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(54) Electrophotosensitive member.

(57) The present invention relates an electrophotosensitive member provided with a semiconductive charge acceptance layer into which an electron generated in a charge generating layer is easily injected, and an insulating surface protective layer; said photosensitive member has a sensitivity at positive charge, and prevented from the increase of potential after repeat of use, which is usually caused in a photosensitive member furnished with a surface protective layer, improved in the stability of electrical resistance at high temperature and high humidity, and prevented from the image flow.

The present invention relates to an electrophotosensitive member containing an organic photoconductive material, especially a multilayer photosensitive member usable at positive charge.

Up to the recent time there has been widely used a photosensitive member consisting of an inorganic photoconductive material such as selenium, selenium-tellurium alloy, cadmium sulfide, zinc oxide and the like. Recently, however, it has been studied an organic photoconductive material having features of easy production, possible selection of compound possesing a photoconductivity at a desired wave range and so on.

An electrophotosensitive member containing an organic photoconductive material in the photosensitive layer has various merits such as easy membrane production, high liberality in design due to its high flexibility, inexpensive, lower pollution and the like, but it is inferior to a photosensitive member made of an inorganic photoconductive material in the sensitivity and the life. In order to improve such inferiority it was proposed a multilayer photosensitive member having a photosensitive layer separated to a charge generating layer (referred to as CGL hereinafter) and a charge transporting layer (referred to as CTL), and actually practised. As the charge transporting agent generally used in such a multilayer electrophotosensitive member is an electron donative material such as pyrazoline, hydrazone, oxazole and the like, the CTL obtained becomes a hole mobility type, and used at negative charge when the CTL is laminated on a CGL.

On the other hand these kinds of electrophotosensitive member are used generally repeating the processes including charging, exposing, developing, transferring, cleaning and erasing in this order. In these processes the positive charge is more stable than the negative charge in the corona discharge, and the deterioration of the properties by ozone oxidation is minimized in the former because of less ozone generation. Further, an organic photosensitive member usable in positive charge has been desired, because it can be used in the same process as a conventional inorganic photosensitive member using, for instance selenium, selenium-tellurium alloy and the like, which is generally used in positive charge.

Though an electron acceptor such as trinitrofluorenone as a charge transporting agent may be used in order to make a photosensitive member usable in positive charge under a usual construction laminated with a CTL on a CGL, few charge transporting agents have been used in general because of its low mobility, low chemical stability, toxicity such as carcinogenic property and the like. Alternatively, there has been proposed the construction comprising a CTL and a CGL which are laminated on an electrically conductive substrate in this order in order to make possible positive charge using an electron donor, but this construction has some defects such as drop in chargeability due to the large carrier injection from a CGL to a CTL, lower mechanical durability because of a CGL being generally thin, and the like.

Further, there have been proposed a photosensitive member having a three layers-construction of CTL, CGL and a surface protective layer made of resious thin membrane in this order on a substrate, and a photosensitive member having a two layers-construction of a CTL and a CGL, in which the mechanical strength is improved by thickening the CGL to about 5 µm and a charge transporting agent is added into the CGL so as to maintain the sensitivity (see, for instance, The 3rd International Congress on Advances in Non-Impact Printing Technologies, Pre-Edition, page 115, and The Pre-Edition for No. 59th. Research Conference in the Congress of Electrophotography, page 184).

Furthermore, there are proposed, as a resin for a protective layer of a photosensitive member, polyester resin, polyvinyl acetate resin, phenol resin, acetyl cellulose , styrene/maleic anhydride copolymer, polyamide resin, polyimide resin, melamine resin (see Japanese Patent Publication Nos. 38-15446, 51-15748, 52-24414, 56-34860, 56-53756, 60-55357, and 61-22345 and so on), but these photosensitive members have insufficient mechanical strength such as abrasion resistance, scratch resistance and the like, and stability under ambient conditions.

The resin which has been conventionally used for a protective layer has insufficient durability when used as a thin film, whereas the residual potential increases or the repeating properties become worse when the protective layer is thickened.

Alternatively, it is proposed a photosensitive member having a protective layer in which a metal oxide is dispersed into the binding resin (for instance, Japanese Patent Publication Nos. 57-39846, 58-121044, and 59-223445 and so on). In such a photosensitive member the metal oxide is insoluble in the binder resin and solvent, and the shape of it is massive, so that even though the content of the metal oxide in the protective layer is fixed to a given value, the electric resistance easily varies, properties become unstable according to the dispersion conditions, and the chargeability, change of residual potential under the variation of circumstances or repeating condition. Accordingly, it has been tried to obtain a photosensitive member more excellent in the sensitivity, durability and the like, and further desired to obtain one stable at an ambient temperature and moisture, usable at positive charge, having a long life and satisfying every properties required for use as an electrophotosensitive member.

In case that an insulating material is used for a surface protecting layer in a photosensitive member containing a CTL and a CGL on an electrically conductive substrate in this order, and sensitive to positive charge, the hole between the hole and the electron which generate in the CGL is injected into the CTL. The electron, on the other hand, accumulates in the CGL through the repeated use because it takes long time to move in the surface protective layer, and this electron is bound again with a hole which generates at exposure so as to increase the potential after exposure. This is one of the big problems. There is a tendency that the electrical resistance of a thin layer of resinous material increases at low temperature and low humidity, whereas it decreases at high temperature and high humidity. The resistance, however, should be high, e.g. higher than 10^{10} Ωcm under the condition of use lest the image flow should give rise to even under high temperature and high humidity. The resistance is preferably less than 10^{12} Ωcm lest the electron generated in the CGL should increase through the repeated use under low temperature and low humidity.

It is difficult, however, to control stably the resistance of the surface protecting layer within the above range as maintaining the sufficient durability to wear under any temperature and moisture in a conventional photosensitive member, and even if it can be controlled the member has a defect that even a slight drop of the resistance through the repeated use gives rise to the image flow. Accordingly, it has been desired to develop a fundamentally new construction to control the increase of potential after exposure in a photosensitive layer having an insulating surface protective layer.

SUMMARY OF THE INVENTION

The present invention provides a photosensitive member having a new construction in order to solve the aforementioned problem possessed by a conventional one.

The photosensitive member of the present invention has on an electrically conductive substrate, a CTL, a CGL, a semiconductive charge acceptable layer and an insulating surface protective layer in this order, which has a sensitivity at positive charge, little image flow under high temperature and high humidity, stability to the change of temperature and humidity, little increase of electrical potential in the repeat of use, excellent wear resistance and durability.

BRIEF DESCRIPTION OF THE DRAWING

Fig. 1 is an illustrative view of the function of a photosensitive member of the present invention,

Fig. 2 is an illustrative view of the function of a conventional photosensitive member without an electron acceptance layer, and

Fig. 3 is a schematic view of a test device which is used for properties of an photosensitive member in the Examples.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a photosensitive member which comprises a charge transporting layer, a charge generating layer, a semiconductive charge acceptance layer and an insulating surface protective layer in this order on an electrically conductive substrate.

The CTL of the photosensitive layer of the present invention contains an electrodonative material; the CGL contains a charge generating material which generates a charge when absorbing light of a given wave length; the electron acceptance layer is a semiconductor layer into which the electron generated in the CGL is easily injected; and the surface protective layer is insulating.

In the photosensitive layer of the present invention the hole in the electron and the hole which generate in the CGL on the exposure of the light having a given wave length is injected into the CTL, and transported to the electrically conductive substrate, whereas the electron is injected into the charge acceptance layer, and accumulated therein at the repeat of use because the surface protective layer is insulating and the transportation of the electron needs long time, but the increase of the electron in the CGL can be controlled. By this function of the electron acceptance layer the rebinding of the hole generated in the CGL at the exposure and the electron accumulating at the repeat of use can be reduced so as to improve the increase of potential after exposure. This is one of the problem caused at the repeat of use in an electrophotosensitive member provided with an insulating surface protective layer.

In the electrophotosensitive member of the present invention the image flow can be prevented by stabilizing the electrical resistance of the surface protective layer under high temperature and high humidity using an insulating resinous membrane as the protective layer.

The charge acceptance layer of the photosensitive member of the present invention may be semiconductive such that the electron generated in the CGL can be easily injected, not so insulating that the image flow gives rise to, and not absorbable the wave length to which the CGL is sensitive. It shows a sensitivity at positive charge when the CTL, CGL, charge acceptance layer, surface protective layer are laminated on the substrate in this order.

The charge acceptance layer desirably has a conductivity in the dark place similar to the CGL, and an ionizing potential equal to or larger than that of the CGL by 0.5 eV or less. Further, it most desirably has so large resistance that the electrostatic latent image formed on the exposure does not flow before development. Further, the charge acceptance layer preferably does not absorbe a substantial amount of light to which the photosensitive layer is sensitive. Furthermore, the electrical resistance of the charge acceptance layer of the present invention may preferably be about 10^6 - 10^{14} Ωcm, more preferably 10^8 -10^{12} Ωcm.

The function of the photosensitive member of the present invention is illustrated according to Fig. 1.

The photosensitive member of the present invention is essentially composed of a CTL (102) formed on an electrically conductive substrate (101), a CGL (103) formed on the CTL, a charge acceptance layer (104) on the CGL, and a surface protective layer (105) on the charge acceptance layer.

The charge distribution ρ and the electrical field distribution E in the inside of the electrophotosensitive member are illustrated in Fig. 1 (a), when it is positively charged on the surface to induce a negative charge at the substrate by a corona charger (106).

When this photosensitive member is exposed to a light having a wave length to which the CGL is sensitive, the hole and electron generate in the CGL, and the electron is injected into the charge acceptance layer and the hole into the CTL under the influence of the electrical field as illustrated in Fig. 1 (b).

The hole moves through the CTL to the substrate, and the electron remains in the charge acceptance layer because the surface protective layer is of insulation as illustrated in Fig. 1 (c). The charge which is formed by the remaining electrical field in the surface protective layer is mainly observed as a surface potential of the photosensitive member.

When the photosensitive member is charged by the corona charger again, the charge distribution and the electrical field distribution are the same as the (a) except that the electrical field in the surface protective layer is enlarged due to the electron remaining in the charge acceptance layer (see Fig. 1 (d)).

When exposed again as Fig. 1 (e), the electron generated in the CGL is injected into a charge acceptance layer, and the hole is injected into the CTL. The hole is transported through the CTL to the electrical conductive substrate, but the electron remains in the charge acceptance layer because of the surface protective layer being insulating. This is illustrated in Fig. 1 (f). The surface potential in Fig. 1 (f) increases by the increment of electrical field in the surface protective layer in comparison with Fig. 1 (c) after the first exposure, and it increases after the second exposure, but the electrical potential does not increase up to too high level, because it is saturated at the value that the charge injected into the charge acceptance layer in one cycle becomes equal to the charge which can be conducted through the surface protective layer in one cycle. Accordingly, the influence by the temperature and moisture can be also reduced.

The function of a conventional photosensitive member having no charge acceptance layer is schematically illustrated according to Fig. 2.

The illustrated photosensitive member has a CTL (202) formed on an electrically conductive substrate, a CGL (203) formed on the CTL, and a surface protective layer (204) on the CGL, but no charge acceptance layer.

When the above photosensitive member is positively charged by a corona charger (205), the surface is positively charged and a negative charge is induced at the substrate. The charge distribution ρ and the electrical field distribution E inside the photosensitive member are shown in Fig. 2 (a).

When the photosensitive member is exposed by the light having a wave length to which the CGL is sensitive, the hole and electron generate in the CGL, and the hole is injected into the CTL under the influence of the electrical field. The hole moves through the CTL to the substrate, but the electron remains in the CGL because the surface protecting layer is insulating as illustrated in Fig. 2 (c). The surface potential observed is formed mainly by the electrical field remaining in the surface protective layer.

When the photosensitive member is charged by the corona charger again, the charge distribution and the electrical field distribution are the same as Fig. 2 (a) except that the electrical field in the surface protective layer increases due to the electron remaining in the CGL (see Fig. 2 (d)).

When exposed again as Fig. 2 (e), the electron generated in the CGL remains therein, so that the electron accumulates therein, and rebounded with the hole generated on the exposure so as to remain a large surface potential due to the reduction of sensitivity. The reduction of sensitivity caused by the rebinding of the hole generated by the exposure and the electron remaining in the CGL increases according to the increment of the electron in the CGL by repeat of use. Therefore, the electrical potential after the exposure increases remarkably by the repeat of use, and influenced by the temperature and moisture.

The electron donative material usable in the CTL of the photosensitive member of the present invention includes compounds having one or more electrodonative group such as an alkyl, alkoxyl, amino, imido group and the like, a polycyclic aromatic compound such as anthracene, pyrene, phenanthrene and the like or derivatives thereof, a heterocyclic compound such as indol, oxazole, oxadiazole, carbazole, thiazole, pyrazoline, imidazole, triazole and the like or derivatives thereof.

The electron donative material is dissolved in a suitable solvent together with a binder resin, and the mixture was applied by a usual manner such as coating, and then dried to form a CTL. In case that the electron donative material is a polymeric compound, the CTL may be formed by it alone without a binder resin. The thickness of the CTL may be about several micrometer to several decades micrometer, preferably about 5 to about 25 micrometer.

The charge generating material usable in the photosensitive member of the present invention includes phthalocyanine, azo, squarillium, cyanine, perylene pigments or dyes and the like. The charge generating layer may be prepared by the application of coatings prepared by dispersing these charge generating materials in a suitable binder resin. The dried thickness of the CGL may be 0.1 - 10 μm, preferably about 0.2 to about 2 μm. As the phthalocyanine pigments usable there are exemplified ϵ type, α type or β type copper phthalocyanine, another metal phthalocyanine, metal free phthalocyanine and the like.

The binder resin may be used in the CGL or CTL in order to improve the adhesivity to another layer, evenness of coated layer, flowability at application and so on, if desired. Examples of the binder resin usable in the present invention are polyester, polyvinyl chloride, polyvinyl butyral, polyvinylacetate, polycarbonate, acryl resin, methacryl resin, silicone resin, or copolymer or mixture thereof. As the solvent used for a CGL one which dissolves a binder resin and is excellent in the dispersability of a charge generating material is preferable, and one for a CTL a solvent which can dissolve the charge transporting material and the binder resin is usable. As a suitable solvent there are exemplified halogenated hydrocarbons, halogenated aromatic compounds, aromatic compounds, ketones, esters, ethers, alcohols and the like.

The surface protective layer for the present invention may be a material having a high hardness, wear resistance, and high electrical resistance such that it does not cause image flow at repeat of use under high temperature and high humidity. Examples of the material for the surface protective layer are a thermocurable silicone resin, urethane elastomer or the mixture and the like.

As the electrically conductive substrate for the present invention any electrically conductive substrate used in a conventional photosensitive member may be used. Examples of such substrate are a metal plate, drum and the like made of, for instance, aluminum, aluminum alloy and the like; a plate, for instance, made of tin oxide, indium oxide and the like; a plastic film, a plate, a sheet, a paper and the like on which thin layer of the metal or metal oxide as aforementioned is formed by vacuum deposition, sputtering, laminating, coating and the like.

The photosensitive member of the present invention may be furnished with one or more adhesive or barrier layer(s) of casein, polyvinyl alcohol, polyvinyl acetate, polyamide and the like between the substrate and the CTL as a conventional photosensitive member.

The photosensitive member composed of a photosensitive layer consisting of a CTL and a CGL, a semiconductive charge acceptance layer and an electrically insulating surface protective layer on an electrically conductive substrate are prepared by laminating on the substrate a CTL, a CGL, an charge acceptance layer and a surface protecting layer, and has a sensitivity at positive charge.

The present invention is illustrated according to the Examples, but it should not be construed restrictive to the Examples.

EXAMPLE 1

On an aluminum drum as an electrically conductive substrate a CTL, a CGL, a charge acceptance layer and a surface protective layer were laminated in this order according to the following manner.

In methylene chloride 9 parts by weight 1,1-bis(p-diethylaminophenyl)-4,4-diphenyl-1,3-butadiene one part by weight and polycarbonate (Trade name: Novarex 7030A, available from Mitsubishi Chemical Industries Ltd.) one part by weight were dissolved, into which the aluminum drum was immersed, and then dried at 80 °C for one hour to give a drum coated with a CTL of 25 μm thick.

In s-butyl alcohol 115 parts by weight τ type metal free phthalocyanine (available from Toyo Ink Mfg. Co., Ltd.) 5 parts by weight, acrylic resin (Trade Name: Dianal HR664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight, and melamine resin (Trade Name: Super Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight were dispersed. The CTL coated drum obtained above was immersed into the dispersion, taken out, and then dried at 120 °C for one hour to give a CGL coated drum. The thickness of the CGL is 0.2 µm .

In s-butyl alcohol 115 parts by weight Dibromanthanthrone (available from ICI Japan) 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Super Beckamine L145 - 60) one part by weight were dispersed to prepare a dispersion for a charge acceptance layer. The CGL coated drum was immersed into the dispersion, taken out from the dispersion, and then dried at 120 °C for one hour to give a drum coated with a charge acceptance layer (referred to as a CAL coated drum). The thickness of the charge acceptance layer formed is 0.5 µm.

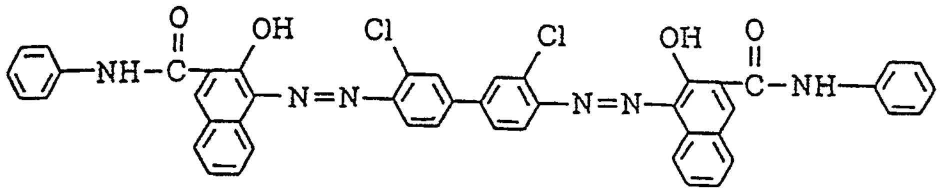
In n-butyl alcohol 115 parts by weight thermocurable silicone resin (Trade Name: Tosgard 520, available from Toshiba Silicone K.K.) 7 parts by weight and urethane elastomer (Trade Name: Orester NL 2249E) 3 parts by weight were dissolved to give a solution. The CAL coated drum was immersed into the solution, taken out therefrom, and cured at 120 °C for one hour to give a phtosensitive member with a surface protective layer of 1 µm thick.

The electrophotosensitive member thus obtained was tested of the properties using a test devise as illustrated in Fig. 3, in which 301 is a photosensitive drum, 302 a corona charger, 303 a surface charge gauge probe A, 304 and 307 tungsten lumps, 305 an interference filter (800 nm), 306 a surface charge gauge probe B, and 308 a color glass filter (ultraviolet screen). The electric potential Vo after charging was determined by the charge gauge probe A 303, and the potential VL after exposing by the probe B 306. As a surface charge gauge was used Model 344 available from Trek, Inc.. the light volume was 3 µJ/cm^2 at 800 nm. The same determination was made after 100 reptitions of cycle of the charging, exposing and erasing at the rate of 0.8 second per one cycle.

The photosensitive member thus obtained was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after the 100 repetitions.

EXAMPLE 2

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CAL was prepared using a dispersion of Chlorodian Blue of the formula I as an azo pigment 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight. The thickness of the CAL was 0.5 µm.

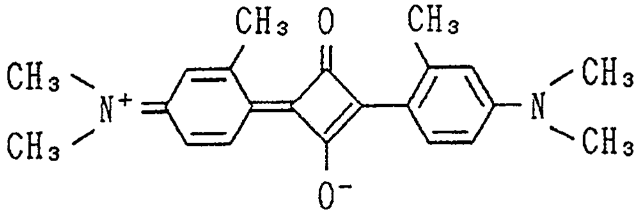


[I]

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after the repetitions.

EXAMPLE 3

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CAL was prepared using a dispersion of squarillium salt of the formula II as a squarillium pigment 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight. The thickness of the CAL was 0.5 µm.

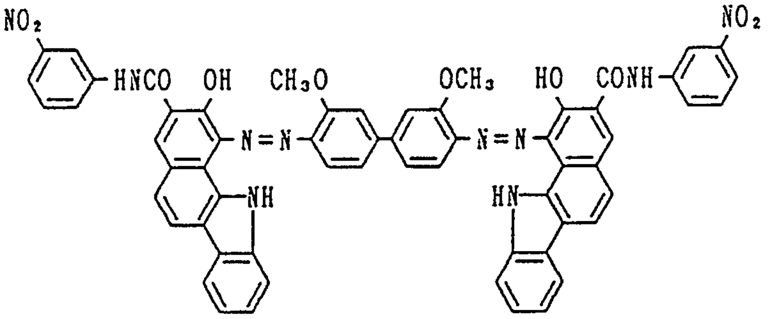

[II]

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 4

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing a drum with a CTL into a dispersion of dimethoxybiphenyl bis-azo pigment represented by the formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one parts by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).


[III]

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of Dibrom-anthanthrone (available from ICI Japan) 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 5

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing the drum with a CTL into a dispersion of dimethoxybiphenyl bis-azo pigment represented by the Formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one parts by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of Chlorodian Blue (Formula I) 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 6

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing the drum with a CTL into a dispersion of dimethoxybiphenyl bis-azo pigment represented by the formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one parts by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of squarillium salts represented by the Formula II 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 7

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing a drum with the CTL into a dispersion of Dibrom-anthanthrone (available from ICI Japan) 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one parts by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of dimethoxy biphenyl bis-azo pigment represented by the Formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The electrophotosensitive member thus obtained was tested of the properties using a test devise as illustrated in Fig. 3. The electric potential Vo after charging was determined by the charge gauge probe A 303, and the potential VL after exposing by the probe B 306. As a surface charge gauge was used Model 344 available from Trek, Inc.. The exposure was carried out under the light volume of 10 lux without the interference filter. The same determination was made after 100 repetitions of cycle of the charging, exposing and erasing at the rate of 0.8 second a cycle.

The photosensitive member thus obtained was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 8

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing a drum with the CTL into a dispersion of Chlorodian Blue represented by the Formula I 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one parts by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of dimethoxy biphenyl bis-azo pigment represented by the Formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 9

A photosensitive member was prepared according to the same manner as in the Example 1 except that a CGL and a CAL were formed according to the following manner.

The CGL was prepared by immersing a drum with a CTL into a dispersion of squarillium pigment represented by the Formula II 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying it at 120 °C for one hour (thickness of 0.2 µm).

The CAL was prepared by immersing the CGL coated drum obtained above into a dispersion of dimethoxy biphenyl bis-azo pigment represented by the Formula III 5 parts by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine, available from Dainippon Ink and Chemicals, Inc.) one part by weight in s-butyl alcohol 115 parts by weight, taking it out from the dispersion, and drying at 120 °C for one hour (the thickness of CAL being 0.5 µm).

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 10

A photosensitive member was prepared according to the same manner as in the Example 1 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 1.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

Example 11

A photosensitive member was prepared according to the same manner as in the Example 2 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 2.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 12

A photosensitive member was prepared according to the same manner as in the Example 3 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 3.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 13

A photosensitive member was prepared according to the same manner as in the Example 4 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 4.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 14

A photosensitive member was prepared according to the same manner as in the Example 5 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 5.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 15

A photosensitive member was prepared according to the same manner as in the Example 6 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 6.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 16

A photosensitive member was prepared according to the same manner as in the Example 7 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 7.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 17

A photosensitive member was prepared according to the same manner as in the Example 8 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine

L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 8.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 18

A photosensitive member was prepared according to the same manner as in the Example 9 except that as the binder resins for the CGL and the CAL were used butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 9.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 19

A photosensitive member was prepared according to the same manner as in the Example 1 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 1.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 20

A photosensitive member was prepared according to the same manner as in the Example 2 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 2.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 21

A photosensitive member was prepared according to the same manner as in the Example 3 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 3.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties affer 100 repetitions.

EXAMPLE 22

A photosensitive member was prepared according to the same manner as in the Example 4 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 4.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 23

A photosensitive member was prepared according to the same manner as in the Example 5 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 5.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 24

A photosensitive member was prepared according to the same manner as in the Example 6 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 6.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 25

A photosensitive member was prepared according to the same manner as in the Example 7 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 7.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 26

A photosensitive member was prepared according to the same manner as in the Example 8 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 8.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 27

A photosensitive member was prepared according to the same manner as in the Example 9 except that as the binder resins for the CGL and the CAL were used fluoro-resin containing copolymers of fluoroolefin and alkyl vinyl ether as a main component 2 parts by weight, butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) 2 parts by weight and melamine resin (Trade Name: Supper Beckamine L145-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight instead of the acrylic resin and the melamine resin in the Example 9.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 28

A photosensitive member was prepared according to the same manner as in the Example 1 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1μ m.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 29

A photosensitive member was prepared according to the same manner as in the Example 2 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 μm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 30

A photosensitive member was prepared according to the same manner as in the Example 3 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 μm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 31

A photosensitive member was prepared according to the same manner as in the Example 4 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 μm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 32

A photosensitive member was prepared according to the same manner as in the Example 5 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available-from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 µm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 33

A photosensitive member was prepared according to the same manner as in the Example 6 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 µm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 34

A photosensitive member was prepared according to the same manner as in the Example 7 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 µm.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 35

A photosensitive member was prepared according to the same manner as in the Example 8 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 µm.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 36

A photosensitive member was prepared according to the same manner as in the Example 9 except that an adhesive layer was provided between the aluminum drum and the CTL. The adhesive layer was prepared by immersing the aluminum drum into a solution of butyral resin (Trade Name: S-Lecs BL-1, available from Sekisui Kagaku Kogyo K.K.) one part by weight in a mixed solvent of toluene 10 parts by weight and ethanol 10 parts by weight, taking it up, and then drying at 100 °C for one hour. The thickness of the adhesive layer was 0.1 µm.

The photosensitive member obtained was tested according to the Example 7, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

EXAMPLE 37

A photosensitive member was prepared according to the same manner as in the Example 1 except that an electrical conductive layer was provided between the aluminum drum and the CTL. The electrical conductive layer was prepared by immersing the aluminum drum into a dispersion of tin oxide type electrical conductive material (Trade Name: T-1, available from Mitsubishi Kinzoku K.K.) one part by weight, acrylic resin (Trade Name: Dianal HR 664, available from Mitsubishi Rayon Co., Ltd.) 4 parts by weight and melamine resin (Trade Name: Supper Beckamine G-821-60, available from Dainippon Ink and Chemicals, Inc.) one part by weight in xylene/cyclohexanone/butanol mixed solvent 7 parts by weight, taking it up, and then drying at 150 °C for 30 minutes. The thickness of the electrically conductive layer thus obtained was 15 μm.

The photosensitive member obtained was tested according to the Example 1, and was not so remarkably affected by temperature and moisture, and showed comparatively stable properties after 100 repetitions.

COMPARATIVE EXAMPLE 1

An electrophotosensitive member was prepared according to the same manner as in the Example 1 except that the CAL was not provided.

It was tested according to the Example 1, and was remarkably influenced in the properties as an electrophotosensitive member by the temperature and moisture. It is comparatively stable to the repeat of use under high temperature and high humidity, but unstable under low temperature and low moisture, and showed an electrical potential after exposure higher than twice of the initial when used ten times, and higher than 4 times before 100 times repetition under such a condition.

COMPARATIVE EXAMPLE 2

An electrophotosensitive member was prepared according to the same manner as in the Example 1 except that a binder resin alone was coated instead of the CAL.

It was tested according to the Example 1, and was remarkably influenced in the properties as an electrophotosensitive member by the temperature and moisture. It is comparatively stable to the repeat of use under high temperature and humidity, but showed an electrical potential after exposure higher than twice of the initial after ten times repetition, and higher than 4 times before 100 times repetition under low temperature and low moisture.

Claims

1. An electrophotosensitive member comprising a photosensitive layer, a charge acceptance layer and a surface protective layer in this order on an electrically conductive substrate wherein the charge acceptance layer is a semiconductive layer and the surface protective layer is an electrically insulating layer.

2. An electrophotosensitive member of the Claim 1, in which the photosensitive layer is formed by laminating a charge transporting layer and a charge generating layer in this order on the electrically conductive substrate.

3. An electrophotosensitive member of the Claim 1, in which the surface protective layer contains a thermocurable silicone resin and an urethane elastomer.

4. An electrophotosensitive member of the Claim 1, in which the charge acceptance layer contains pigments selected from the group consisting of Diane Blue type pigment, Squarillium type pigment and Bis-azo type pigment.

Fig. 1

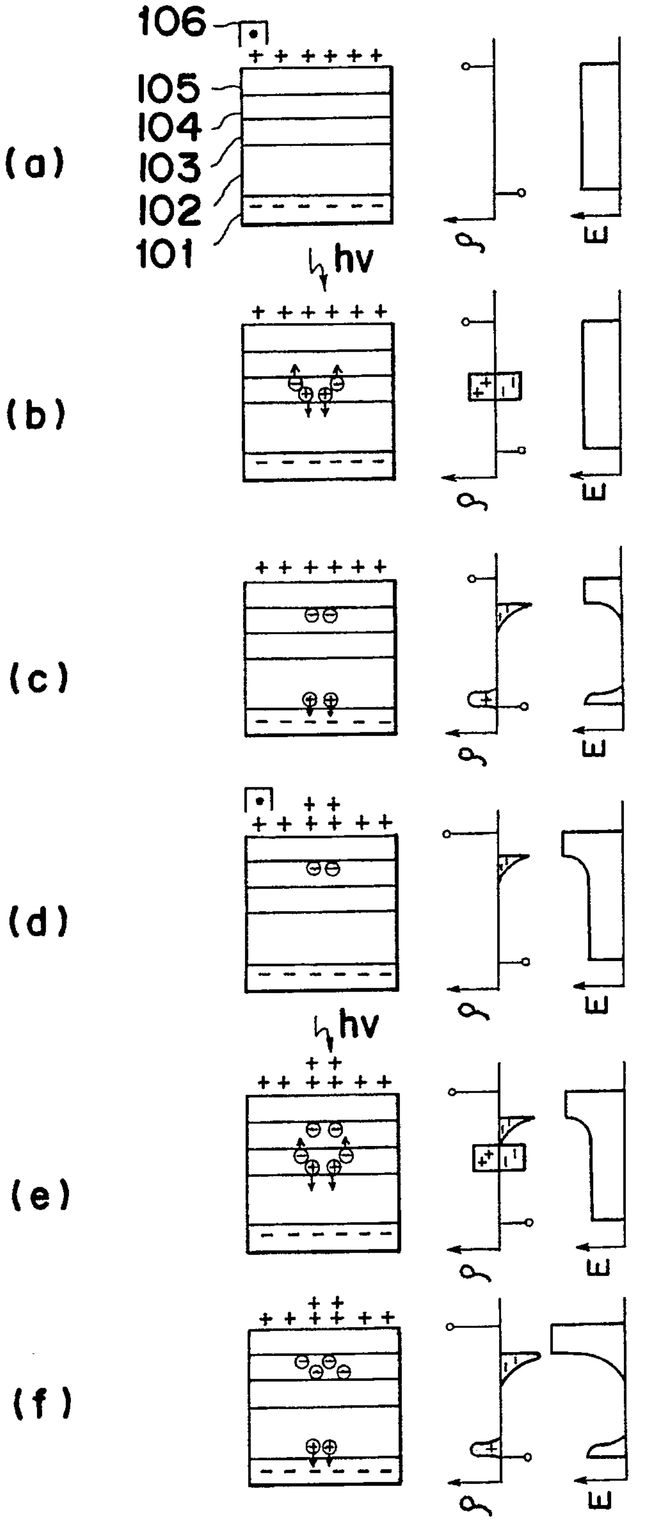


Fig. 2

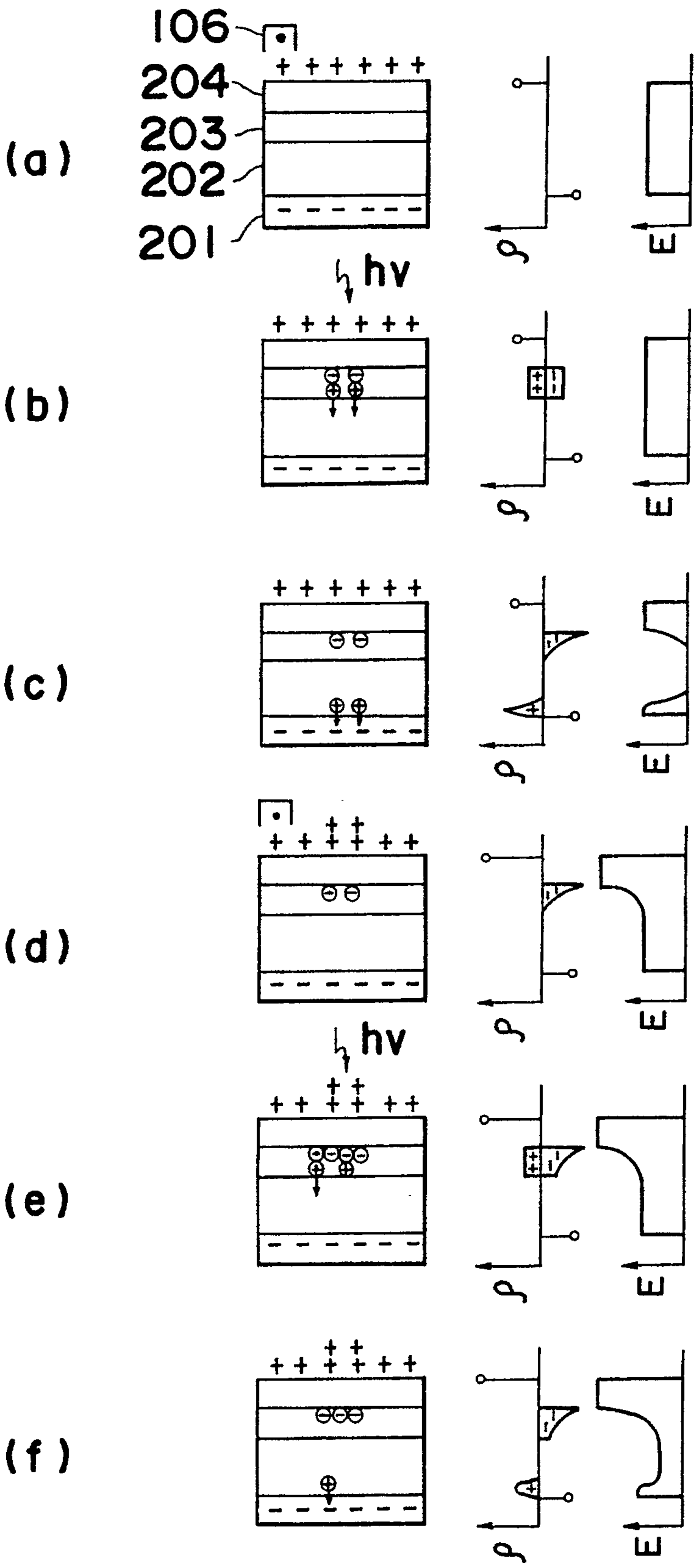
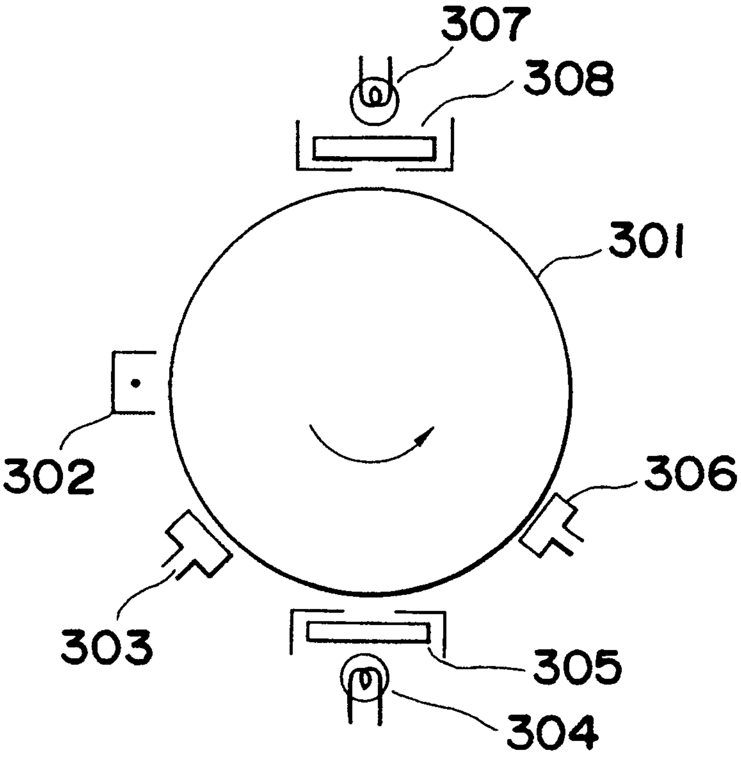


Fig . 3



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EUROPEAN SEARCH REPORT

Application Number

EP 91 10 3642

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	GB-A-2 070 797 (XEROX) * page 3, lines 13 - 19 * * page 3, line 34 * * page 3, line 54; figure 1 * – – –	1,2	G 03 G 5/147 G 03 G 5/043
X	GB-A-2 219 867 (FUJI) * page 3, paragraph 6 - page 5, paragraph 1; figure 1 * * claims 1, 6, 7, 19 * – – –	1-3	
X	EP-A-0 014 061 (XEROX) * abstract * * page 10, paragraph 2; claim 1; figure 1A * – – –	1,2	
A	PATENT ABSTRACTS OF JAPAN vol. 13, no. 96 (P-839)(3444) 07 March 1989, & JP-A-63 278066 (MINOLTA) 15 November 1988, * the whole document * – – –	1-3	
A	PATENT ABSTRACTS OF JAPAN vol. 11, no. 391 (P-649)(2838) 22 December 1987, & JP-A-62 157046 (KONISHIROKU) 13 July 1987, * the whole document * – – –	1-3	TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	DE-A-3 825 034 (KONICA) * abstract; claims 1, 2 * * page 5, lines 18 - 20 * – – – – –	1-3	G 03 G

The present search report has been drawn up for all claims

Place of search	Date of completion of search	Examiner
The Hague	30 July 91	VOGT C.H.C.

CATEGORY OF CITED DOCUMENTS

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