --required--

line 37, "in above- should read --in the above- --

line 43, "composing" should read --composed--

line 44, "composing" should read --composed--

line 45, "toal" should read --total--

line 49 and 56, in both occurrence "phthalate" should read --terephthalate--

Column 6, line 5, "with electrophoto-" should read --with an electrophoto- --

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Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Negishi, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 10, "compriz-" should read --compris- --

line 11, "layer of" should read --layers:--

line 18, "posed of" should read --posed of the--

line 19, "upon" should read --one--

line 20, "of above-" should read --of the above- --

line 24, "case" should read --cases--

line 26, "take more" should read --take a more--

line 34, "have" should read --has--

line 35, "conbination" should read --combination--

line line 42, "have" should read --has--

line 48, "causes" should read --cause--

line 50, "member" should read --members--

line 53, "is enabled" should read --enables one--

line 57, "no-moisute premeating" should read --no-moisture permeating--

line 61, "composing" should be deleted.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Negishi, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 7, line 2, "coated electrophotographic" should read --coated an electrophotographic--

line 21, "Trade name a" should read --Trade name a:--

line 26, "and total thickness" should read --and the total average thickness--

line 27, "in average" should be deleted

line 29, "applied for" should be deleted

line 30, "patent by this applicant and" should be deleted; and inserted therefore should be --applicants' copending--

line 49, "subject" should read --subjected--

line 50, "above-" should read --the above- --

line 52, "of charging process" should be deleted

line 67, "filed by the present" should be deleted

Column 8, line 1, "applicant and" should be deleted, and "in U.S." should read --in applicants' copending U.S.--

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,874,942 Dated April 1, 1975

Inventor(s) Hirokazu Ikeda, et al.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 8, line 14, "by cascade" should read --by the cascade--

line 18, "condition as Ex-" should read --conditions as in Ex- --

lines 19 and 20 "of charging process" should be deleted.

line 27, "anode of" should read --anode of a--

line 28, "spattering" should read --sputtering--

line 30, "at vac-" should read --at a vac- --

line 35, "spattering" at both occurrences should read --sputtering--

Signed and sealed this 24th day of June 1975.

(SEAL)
Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents
and Trademarks