Appeal Decision

Appeal No. 2020-15147

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2018-553617, entitled "PHOTOSENSITIVE ELEMENT, METHOD FOR FORMING RESIST PATTERN, AND METHOD FOR PRODUCING PRINTED WIRING BOARD" (International publication No. WO2018/100730 published on June 7, 2018) has resulted in the following appeal decision:

Conclusion

The appeal of the case was groundless.

Reason

No. 1 History of the procedures

Japanese Patent Application No. 2018-553617 (hereinafter, referred to as "the present application") was originally filed on December 2, 2016 as an International Patent Application and the history of the procedures is as follows:

As of October 23, 2019 : Notification of reasons for refusal
As of January 20, 2020 : Written opinion
As of January 20, 2020 : Written amendment
As of April 21, 2020 : Notification of reasons for refusal

As of June 23, 2020 : Written opinion
As of September 7, 2020 : Decision of refusal (hereinafter, referred to as "Examiner's decision")
As of October 30, 2020 : Written demand for trial
As of October 30, 2020 : Written amendment
As of April 19, 2021 : Written statement

No. 2 Decision to dismiss amendment
[Conclusion of decision to dismiss amendment]
The amendment made on October 30, 2020 (hereinafter, referred to as "the Amendment") shall be dismissed.

[Reason]
1 Regarding the Amendment
(1) Claims before the Amendment
Claim 1 of the scope of claims before the Amendment (after the written amendment made on January 20, 2020) states as follows:
"A photosensitive element comprising a support film and a photosensitive layer disposed on the support film, wherein
the photosensitive layer comprises a binder polymer, a photopolymerizable compound having an ethylenically unsaturated bond, and a photopolymerization initiator, wherein
the number of defects having a maximum diameter of 2 μm or more on the surface of the support film facing photosensitive layer is 30 or less per 2 mm^2."

(2) Claims after the Amendment
Claim 1 of the scope of claims after the Amendment states as follows (underlines indicate amended portions):
"A photosensitive element comprising a support film and a photosensitive layer disposed on the support film, wherein
the photosensitive layer comprises a binder polymer, a photopolymerizable compound having an ethylenically unsaturated bond, and a photopolymerization initiator, wherein
the number of defects having a maximum diameter of 2 μm or more on the surface of the support film facing photosensitive layer is 30 or less per 2 mm^2 (excluding a photosensitive element comprising a support film and a photosensitive

layer consisting of a photosensitive resin composition formed on the support film, wherein the support film has a haze of 0.01 to 1.5%, the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D))."

(3) Details of the Amendment

The Amendment is an amendment excluding the underlined aspect from the scope of the invention recited in Claim 1 before the Amendment. Also, the invention recited in Claim 1 before the Amendment and the invention recited in Claim 1 after the Amendment are identical in light of the field of industrial application and the problems to be solved ([0001] and [0008] of the description of the Application).

Therefore, the Amendment falls under the provisions of Article 17-2(3) of the Patent Act and aims at the matters prescribed in Article 17-2(5)(ii) of the Patent Act (the restriction of the scope of claims).

Then, we will examine as follows whether or not the invention recited in Claim 1 after the Amendment (hereinafter, referred to as "the Amended Invention") falls under the provisions of Article 126(7) of the Patent Act, which is applied mutatis mutandis pursuant to Article 126(7) of the Patent Act (whether or not it is independently patentable at the time of filing of the patent application).

2 Judgment on independent requirements for patentability

(1) Statements in Cited Document 2

Cited Document 2 (Japanese Unexamined Patent Application Publication No. 2009-186780) cited in the reasons for refusal stated in the examiner's decision is a publication that had been distributed in Japan or a foreign country prior to the filing of the Application and states as below. The underlines are created by the collegial body, and indicate the parts used for the recognition of the Cited Invention, judgment, etc.

A "[Scope of Claims]

[Claim 1]

A photosensitive element comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film, wherein

the support film has a haze of 0.01 to 1.5%,

the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D).

... Omitted ...

[Claim 3]

The photosensitive element of Claim 1 or 2, wherein the photosensitive layer has a film thickness of 3 to 30 μm."

B "[Technical Field]

[0001]

The present invention relates to a photosensitive element and a method for forming a resist pattern and method for producing a printed wiring board using the same.

[Background Art]

[0002]

Heretofore, in the field of producing printed wiring boards and the field of precision processing of metals, a widely used resist material for etching, plating, etc. is a photosensitive element composed of a layer made of photosensitive resin composition (hereinafter referred to as "photosensitive layer"), a support film, and a protective film.

... Omitted ...

[0006]

Normally, the formation of a resist using a photosensitive element is carried out by laminating a photosensitive layer on a substrate and then exposing it to light without peeling off the support film. ... Omitted ... For applying the photosensitive resin composition on the support film with a uniform thickness and good yield, the support film is required to have a certain thickness (generally 10 μm to 30 μm). In addition, for improving the productivity of the support film, or improving the winding property of the support film, the support film generally contains inorganic or organic fine particles. Therefore, an increase in haze value as well as light scattering caused during exposure due to the fine particles contained in the support film tends to make the conventional support film to unable to meet the demand for higher resolution of the photosensitive film.

... Omitted ...

[0009]

On the other hand, a semi-additive method is one of useful methods for producing printed wiring boards, which have become denser in recent years. The characteristics required for the resist in this method include adhesion, resolution, resist shape after development, flexibility, and peelability after plating. This semi-additive method includes a step of passing an electric current for a long time in a high-concentration chemical solution and has problems that the adhesion of the resist on the thin wire portion is lowered and plating burrs are generated.

[0010]

Therefore, as a means for improving the adhesion, a method of adding an adhesion-imparting agent to a photosensitive layer has been proposed.

... Omitted ...

[Problem to be solved by the invention]

[0012]

... Omitted ...

[0013]

Furthermore, as a result of studies by the present inventors, it has been found that the means stated in Patent Document 9 or 10 causes a hole of about 1 μm (hereinafter, referred to as a "sidewall pit") on the side surface of the resist after development as the thickness of the photosensitive layer is reduced and as the characteristics such as the resolution of the photosensitive resin composition are improved, although the resolution and the resist shape, such as side knurls, are improved. Especially in the case of the semi-additive method, the resist shape after development is transferred to the plating line shape as it is, making the sidewall pit cause a protrusion on the side surface of the plating line and becoming a problem of lowering the producing yield of printed wiring boards.

... Omitted ...

[0018]

The present invention has been made in view of the above circumstances, and intends to provide a photosensitive element having excellent adhesion and resolution and capable of minimizing the occurrence of sidewall pits and forming a resist pattern without side knurls, and to provide a method for forming a resist pattern and method for producing printed wiring board using the same."

C "[Means for solving the problem]

[0019]

For solving the above problem, the present invention provides a photosensitive element comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film, wherein the support film has a haze of 0.01 to 1.5%, the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D).

[0020]

The present inventors have found that the occurrence of sidewall pits, which is a problem in high-resolution resist patterns, is reduced by incorporating an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule as the adhesion imparting agent (D) in the photosensitive layer. In addition, the present inventors have completed the present invention by finding out that the haze of the support film is sufficiently reduced to 0.01 to 1.5% and both adhesion and resolution can be achieved at high levels in addition to improving the side knurls of the resist by allowing a photosensitive layer to comprise a 2,4,5-triarylimidazole dimer as a photopolymerization initiator (C) and an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule as the adhesion imparting agent (D).

[0021]

Furthermore, in the photosensitive element of the present invention, the photosensitive layer preferably further comprises as the adhesion imparting agent (D) one or more heterocyclic compounds selected from the group consisting of (b) triazoles, tetraazoles, and imidazoles. This makes it possible to form a resist pattern having higher adhesion.

[0022]

Furthermore, in the photosensitive element of the present invention, the above photosensitive layer consisting of the above photosensitive resin composition preferably has a film thickness of 3 to 30 μm. By setting the film thickness within this range, a resist pattern with higher resolution can be formed after development.

... Omitted ...

[Advantage of the Invention]

[0028]

According to the invention, a photosensitive element having excellent adhesion and resolution and capable of minimizing the occurrence of sidewall pits and forming a resist pattern without side knurls can be provided. In other words, according to such a photosensitive element, it is possible to obtain a good plating line shape with high definition and no protrusions on the surface without causing plating burrs in the subsequent steps, such as plating treatment, allowing the production yield of the printed wiring board to be improved. Furthermore, the present invention can provide a method for forming a resist pattern and a method for producing a printed wiring board, which use the above photosensitive element of the present invention."

D "[Best Mode for Carrying Out the Invention]

[0029]

... Omitted ...

[0030]

FIG. 1 is a schematic cross-sectional view illustrating a preferred embodiment of the photosensitive element of the present invention. The photosensitive element 1 shown in FIG. 1 is composed of a support film 10 and a photosensitive layer 20. The photosensitive layer 20 is provided on the first main surface 12 of the support film 10. Further, the support film 10 has a second main surface 14 on the side opposite the first main surface 12.

[0031]

(Support film)

The support film 10 of the present invention has a haze of 0.01 to 1.5%, more preferably 0.01 to 1.3%, still more preferably 0.01 to 1.0%, particularly preferably 0.01 to 0.8%, and extremely preferably 0.01 to 0.6%. If this haze is less than 0.01%, the ease of manufacture tends to be inferior. If this haze exceeds 1.5%, the sensitivity and resolution will deteriorate and the side knurls of the resist will tend to occur. The haze in the present invention was measured according to JIS K7105. Here, "haze" means turbidity, or a value measured using a commercially available turbidity indicator (turbidimeter) in accordance with the method specified in JIS K7105. For example, haze can be measured with a commercially available turbidimeter, such as NDH-1001DP (manufactured by Nippon Denshoku Industries Co., Ltd., trade name).

[0032]

The support film 10 is not particularly limited as long as it can support the photosensitive layer 20, and examples thereof include films containing resin materials,

such as polyethylene terephthalate, polypropylene, polyethylene, and polyester. A film containing two or more of these resin materials may also be used. As the resin material, polyethylene terephthalate is particularly preferable.

[0033]

The support film 10 has a thickness of, but not particularly limited to, preferably 5 to 40 μm, more preferably 8 to 35 μm, further preferably 10 to 30 μm, and particularly preferably 12 to 25 μm. If the thickness is less than 5 μm, the support film 10 tends to be easily torn when the support film 10 is peeled from the photosensitive element 1. Further, when the thickness exceeds 40 μm, the resolution tends to decrease and the cost tends to be difficult to lower.

[0034]

Further, the support film 10 is not particularly limited in its production method, and may be a single layer or a multilayer. For example, when a two-layer support film composed of two layers is used, it is preferred that the support film may be a two-layer film formed by laminating a resin layer containing fine particles on one surface of a biaxially oriented polyester film and forming a photosensitive layer on the surface opposite to the surface on which the resin layer containing the fine particles is formed. Alternatively, the support film may be a multi-layer support film composed of three layers (for example, layer A/layer B/layer A). The multi-layer support film is preferably configured such that the outermost layer (layer A in the case of the above three layers) is a resin layer containing fine particles, from the viewpoint of film slipperiness and the like, but is not particularly limited thereto.

... Omitted ...

[0036]

The average particle size of the fine particles is preferably 0.1 to 10 times, more preferably 0.2 to 5 times the layer thickness of the resin layer containing the fine particles. If the average particle size is less than 0.1 times, the slipperiness tends to be inferior, and if it exceeds 10 times, the photosensitive layer tends to be particularly uneven.

... Omitted ...

[0039]

From the viewpoint of resolution, the resin layer containing the fine particles has a film thickness of preferably 0.01 to 5 μm, more preferably 0.05 to 3 μm, and further preferably 0.1 to 2 μm. The surface of the outermost layer that does not face the intermediate layer preferably has a coefficient of static friction of 1.2 or less. If the coefficient of static friction exceeds 1.2, wrinkles are likely to occur during film

production and photosensitive element production and static electricity is likely to be generated. As a result, dust tends to adhere easily.

... Omitted ...

[0040]

In the support film 10 of the present invention, the number of particles and agglomerates having a diameter of 5 μm or more (hereinafter, simply referred to as "particles or the like") contained in the support film 10 is preferably 5 particles/mm^2 or less, more preferably 3 particles/mm^2 or less, more preferably 1 particle/mm^2 or less. If the number of these particles or the like exceeds 5 particles/mm^2, a partial defect (resist chipping) of the resist pattern after exposure and development is likely to occur. If such a photosensitive element is used for a printed wiring board, it may contribute to the occurrence of open defects during etching and short defects during plating. Thus, the production yield of printed wiring boards tends to decrease.

[0041]

Patent Documents 9 and 10 specify a two-layer support film containing inorganic or organic fine particles having an average particle size of about 0.01 to 5 μm. However, the present inventors have found that, in practice, a large number of particles having a diameter of 5 μm or more and less than 20 μm are contained in the support film (according to the investigation by the present inventors, 20 particles/mm^2 or more). Use of such a support film in the field of printed wiring boards where high density is required causes light scattering of active rays irradiated at the time of exposure, resulting in difficulty for the active rays to reach the photosensitive layer. Therefore, a partial defect of the resist pattern (resist chipping) after development may affect the decrease in production yield.

... Omitted ...

[0043]

Incidentally, the fine particles contained in the resin layer described above have a particle size of preferably less than 5 μm to reduce the number of particles, etc. with a diameter of 5 μm or more contained in the support film 10 to 5 particles/mm^2 or less. Then, it is preferable to appropriately adjust the layer thickness of the resin layer containing the fine particles in line with the particle size of the fine particles to further reduce light scattering during exposure.

[0044]

As the support film 10, one that can be used as a support film for the photosensitive element 1 may be obtained from commercially available general industrial films and then appropriately processed. Commercially available general

industrial films that can be used as support film 10 include, for example, polyethylene terephthalate films "QS-48" (manufactured by Toray Industries, Inc., trade name), "HTF-01" (Teijin DuPont Film Co., Ltd., product name), "A-1517" and "A2100-16" (manufactured by Toyobo Co., Ltd., product name), and "R-340G" (Mitsubishi Chemical Polyester Film Co., Ltd., product name). Above all, "QS-48" (manufactured by Toray Industries, Inc., trade name) is preferable from the viewpoint of reducing the number of particles, etc. having a diameter of 5 μm or more contained in the support film to 5 particles/mm^2 or less.

... Omitted ...

[0046]

(photosensitive layer)

The photosensitive layer 20 is a layer made of a photosensitive resin composition. The photosensitive resin composition that composes the photosensitive layer 20 comprises: (A) a carboxyl group-containing binder polymer (hereinafter, occasionally referred to as "the component (A)"); (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule (hereinafter, occasionally referred to as "the component (B)"); (C) a photopolymerization initiator (hereinafter, occasionally referred to as "the component (C)"); and (D) an adhesion imparting agent (hereinafter, occasionally referred to as "the component (D)"). In addition, 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D) (hereinafter, occasionally referred to as "the component (a)").

[0047]

Furthermore, the photosensitive resin composition, which composes the photosensitive layer 20, preferably further comprises as the adhesion imparting agent (D) one or two or more heterocyclic compounds selected from the group consisting of (b) triazoles, tetraazoles, and imidazoles (hereinafter, occasionally referred to as "component (b)").

... Omitted ...

[0056]

Examples of the photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, which is the component (B), include: a compound obtained by reacting a polyhydric alcohol with an α, β-unsaturated carboxylic acid; a bisphenol A-based (meth) acrylate compound; a compound obtained by reacting a glycidyl group-containing compound with an α, β-unsaturated carboxylic

acid; urethane monomers, such as (meth) acrylate compounds with urethane bonds; γ-chloro-β-hydroxypropyl-β'-(meth) acryloyloxyethyl-o-phthalate; β-hydroxyethyl-β'-(meth) acryloyloxyethyl-o-phthalate; β-hydroxypropyl-β'-(meth) acryloyloxyethyl-o-phthalate; and (meth) acrylic acid alkyl ester.

... Omitted ...

[0097]

The photopolymerization initiator (C) contains 2,4,5-triarylimidazole dimer as an essential component. Examples of the 2,4,5-triarylimidazole dimer include 2-(o-chlorophenyl)-4,5-diphenylimidazole dimer ... omitted .... Among them, from the viewpoint of further improving adhesion and sensitivity, 2-(o-chlorophenyl)-4,5-diphenylimidazole dimer is preferred.

... Omitted ...

[0099]

The content ratio of 2,4,5-triarylimidazole dimer to the total amount of the component (C) in the present invention is preferably 70 to 100% by mass, more preferably 85 to 100% by mass, further preferably 90 to 100% by mass, and particularly preferably 93 to 100% by mass. Containing 2,4,5-triarylimidazole dimer in this ratio imparts better adhesion and sensitivity to the photosensitive element of the present invention.

[0100]

Furthermore, as the photopolymerization initiator as the component (C), other photopolymerization initiators may be used in addition to the above 2,4,5-triarylimidazole dimer. Examples of other photopolymerization initiators include aromatic ketones, p-aminophenyl ketones, quinones, benzoin ether compounds, benzoin compounds, benzyl derivatives, acridine derivatives, coumarin compounds, oxime esters, N-aryl-α-amino acid compounds, aliphatic polyfunctional thiol compounds, acylphosphine oxides, thioxanthones, and tertiary amine compounds. These compounds may be used in combination.

... Omitted ...

[0116]

As the photopolymerization initiator (C) of the present invention, the above aromatic ketones are preferably contained in addition to 2,4,5-triarylimidazole dimer. Among them, N, N'-tetraethyl-4,4'-diaminobenzophenone (Michler's ketone) is preferably contained.

[0117]

The adhesion imparting agent (D) contains (a) an aliphatic carboxylic acid

compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule as an essential component.

... Omitted ...

[0121]

As the component (D), it is preferable to further contain one or more heterocyclic compounds selected from the group consisting of (b) triazoles, tetraazoles, and imidazoles.

... Omitted ...

[0128]

The content of the photopolymerization initiator as the component (C) is preferably 0.1 to 20 parts by mass, more preferably 0.15 to 10 parts by mass, and particularly preferably 0.2 to 5 parts by mass based on 100 parts by mass of the total amount of the components (A) and (B). If this content is less than 0.1 parts by mass, the light sensitivity tends to be insufficient, and if it exceeds 20 parts by mass, the light absorption on the surface of the photosensitive resin composition increases during exposure, and as a result the internal photocuring tends to be inadequate.

[0129]

The content of the component (a) of the adhesion imparting agent as the component (D) is preferably 0.0005 to 1 part by mass, more preferably 0.001 to 0.7 parts by mass, further preferably 0.01 to 0.5 parts by mass, and particularly preferably 0.05 to 0.3 parts by mass with respect to 100 parts by mass of the total amount of the components (A) and (B). When the content of the component (a) is within this range, the adhesion and peelability between the metal surface and the resist can be improved in a well-balanced manner.

... Omitted ...

[0135]

The photosensitive layer 20 in the photosensitive element 1 of the present invention can be formed by applying the above photosensitive resin composition on the support film 10 and removing a solvent therefrom.

... Omitted ...

[0136]

The thickness of the photosensitive layer 20 formed in this manner is preferably 3 to 30 μm, more preferably 5 to 25 μm, further preferably 7 to 25 μm, and particularly preferably about 10 to 20 μm. If this thickness is less than 3 μm, problems are likely to occur when the photosensitive layer is laminated on the circuit forming substrate. Alternatively, in that case, the tenting property is inferior, and the resist may be

damaged during the developing and etching steps, which may contribute to an open defect. As a result, the production yield of the printed wiring board tends to decrease. On the other hand, if the thickness exceeds 30 μm, the resolution of the photosensitive layer 20 deteriorates or the spreading of the etching solution deteriorates. As a result, the influence of side etching becomes large, and as a result the production of a high-density printed wiring board tends to be difficult.

... Omitted ...

[0152]

(Method for producing semiconductor package substrate)

The photosensitive element 1 of the present invention can also be used for a package substrate including a rigid substrate and an insulating film formed on the rigid substrate.

... Omitted ...

[0153]

This solder resist is effective as a permanent mask for semiconductor packages because it also serves as a protective film for wiring after soldering to the substrate and has excellent physical characteristics, such as tensile strength, as well as excellent elongation and thermal shock resistance."

E "[Examples]

[0156]

... Omitted ...

[0157]

[Examples 1 to 18 and Comparative Examples 1 to 5]

(Preparation of photosensitive resin composition solution)

The basic solution of photosensitive resin composition was prepared by blending the respective components shown in Table 1 below.

[0158]

[Table 1]

材料		基本溶液(1) 配合量 [g]	基本溶液(2) 配合量 [g]
(A)成分	メタクリル酸／メタクリル酸メチル／スチレン共重合体(質量比:25／30／25、重量平均分子量:50000、酸価:163mg KOH／g)の60質量%トルエン／メチルセルソルブ(質量比:6／4)溶液	150 (固形分60)	150 (固形分60)
(B)成分	2，2－ビス(4－(メタクリロキシペンタデカエトキシ)フェニルプロパン	30	30
	ノニルフェノキシポリエチレンオキシアクリレート(オキシレン単位の繰り返し数:8)	10	10
(C)成分	N，N'－テトラエチル－4，4'－ジアミノベンゾフェノン	0．15	0．03
	2－(o－クロロフェニル)－4，5－ジフェニルイミダゾール二量体	3．0	－
	1，7－ビス(9－アクリジニル)ヘプタン	－	0．2
その他成分	ロイコクリスタルバイオレット	0．5	0．5
	マラカイトグリーン	0．05	0．05
	4－ターシャリーブチルカテコール	0．025	0．025
溶剤	アセトン	5	5
	トルエン	10	10
	メタノール	5	5

材料 Materials

基本溶液（１） Basic solution (1)

配合量 Blending mount

基本溶液（２） Basic solution (2)

（Ａ）成分 Component (A)

メタクリル酸／メタクリル酸メチル／スチレン共重合体（質量比：２５／３０／２５、重量平均分子量：５００００、酸価：１６３ｍｇ　ＫＯＨ／ｇ）の６０質量％トルエン／メチルセルソルブ（質量比：６／４）溶液

Methacrylic acid/methyl methacrylate/styrene copolymer (mass ratio: 25/30/25, weight average molecular weight: 50,000, acid value: 163 mg, KOH/g) in 60 mass% toluene/methyl cellosolve (mass ratio: 6/4) solution

（固形分６０） (Solid content 60)

（Ｂ）成分 Component (B)

２，２－ビス（４－（メタクリロキシペンタデカエトキシ）フェニルプロパン　2,2-bis(4-(methacryloxy pentadecaethoxy) phenylpropane

ノニルフェノキシポリエチレンオキシアクリレート（オキシレン単位の繰り返し数：８） Nonylphenoxy polyethylene oxyacrylate (number of repetitions in oxirene units: 8)

（Ｃ）成分	Component (C)
Ｎ，Ｎ’－テトラエチル－４，４’－ジアミノベンゾフェノン	N, N'-tetraethyl-4,4'-diaminobenzophenone
２－（ｏ－クロロフェニル）－４，５－ジフェニルイミダゾール二量体	2-(o-Chlorophenyl)-4,5-diphenylimidazole dimer
１，７－ビス（９－アクリジニル）ヘプタン	1,7-bis (9-acridinyl) heptane
その他成分	Other components
ロイコクリスタルバイオレット	Leuco crystal violet
マラカイトグリーン	Malachite green
溶剤	Solvent
アセトン	Acetone
トルエン	Toluene
メタノール	Methanol

[0159]

The adhesion imparting agent, which is the component (D), was added to the above basic solution as needed as shown in Tables 2 to 5 below to give a photosensitive resin composition solution.

[0160]

(Preparation of photosensitive element)

Polyethylene terephthalate (hereinafter referred to as "PET") films shown in Tables 2 to 5 were prepared as support films for the photosensitive element. Tables 2 to 5 show the results of measuring haze and the number of particles of 5 μm or more in each PET film.

... Omitted ...

[0163]

In Tables 2 to 5, furthermore, HTR-02[*1] is a biaxially oriented polyethylene terephthalate film (manufactured by Teijin DuPont Co., Ltd., trade name) having a three-layer structure including front and back side layers containing fine particles; QS-48[*2] is a biaxially oriented polyethylene terephthalate film (manufactured by Toray Industries, Inc., trade name) having a three-layer structure including front and back side layers containing fine particles; and 1-[N,N-bis-(2-ethylhexyl)] aminomethylbenzotriazole-5-carboxylic acid[*3] is manufactured by Chiyoda Kagaku Co., Ltd.

... Omitted ...

[0171]

[Table 2]

項目			実施例1	実施例2	実施例3	実施例4	実施例5	実施例6
PETフィルム	商品名		QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2
	膜厚（μm）		16	16	16	16	16	16
	粒子等（個）		1	1	1	1	1	1
	ヘーズ値（%）		0.4	0.4	0.4	0.4	0.4	0.4
基本溶液			（1）	（1）	（1）	（1）	（1）	（1）
（D）成分	（a）成分	セバシン酸	0.1	0.1	0.5	0.5	-	0.5
		オクタデカン二酸	-	-	-	-	0.1	-
		オクタン酸	-	-	-	-	-	-
		エチレンジアミン四酢酸	-	-	-	-	-	-
		酒石酸	-	-	-	-	-	-
	（b）成分	カルボキシベンゾトリアゾール	0.1	0.5	0.1	0.5	0.1	-
		ベンゾトリアゾール	-	-	-	-	-	-
		3－アミノ－1，2，4－トリアゾール	-	-	-	-	-	-
		3－メルカプト－1，2，4－トリアゾール	-	-	-	-	-	-
		1－［N，N－ビス－（2－エチルヘキシル）］アミノメチルベンゾトリアゾール－5－カルボン酸*3	-	-	-	-	-	-
感光層の膜厚（μm）			15	15	15	15	15	15
最少現像時間（秒）			9	9	9	9	9	9
光感度（段）			5.0	5.0	5.0	5.0	5.0	5.0
サイドウォールピット発生数（個）			3	2	1	2	2	0
密着性（μm）			9	9	9	9	9	10
解像度（μm）			8	8	8	8	8	8
レジストパターンの側面ギザ性			浅い	浅い	浅い	浅い	浅い	浅い

1

項目 Item

実施例１	Example 1
実施例２	Example 2
実施例３	Example 3
実施例４	Example 4
実施例５	Example 5
実施例６	Example 6
ＰＥＴフィルム	PET film
商品名	Product name
膜厚	Film thickness
粒子等（個）	Particles, etc. (number of pieces)
ヘーズ値	Haze value
基本溶液	Basic solution
（Ｄ）成分	Component (D)
（ａ）成分	Component (a)
（ｂ）成分	Component (b)
セバシン酸	Sebacic acid
オクタデカン二酸	Octadecane diacid
オクタン酸	Octanoic acid
エチレンジアミン四酢酸	Ethylenediaminetetraacetic acid
酒石酸	Tartaric acid
カルボキシベンゾトリアゾール	Carboxybenzotriazole
ベンゾトリアゾール	Benzotriazole
３－アミノ－１，２，４－トリアゾール	3-amino-1,2,4-triazole
３－メルカブト－１，２，４－トリアゾール	3-mercapto-1,2,4-triazole
１－［Ｎ，Ｎ－ビス－（２－エチルヘキシル）］アミノメチルベンゾトリアゾール－５－カルボン酸[*3]	1-[N, N-bis(2-ethylhexyl)] aminomethylbenzotriazole-5-carboxylic acid[*3]
感光層の膜厚	Film thickness of photosensitive layer
最少現像時間（秒）	Minimum development time (seconds)
光感度（段）	Light sensitivity (stage)
サイドウォールビット発生数（個）	Number of sidewall bits generated (number of pieces)
密着性	Adhesion
解像度	Resolution
レジストパターンの側面ギザ性	Side knurling of resist pattern
浅い	Shallow

[0172]
[Table 3]

項目			実施例7	実施例8	実施例9	実施例10	実施例11	実施例12
PETフィルム	商品名		QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2
	膜厚（μm）		16	16	16	16	16	16
	粒子等（個）		1	1	1	1	1	1
	ヘーズ値（%）		0.4	0.4	0.4	0.4	0.4	0.4
基本溶液			（1）	（1）	（1）	（1）	（1）	（1）
（D）成分	（a）成分	セバシン酸	–	–	–	–	–	–
		オクタデカンニ酸	–	–	–	–	–	–
		オクタン酸	0.1	0.1	0.5	0.5	–	–
		エチレンジアミン四酢酸	–	–	–	–	0.1	0.1
		酒石酸	–	–	–	–	–	–
	（b）成分	カルボキシベンゾトリアゾール	–	–	–	–	–	–
		ベンゾトリアゾール	0.1	0.5	0.1	0.5	–	–
		3－アミノ－1，2，4－トリアゾール	–	–	–	–	0.1	0.5
		3－メルカプト－1，2，4－トリアゾール	–	–	–	–	–	–
		1－[N，N－ビス－（2－エチルヘキシル）]アミノメチルベンゾトリアゾール－5－カルボン酸*3	–	–	–	–	–	–
感光層の膜厚（μm）			15	15	15	15	15	15
最少現像時間（秒）			9	9	9	9	9	9
光感度（段）			5.0	5.0	5.0	5.0	5.0	5.0
サイドウォールピット発生数（個）			5	3	4	2	4	2
密着性（μm）			10	10	9	9	9	9
解像度（μm）			8	8	8	8	8	8
レジストパターンの側面ギザ性			浅い	浅い	浅い	浅い	浅い	浅い

項目 Item

実施例 7 Example 7

実施例８	Example 8
実施例９	Example 9
実施例１０	Example 10
実施例１１	Example 11
実施例１２	Example 12
ＰＥＴフィルム	PET film
商品名	Product name
膜厚	Film thickness
粒子等（個）	Particles, etc. (number of pieces)
ヘーズ値	Haze value
基本溶液	Basic solution
（Ｄ）成分	Component (D)
（ａ）成分	Component (a)
（ｂ）成分	Component (b)
セバシン酸	Sebacic acid
オクタデカン二酸	Octadecane diacid
オクタン酸	Octanoic acid
エチレンジアミン四酢酸	Ethylenediaminetetraacetic acid
酒石酸	Tartaric acid
カルボキシベンゾトリアゾール	Carboxybenzotriazole
ベンゾトリアゾール	Benzotriazole
３－アミノ－１，２，４－トリアゾール	3-amino-1,2,4-triazole
３－メルカブト－１，２，４－トリアゾール	3-mercapto 1,2,4-triazole
１－［Ｎ，Ｎ－ビス－（２－エチルヘキシル）］アミノメチルベンゾトリアゾール－５－カルボン酸*３	1-[N, N-bis(2-ethylhexyl)] aminomethylbenzotriazole-5-carboxylic acid*3
感光層の膜厚	Film thickness of photosensitive layer
最少現像時間（秒）	Minimum development time (seconds)
光感度（段）	Light sensitivity (stage)
サイドウォールビット発生数（個）	Number of sidewall bits generated (number of pieces)
密着性	Adhesion
解像度	Resolution
レジストパターンの側面ギザ性	Side knurling of resist pattern
浅い	Shallow

[0173]

[Table 4]

項目			実施例13	実施例14	実施例15	実施例16	実施例17	実施例18
PETフィルム	商品名		QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2	QS-48*2
	膜厚（μm）		16	16	16	16	16	16
	粒子等（個）		1	1	1	1	1	1
	ヘーズ値（%）		0.4	0.4	0.4	0.4	0.4	0.4
基本溶液			（1）	（1）	（1）	（1）	（1）	（1）
（D）成分	（a）成分	セバシン酸	–	–	–	–	–	–
		オクタデカンニ酸	–	–	–	–	–	–
		オクタン酸	–	–	–	–	–	–
		エチレンジアミン四酢酸	0.5	0.5	–	–	–	–
		酒石酸	–	–	0.1	0.1	0.5	0.5
	（b）成分	カルボキシベンゾトリアゾール	–	–	–	–	–	–
		ベンゾトリアゾール	–	–	–	–	–	–
		3－アミノ－1，2，4－トリアゾール	0.1	0.5	–	–	–	–
		3－メルカプト－1，2，4－トリアゾール	–	–	0.1	0.5	0.1	0.5
		1－[N，N－ビス－（2－エチルヘキシル）]アミノメチルベンゾトリアゾール－5－カルボン酸*3	–	–	–	–	–	–
感光層の膜厚（μm）			15	15	15	15	15	15
最少現像時間（秒）			9	9	9	9	9	9
光感度（段）			5.0	5.0	5.0	5.0	5.0	5.0
サイドウォールピット発生数（個）			3	2	5	4	3	3
密着性（μm）			9	9	9	9	9	9
解像度（μm）			8	8	8	8	8	8
レジストパターンの側面ギザ性			浅い	浅い	浅い	浅い	浅い	浅い

項目	Item
実施例１３	Example 13
実施例１４	Example 14
実施例１５	Example 15
実施例１６	Example 16
実施例１７	Example 17
実施例１８	Example 18
ＰＥＴフィルム	PET film
商品名	Product name
膜厚	Film thickness
粒子等（個）	Particles, etc. (number of pieces)
ヘーズ値	Haze value
基本溶液	Basic solution
（Ｄ）成分	Component (D)
（ａ）成分	Component (a)
（ｂ）成分	Component (b)
セバシン酸	Sebacic acid
オクタデカン二酸	Octadecane diacid
オクタン酸	Octanoic acid
エチレンジアミン四酢酸	Ethylenediaminetetraacetic acid
酒石酸	Tartaric acid
カルボキシベンゾトリアゾール	Carboxybenzotriazole
ベンゾトリアゾール	Benzotriazole
３－アミノ－１，２，４－トリアゾール	3-amino-1,2,4-triazole
３－メルカブト－１，２，４－トリアゾール	3-mercapto 1,2,4-triazole
１－［Ｎ，Ｎ－ビス－（２－エチルヘキシル）］アミノメチルベンゾトリアゾール－５－カルボン酸*３	1 [N, N-bis(2-ethylhexyl)] aminomethylbenzotriazole-5-carboxylic acid*3
感光層の膜厚	Film thickness of photosensitive layer
最少現像時間（秒）	Minimum development time (seconds)
光感度（段）	Light sensitivity (stage)
サイドウォールビット発生数（個）	Number of sidewall bits generated (number of pieces)
密着性	Adhesion
解像度	Resolution
レジストパターンの側面ギザ性	Side knurling of resist pattern

浅い	Shallow

[0174]
[Table 5]

項目			比較例1	比較例2	比較例3	比較例4	比較例5
PETフィルム	商品名		QS-48*2	QS-48*2	QS-48*2	QS-48*2	HTR-02*1
	膜厚（μm）		16	16	16	16	16
	粒子等（個）		1	1	1	1	318
	ヘーズ値（%）		0.4	0.4	0.4	0.4	2.0
基本溶液			（1）	（1）	（1）	（2）	（1）
（D）成分	（a）成分	セバシン酸	–	–	–	0.5	0.1
		オクタデカン二酸	–	–	–	–	–
		オクタン酸	–	–	–	–	–
		エチレンジアミン四酢酸	–	–	–	–	–
		酒石酸	–	–	–	–	–
	（b）成分	カルボキシベンゾトリアゾール	–	0.5	–	0.5	0.1
		ベンゾトリアゾール	–	–	–	–	–
		3－アミノ－1，2，4－トリアゾール	–	–	–	–	–
		3－メルカプト－1，2，4－トリアゾール	–	–	–	–	–
		1－［N，N－ビス－（2－エチルヘキシル）］アミノメチルベンゾトリアゾール－5－カルボン酸*3	–	–	0.5	–	–
感光層の膜厚（μm）			15	15	15	15	15
最少現像時間（秒）			9	9	9	9	9
光感度（段）			5.0	5.0	5.0	5.0	5.0
サイドウォールピット発生数（個）			2	134	348	0	観測不可
密着性（μm）			12	10	10	15	9
解像度（μm）			8	8	8	10	8
レジストパターンの側面ギザ性			浅い	浅い	浅い	浅い	深い

項目　Item

比較例１　Comparative Example 1

比較例２　Comparative Example 2

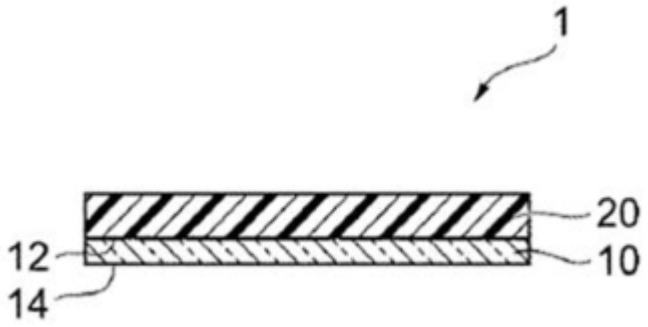
比較例３	Comparative Example 3
比較例４	Comparative Example 4
比較例５	Comparative Example 5
ＰＥＴフィルム	PET film
商品名	Product name
膜厚	Film thickness
粒子等（個）	Particles, etc. (pieces)
ヘーズ値	Haze value
基本溶液	Basic solution
（Ｄ）成分	Component (D)
（ａ）成分	Component (a)
（ｂ）成分	Component (b)
セバシン酸	Sebacic acid
オクタデカン二酸	Octadecane diacid
オクタン酸	Octanoic acid
エチレンジアミン四酢酸	Ethylenediaminetetraacetic acid
酒石酸	Tartaric acid
カルボキシベンゾトリアゾール	Carboxybenzotriazole
ベンゾトリアゾール	Benzotriazole
３－アミノ－１，２，４－トリアゾール	3-amino-1,2,4-triazole
３－メルカブト－１，２，４－トリアゾール	3-mercapto 1,2,4-triazole
１－［Ｎ，Ｎ－ビス－（２－エチルヘキシル）］アミノメチルベンゾトリアゾール－５－カルボン酸[*3]	1-[N, N-bis(2-ethylhexyl)] aminomethylbenzotriazole-5-carboxylic acid[*3]
感光層の膜厚	Film thickness of photosensitive layer
最少現像時間（秒）	Minimum development time (seconds)
光感度（段）	Light sensitivity (stage)
サイドウォールビット発生数（個）	Number of sidewall bits generated (number of pieces)
密着性	Adhesion
解像度	Resolution
レジストパターンの側面ギザ性	Side knurling of resist pattern
観測不可	Not observable
浅い	Shallow
深い	Deep

[0175]

As is evident from the results shown in Tables 2 to 5, Examples 1 to 18 according to the embodiment of the present invention have a small number of sidewall pits and achieve both adhesion and resolution of 10 μm or less and also have good lateral surface roughness of resist pattern. On the other hand, in Comparative Examples 1 to 5, at least one of the above characteristic features is inferior."

F Figure 1

"



"

(2) Cited Invention

In [0019] to [0022] of Cited Document 2, the following invention of "a photosensitive element" is disclosed (hereinafter, referred to as the "Cited Invention").

"A photosensitive element comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film, wherein

the support film has a haze of 0.01 to 1.5%,

the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D), and

the photosensitive layer has a film thickness of 3 to 30 μm."

(3) Comparison

The following is a comparison between the Amended Invention and the Cited

Invention.

A Photosensitive element

The "photosensitive element" of the Cited Invention is one "comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film."

In view of the above structure and the meaning of the terms, the "support film," "photosensitive layer," and "photosensitive element" stated in the Cited Invention correspond to the "support film", "photosensitive layer," and "photosensitive element" of the Amended Invention, respectively. In addition, the "photosensitive element" in the Cited Invention satisfies the requirement of "comprising a support film and a photosensitive layer disposed on the support film" in the "photosensitive element" of the Amended Invention.

B Composition of photosensitive layer

The "photosensitive layer" in the Cited Invention "comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent."

In view of the above structure and the meaning of the terms, the "carboxyl group-containing binder polymer," "photopolymerizable compound," and "photopolymerization initiator" in the Cited Invention correspond to the "binder polymer," "photopolymerizable compound," and "photopolymerization initiator" in the Amended Invention, respectively. In addition, the "photosensitive layer" in the Cited Invention satisfies the requirement of "comprising a binder polymer, a photopolymerizable compound having an ethylenically polymerizable unsaturated bond, and a photopolymerization initiator" in the "photosensitive layer" stated in the Amended Invention.

(4) Corresponding Feature and Different Feature

A Corresponding Feature

The Amended Invention and the Cited Invention correspond to each other in the following construction.

"A photosensitive element comprising a support film and a photosensitive layer disposed on the support film, wherein

the photosensitive layer comprises a binder polymer, a photopolymerizable compound having an ethylenically unsaturated bond, and a photopolymerization

initiator."

B Different Feature

The Amended Invention and the Cited Invention differ from each other in the following features:

(Different Feature 1)

The "photosensitive element" of the Amended Invention satisfies the requirement of "the number of defects having a maximum diameter of 2 μm or more on the surface of the support film facing photosensitive layer is 30 or less per 2 mm^2," whereas it is unclear whether the Cited Invention satisfies this requirement.

(Different Feature 2)

The scope of the "photosensitive element" of the Amended Invention excludes "a photosensitive element comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film, wherein the support film has a haze of 0.01 to 1.5%, the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D)." On the other hand, the Cited Invention includes this exclusion (hereinafter, the exclusion is occasionally referred to as the "excluded photosensitive element") in the scope.

(5) Judgment

A Regarding Different Feature 1

Regarding the "support film" in the Cited Invention, [0044] of Cited Document 2 states that "as the support film 10, one that can be used as a support film for the photosensitive element 1 may be obtained from of commercially available general industrial films and then appropriately processed." and "from the viewpoint of reducing the number of particles, etc. with a diameter of 5 μm or more contained in the support film to 5 particles/mm^2 or less, "QS-48" (Toray Industries, Inc.), (Product name) is preferable."

Then, in embodying the "photosensitive element" of the Cited Invention, a

person skilled in the art would make "QS-48" the first choice for "support film."

However, in view of the above statement, "QS-48" is just the first choice when a person skilled in the art at the time of inventing the Cited Invention would select the "support film" of the Cited Invention from "commercially available general industrial films." Then, the above [0044] states that the reason why "QS-48" is preferable is that "from the viewpoint of reducing the number of particles, etc. with a diameter of 5 μm or more contained in the support film to 5 particles/mm^2." In addition, [0036] and [0039] of Cited Document 2 state the findings that "The average particle size of the fine particles is preferably 0.1 to 10 times, more preferably 0.2 to 5 times the layer thickness of the resin layer containing the fine particles. If the average particle size is less than 0.1 times, the slipperiness tends to be inferior, and if it exceeds 10 times, the photosensitive layer tends to be particularly uneven." and "From the viewpoint of resolution, the resin layer containing the fine particles has a film thickness of preferably 0.01 to 5 μm, more preferably 0.05 to 3 μm, and further preferably 0.1 to 2 μm," respectively.

Then, a person skilled in the art before filing the application (a person who could select a better product than at the time when the Cited Invention was invented) or a person skilled in the art who could produce a "support film" by oneself would obtain or produce a better "support film" based on the above findings disclosed in Cited Document 2. Furthermore, from the statements in [0036] and [0039] of Cited Document 2, a person skilled in the art could recognize that [A] the slipperiness tends to be inferior when the average particle size of the fine particles is less than 0.1 times the layer thickness of the resin layer containing the fine particles, [B] the photosensitive layer tends to be particularly uneven when the average particle size of the fine particles exceeds 10 times the layer thickness of the resin layer containing the fine particles, and [C] the resin layer containing fine particles preferably has a layer thickness of 0.1 to 2 μm. In addition, a person skilled in the art who had come into contact with the underlined statement in [0041] of Cited Document 2 would notice that the unevenness of the photosensitive layer tends to be caused by particles having a larger diameter rather than particles having a smaller diameter.

Then, it remains no more than the usual ingenuity based on the suggestions stated in Cited Document 2 that a person skilled in the art who has considered the problems of film slipperiness and the unevenness of the photosensitive layer could employ, for example, a "support film" of the Cited Invention containing fine particles having a sharp particle size distribution peak at 1 μm and reach a "photosensitive element" that meets the requirements in Different Feature 1 of the Amended Invention .

B Regarding Different Feature 2

The photosensitive element excluded from the Amended Invention is stated in Claim 1 of the scope of claims of Cited Document 2. Thus, it is considered that a person skilled in the art who ingeniously devises within the scope of the invention disclosed in Cited Document 2 would try to exert one's originality and ingenuity within the scope of the excluded photosensitive elements.

However, regarding the constitution of the "haze" in the Cited Invention, the technical significance of the numerical range thereof is stated such that "If this haze is less than 0.01%, the ease of manufacture tends to be inferior. If this haze exceeds 1.5%, the sensitivity and resolution will deteriorate and the side knurls of the resist will tend to occur." in [0031] of Cited Document 2. It is also technically clear that the sensitivity, resolution, and side knurls of the resist (hereinafter referred to as "sensitivity, etc.") also depend on the particle size of the fine particles contained in the support film. Then, for example, reducing the particle size of the fine particles to the extent stated in the A above and checking whether the sensitivity, etc. are within the permissible range when the haze exceeds 1.5% would be within the matters attempted by a person skilled in the art (e.g., in order to achieve both the slipperiness of the film and the problem of the unevenness of the photosensitive layer, increase the amount while reducing the diameter of the fine particles, and change the haze of the Cited Invention to about 1.6%).

Furthermore, [0006] of Cited Document 2 states that "For applying the photosensitive resin composition on the support film with a uniform thickness and good yield, the support film is required to have a certain thickness (generally 10 μm to 30 μm). In addition, for improving the productivity of the support film, or improving the winding property of the support film, the support film generally contains inorganic or organic fine particles. Therefore, an increase in haze value as well as light scattering caused during exposure due to the fine particles contained in the support film tends to make the conventional support film unable to meet the demand for higher resolution of the photosensitive film." The person skilled in the art would understand from this description that the thickness of the support film affects the haze same as the fine particles. Then, for example, in order to solve both these problems and the problem of unevenness of the photosensitive layer, a person skilled in the art interested in the applicability of photosensitive resin composition rather than the slipperiness of film, would reduce the particle size of the fine particles and increase the thickness of the support film accordingly to keep the haze at about 1.6% and then check whether the sensitivity, etc. are still within the permissible range. In other words, it can be said

that such an attempt is within the matters attempted by a person skilled in the art.

Alternatively, regarding the constitution of the "photopolymerization initiator" in the Cited Invention, [0099] of Cited Document 2 states that "Containing 2,4,5-triarylimidazole dimer in this ratio imparts better adhesion and sensitivity to the photosensitive element of the present invention." In addition, the excluded photosensitive element or the Cited Invention further contains "(a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D)." Then, for example, as in Comparative Example 4 of [Table 5] in [0174], confirming the tendency of how the adhesion changes is considered to be the matter attempted by a person skilled in the art by replacing "2,4,5-triarylimidazole dimer" with another "photopolymerization initiator" and by increasing the amount of "adhesion imparting agent," referring to the findings; for example, the underlined part of [0021] of Cited Document 2 (Cited Document 2 does not state such experimental results, and there is room for improvement).

Regarding the configuration of the "adhesion imparting agent" in the Cited Invention, [0020] of Cited Document 2 states further that "The present inventors have found that the occurrence of sidewall pits, which is a problem in high-resolution resist patterns, is reduced by incorporating (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule as the adhesion imparting agent (D) in the photosensitive layer." In addition, from the underlined statement in [0013] of Cited Document 2, it is understood that the sidewall pit is particularly problematic when the "photosensitive element" of the Cited Invention is used for the "semi-additive method." Since it does not matter if "the content of the component (a) of the adhesion imparting agent as the component (D) is preferably 0.0005 to 1 part by mass ... with respect to 100 parts by mass of the total amount of the components (A) and (B)" ([0129]), excluding such a matter can be considered as a matter attempted by a person skilled in the art who does not bear the "semi-additive method" in mind.

In consideration of the above, modifying the Cited Invention outof the excluded photosensitive element is within the extent of an attempt of a person skilled in the art before filing of the application.

(6) Effects of the Invention

Regarding the effects of the Amended Invention, [0017] of the description of the

Application states that "According to the present invention, it is possible to provide a photosensitive element capable of suppressing the occurrence of resist deficiency." and "According to the present invention, even when a high-resolution exposure machine is used, it is possible to suppress the occurrence of resist defects, and good resist formability can be obtained."

However, such effects are also exerted by the Cited Invention.

(7) Appellant's allegation

In the written demand for trial (4) (II) (B), the Appellant alleges as follows: " Cited Document 2 states that, as an essential matter in Cited Invention 2, a photosensitive element is 'a photosensitive element comprising a support film and a photosensitive layer consisting of a photosensitive resin composition formed on the support film, wherein the support film has a haze of 0.01 to 1.5%, the photosensitive layer comprises (A) a carboxyl group-containing binder polymer, (B) a photopolymerizable compound having an ethylenically polymerizable unsaturated bond in the molecule, (C) a photopolymerization initiator, and (D) an adhesion imparting agent, wherein 2,4,5-triarylimidazole dimer is included as the photopolymerization initiator (C), and (a) an aliphatic carboxylic acid compound and/or a carboxylic acid compound having two or more carboxyl groups in the molecule are included as the adhesion imparting agent (D)." (Claim 1, paragraph [0019], etc.). Along with this statement, in the examples showing the specific examples of Cited Invention 2, only the photosensitive element satisfying such an essential matter is used (paragraphs [0156] and following paragraphs). Cited Document 2 is premised on using a photosensitive element that meets the above requirements, and thus includes no statement or suggestion about using a photosensitive element that does not satisfy the above requirements as Cited Invention 2. Then, a person skilled in the art who had referred to Cited Document 2 would usually use a photosensitive element that satisfies the essential matter stated above. It is difficult even for a person skilled in the art to use a photosensitive element that does not satisfy the above essential matter in place of the photosensitive element whose effects are demonstrated in the specific examples of Cited Invention 2."

However, it is as stated in the above (5)B.

The judgment is the same even if the invention for the "photosensitive element" stated in [0019] to [0022] of Cited Document 2 is replaced with the invention for the "photosensitive element" in Claim 3, which depends from Claim 1, of Cited Document

2 as the Cited Invention.

(8) Summary

The Amended Invention could have been invented easily by a person skilled in the art on the basis of the invention disclosed in Cited Document 2. Therefore, the Appellant should not be granted a patent for this independently at the time of patent application under the provisions of Article 29(2) of the Patent Act.

3 Closing on the decision to dismiss amendment

The amendment violates the provisions of Article 126(7) of the Patent Act as applied mutatis mutandis pursuant to the provisions of Article 17-2(6) of the Patent Act and shall be dismissed under the provisions of Article 53(1) of the Patent Act as applied mutatis mutandis by replacing certain terms pursuant to the provisions of Article 159(1) of the Patent Act.

Therefore, the decision shall be made as stated in the above [Conclusion of decision to dismiss amendment].

No. 3 Regarding the invention

1 The Invention

As stated above, as the Amendment has been dismissed, the invention recited in Claim 1 of the Application (hereinafter referred to as "the Invention") is as specified by the matters stated in the above "No. 2" [Reason] 1(1).

2 Reasons for refusal stated in the examiner's decision

The reasons for refusal stated in the examiner's decision includes a reason that the Invention could be easily invented by a person skilled in the art based on the invention stated in Cited Document 2 (Japanese Unexamined Patent Application Publication No. 2009-186780) that had been distributed in Japan or a foreign country prior to the filing of the application, and therefore, the Appellant should not be granted a patent for the Invention under the provisions of Article 29(2) of the Patent Act.

3 Statements in Cited Document and Cited Invention

The statements in Cited Document 2 and the Cited Invention are as stated in the above "No. 2" Reason 2(1) and (2).

4 Comparison and Judgment

The Amended Invention excludes some aspects from the scope of the Invention (the invention stated in the form of the so-called "excluded claim," which excludes the underlined aspect in the above "No. 1" [Reason] 1(2)). The Invention and the Amended Invention are the same except that some aspects are excluded. Furthermore, as stated in the above "No. 2" [Reason] 2(3) to (8), the Amended Invention could have been easily invented by a person skilled in the art based on the invention disclosed in Cited Document 2.

Then, the Invention could also be easily invented by a person skilled in the art based on the invention disclosed in Cited Document 2.

No. 4 Closing

As stated above, since the Appellant should not be granted a patent for it under the provisions of Article 29(2) of the Patent Act, the Application shall be rejected even without examining the inventions recited in the other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

July 9, 2021

Chief administrative judge: SATOMURA, Toshimitsu
Administrative judge: KAWAHARA, Tadashi
Administrative judge: HAYAKAWA, Takayuki