

Description

The present invention relates to a dust-proof film (hereinafter referred to as "pellicle") which is used for preventing a foreign substance such as dust from adhering to a photomask, a reticle or the like (hereinafter referred to as a "mask") used in the lithographing step of processes for fabricating semiconductor devices such as IC and LSI devices.

In the lithographing step, a mask comprising a glass sheet and a circuit pattern which is a vacuum deposited film of chromium or the like formed on the surface of the glass sheet is used, and the circuit pattern is transferred to a resist-coated silicon wafer. At this step, if light exposure is carried out when a foreign substance such as dust is adhered to the circuit pattern on the mask, the foreign substance is transferred to the wafer and a defective product is formed. Especially when light exposure is carried out by using a stepper, the risk that all of the chips formed on a wafer will be defective is increased, and adhesion of a foreign substance to the circuit pattern of the mask is a serious problem. Therefore, as a means of eliminating this problem, a pellicle has recently been developed and used.

In general, the pellicle comprises a transparent film or the like, which pellicle is attached to one surface of a pellicle frame composed of aluminum. A double-sided adhesive tape is applied to the opposite surface of the pellicle frame, and the pellicle is attached to a mask. If such a pellicle is used, the intrusion of foreign substances from the outside can be prevented, and even if a foreign substance adheres to the film, the foreign substance is transferred in a fuzzy state during light exposure and no particular problem arises. Nevertheless, where a foreign substance adheres to the inner face of the film or pellicle frame, if vibration or shock is generated, for example, during exchange of the mask on light exposure apparatus, the foreign substance may drop onto the mask, resulting in the formation of defective products.

JP-A-60-502121 discloses a method in which a protecting cover is applied to the bonding face on the mask side of the pellicle frame. But, when the protecting cover is peeled when using the pellicle, the pressure of the interior is reduced and sometimes a foreign substance is engulfed therein together with air. Accordingly, with the increase in the degree of integration in semiconductor devices and the reduction in the allowable size of a foreign substance, it is feared that even a fine foreign substance having a size of 1 to 2 μm or less will cause a problem.

JP-A-61-241756 discloses a photomask provided with a pellicle holder, in which a tackifying substance (e.g. an epoxy resin) is coated on the inner surface of the pellicle frame to immobilise movable foreign substances so that deposition of the foreign substances onto the mask is prevented.

JP-A-60-75835 discloses a means for preventing an adhesive agent from remaining on a mask as foreign matter, which means comprises making the adhesion strength between the adhesive agent and the mask weaker than that between the adhesive agent and the pellicle frame.

The inventors found that, when a clean pellicle is attached to a mask after confirming that no foreign substance is adhered to the inner side of the film or pellicle, sometimes a foreign substance, not observed before attachment, adheres to the mask. To clarify the cause of this undesirable phenomenon, the inventors carefully examined the interior of a pellicle, and as a result, found that fine convexities and concavities, as shown in Fig. 2, are formed on an aluminized aluminum frame customarily used for the pellicle, and that the section of a double-sided adhesive tape customarily used for bonding the pellicle to a mask is porous, as shown in Fig. 3. Moreover, it was found that a foreign substance contained in such a dent causes generation of dust upon vibration or shock, and it is very difficult to detect or remove a foreign substance of this type. Accordingly, it was concluded that, even if a pellicle having no foreign substance on the surface is obtained and intrusion of a foreign substance from the outside is completely prevented, generation of dust cannot be prevented in the conventional structure.

Accordingly, the objects of the present invention include elimination of the above-mentioned disadvantages of the prior art and the provision of a dust-free pellicle in which generation of dust is completely prevented, even under vibration or shock.

In accordance with the first embodiment of the present invention, there is provided a dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the photomask is attached to the pellicle frame by an adhesive tape comprising a foamed substrate and adhesive layers formed on both surfaces of the foamed substrate, and the inner surface of the foamed substrate and the entire inner surface of the pellicle frame are coated with a paint which:

- a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
- b) is electroconductive,
- c) is a tackifier,
- d) has a flow point of higher than 50 °C, and

e) contains a substance having a boiling point of less than 150°C in an amount of less than 0.0001 mole.

In accordance with a second embodiment of the present invention, there is provided a dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is attached to the photomask by an adhesive tape comprising an unfoamed substrate and adhesive layers formed on both surfaces of the substrate, and the entire inner surface of the pellicle frame is coated with a paint which

a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,

b) is electroconductive,

c) is a tackifier,

d) has a flow point of higher than 50°C , and

e) contains a substance having a boiling point of less than 150°C in an amount of less than 0.0001 mole.

In accordance with a third embodiment of the present invention, there is provided a dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is bonded to the photomask by a tackifier coated on a bonding surface of the frame, and the entire inner surface of the pellicle frame is coated with a paint which

a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,

b) is electroconductive,

c) is a tackifier,

d) has a flow point of higher than 50°C , and

e) contains a substance having a boiling point of less than 150°C in an amount of less than 0.0001 mole.

DESCRIPTION OF THE DRAWINGS

Figure 1 is a sectional view of a pellicle according to one embodiment of the present invention.

Fig. 2 is a microscope photograph of the surface of an aluminized aluminum frame.

Fig. 3 is a microscope photograph showing the section of a double-sided adhesive tape.

According to the present invention, the entire inner surface of the pellicle frame is coated with a paint to confine any foreign substances contained in dents and to prevent such foreign substances from exiting from the dents.

Types of paint which may be used include oily paints, aqueous paints, resin paints, ordinary pigment-containing paints used for surface protection of metals or coloration, paints used for special purposes, for example, conduction of heat, conduction of electricity, and adjustment of absorption or reflection of light, adhesives, and other substances that will not peel and can prevent generation of dust when coated on the pellicle frame. When a paint composed of an electroconductive substance is used, dust is easily drawn in by electrification, and accidental isolation of the foreign substance, which often occurs when the foreign substance is ordinarily adsorbed, can be prevented when an electroconductive substance is used. (A foreign substance adsorbed by a static charge is rarely isolated). Furthermore, when a tackifier is used, the following effect is attained in addition to the inherent effect of preventing generation of dust from the frame. Namely, inspection for the presence of a foreign substance on the inner surface of the frame is performed with the naked eye just before use of the pellicle (automatic inspection is very difficult). When a foreign substance is overlooked, a foreign substance is present which has such a small size that inspection with the naked eye is difficult, or a foreign substance intrudes after inspection but before attachment to the mask and adheres to the inner surface of the frame, the foreign substance can be prevented from dropping onto the mask. Thus, inspection for a foreign substance upon attachment to the mask can be omitted.

Although inorganic and organic tackifier paints are known, an organic tackifier is ordinarily used. If a substance having a boiling point lower than 150°C , such as toluene or ethyl acetate, is contained in the organic tackifier, the amount of the substance must be less than 0.0001 mole. If the amount of the substance is 0.0001 mole or more, the thickness of the film is increased and the transmission is reduced.

Flowing of the paint should be avoided during storage or transportation, and accordingly a paint having a flow point higher than 50°C is used.

Moreover, a paint which is not decomposed or deteriorate by light having a wavelength of 250 to 450 nm, which is the wavelength of light used for light exposure, is used.

As the paint-coating means, there can be mentioned methods of coating an emulsion paint or pasty paint and spray-coating methods. An aluminized aluminum frame customarily used or a frame of another material having a dust-generating property can be used as the pellicle frame.

According to the first embodiment of the present invention, the inner surface of a foamed double-sided adhesive tape is coated with a paint for preventing generation of dust from the double-adhesive tape.

A double-sided adhesive tape is conventionally used for attaching a pellicle to a mask because such tape has good adhesion and a certain elasticity required for bonding. Where a paint is coated on the inner surface of the tape for preventing generation of dust from the tape, as in the first embodiment of the present invention, when the pellicle is pressed onto the mask for bonding, the tape is compressed and there is a risk of squeezing out coated paint onto the mask surface.

The second embodiment of the present invention provides that, to solve the above-mentioned problem, an unfoamed substrate is used as the substrate of the double-sided adhesive tape instead of the foamed substrate.

Sheets of resins or rubbers, especially thin sheets of polyethylene or the like, may be used as the unfoamed substrate.

Where an adhesive tape is used, the width of the tape should be equal to or slightly smaller than the width of the end surface of the frame. If the width of the tape is larger than the width of the end surface of the frame and the tape protrudes at the inner side, the light exposure is influenced by the adhesive tape, and if the tape protrudes at the outer side, handling becomes difficult. In contrast, if the adhesive tape is too small, the bonding area is reduced and the sealing property is degraded. If the thickness of the sheet is reduced, cutting of the tape to a predetermined width is facilitated, and a paint as mentioned above can be applied to the section of the sheet. An adhesive having good elasticity can be used as the adhesive to be coated on both surfaces of the sheet to impart an elasticity to the tape.

The third embodiment of the present invention provides that a tackifier is attached by a tackifier directly applied to the frame surface, instead of the double-sided adhesive tape,

Preferably, a tackifier having a hardness of 3 to 70 °C is used, and preferably the thickness of the layer of tackifier is 0.1 to 3 mm. If the hardness is lower than 3 °C, the tackifier is too soft and the operation is difficult. If the hardness is higher than 70 °C, the tackifier is too hard and the bond-sealing property is drastically degraded. If the thickness of the layer of the coated tackifier is smaller than 0.1 mm, the bonding area is reduced and the bond-sealing property is drastically degraded. If the thickness of the layer of the tackifier is larger than 3 mm, the layer protrudes at the inner or outer side of the frame at the bonding step, and the pellicle becomes sticky at the time of use, and handling becomes difficult. Table 1 illustrates the relationship between the thickness of the tackifier layer and the bonding area obtained when the pellicle is attached to the mask. In Table 1, the bonding area (%) means the ratio of the area of the bonded portion of the surface of the frame to the area over which tackifier is applied.

Figure 1 illustrates an embodiment using a pellicle having the entire inner surface coated with a tackifier 4; the tackifier is coated on the inner surface of the pellicle frame 2 (which has a pellicle film 1 spread on one surface) and of the double-sided tape 3. This pellicle is attached to the front and back faces of a mask 5 to surround a pattern circuit 6.

Examples

The present invention will now be further illustrated by, but is by no means limited to, the following Examples.

Example 1

A pellicle film was spread on one surface of an aluminized aluminum frame and a double-sided adhesive tape was applied to the bonding face on the opposite surface of the pellicle frame. A tackifier was coated on the entire inner surface of the pellicle in a region extending over the tape. Then, the pellicle was attached to a washed quartz substrate, and the number of foreign substances having a size larger than 1 μm present on the substrate was checked. The assembly was allowed to fall 4 times from a height of 3 cm, and the increase or decrease in the number of foreign substances was examined. The results are shown in Table 2.

Example 2

The same pellicle having the tackifier coated on the inner surface of the frame, as used in Example 1, was attached to a quartz substrate by using a double-sided adhesive tape. The increase or decrease in the number of foreign substances was examined in the same manner as described in Example 1. The results are shown in Table 2.

Comparative Example 1

The pellicle of Example 1, the inner surface of the frame of which was not coated with a tackifier, was attached to a quartz substrate by a double-sided adhesive tape according to customary procedures. The increase or decrease in the number of foreign substances was examined. The results are shown in Table 2.

Example 4

A dust-free pellicle having the entire inner surface coated with a tackifier having a flow temperature of 30 or 60 °C was placed in a case and was allowed to stand in an automobile for one whole day and night. The pellicle was then taken out from the case. In the case of the tackifier having a flow temperature of 30 °C, deformation of the bonded portion and migration of the tackifier to the film surface from the inner surface of the frame were observed, but in the case of the tackifier having a flow temperature of 60 °C, these undesirable phenomena were not observed.

Example 5

A pellicle having a film thickness of 0.865 μm was attached to a silicon wafer and allowed to stand for one week, and the change in thickness was examined using a film thickness-measuring apparatus (Model TFM-120 supplied by Oak Co.). The results are shown in Table 3.

Table 1

Thickness of Tackifier Layer (mm)	Bonding Area(%)
0.03	2 - 10
0.05	10 - 20
0.07	15 - 30
0.10	60 - 100
0.50	98 - 100
0.80	98 - 100
1.00	98 - 100

Table 2

Change of Number of Foreign Substances								
	Pellicle Frame	Double-Adhesive Tape	Run Number					Average Increase in Number
			1	2	3	4	5	
Example 1	tackifier coated	tackifier coated	1 - 1	2 - 2	2 - 1	3 - 2	1 - 1	0
Example 2	tackifier coated	tackifier not coated	1 - 4	2 - 5	3 - 3	3 - 7	2 - 6	2.8
Comparative Example 1	tackifier not coated	tackifier not coated	2 - 8	2 - 2	3 - 9	1 - 6	1 - 5	4.2

Table 3

Coated Amount (g)	Amount (mole) of Low-Boiling Point Substance			Total Amount (mole) of Low-Boiling-Point Substances	Change of Thickness (Å)
	0.5% of toluene	0.4% of butyl acetate	0.3% of methylethylketone		
0.4	0.00003	0.00001	0.00002	0.00006	30
0.5	0.00004	0.00001	0.00003	0.00008	70
0.6	0.00005	0.00002	0.00003	0.00010	90
0.7	0.00005	0.00002	0.00004	0.00011	120
0.8	0.00006	0.00002	0.00004	0.00012	140
0.6% of toluene	0.6% of butyl acetate	0.8% of methylethylketone	-	-	-
0.5	0.00003	0.00003	0.00007	0.00013	150

Claims

1. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the photomask is attached to the pellicle frame by an adhesive tape comprising a foamed substrate and adhesive layers formed on both surfaces of the foamed substrate, and the inner surface of the foamed substrate and the entire inner surface of the pellicle frame are coated with a paint which:
 - a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - b) is electroconductive,
 - c) is a tackifier,
 - d) has a flow point of higher than 50 °C, and
 - e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.
2. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is attached to the photomask by an adhesive tape comprising an unfoamed substrate and adhesive layers formed on both surfaces of the substrate, and the entire inner surface of the pellicle frame is coated with a paint which
 - (a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - (b) is electroconductive,
 - (c) is a tackifier,
 - (d) has a flow point of higher than 50 °C, and
 - (e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.
3. A film as claimed in claim 2 wherein the unfoamed substrate is a polyethylene sheet.
4. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is bonded to the photomask by a tackifier coated on a bonding surface of the frame, and the entire inner surface of the pellicle frame is coated with a paint which
 - (a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - (b) is electroconductive,
 - (c) is a tackifier,
 - (d) has a flow point of higher than 50 °C, and
 - (e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.



Table 3

Coated Amount (g)	Amount (mole) of Low-Boiling Point Substance			Total Amount (mole) of Low-Boiling-Point Substances	Change of Thickness (Å)
	0.5% of toluene	0.4% of butyl acetate	0.3% of methylethylketone		
0.4	0.00003	0.00001	0.00002	0.00006	30
0.5	0.00004	0.00001	0.00003	0.00008	70
0.6	0.00005	0.00002	0.00003	0.00010	90
0.7	0.00005	0.00002	0.00004	0.00011	120
0.8	0.00006	0.00002	0.00004	0.00012	140
0.6% of toluene	0.6% of butyl acetate	0.8% of methylethylketone	-	-	-
0.5	0.00003	0.00003	0.00007	0.00013	150

Claims

1. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the photomask is attached to the pellicle frame by an adhesive tape comprising a foamed substrate and adhesive layers formed on both surfaces of the foamed substrate, and the inner surface of the foamed substrate and the entire inner surface of the pellicle frame are coated with a paint which:
 - a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - b) is electroconductive,
 - c) is a tackifier,
 - d) has a flow point of higher than 50 °C, and
 - e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.
2. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is attached to the photomask by an adhesive tape comprising an unfoamed substrate and adhesive layers formed on both surfaces of the substrate, and the entire inner surface of the pellicle frame is coated with a paint which
 - (a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - (b) is electroconductive,
 - (c) is a tackifier,
 - (d) has a flow point of higher than 50 °C, and
 - (e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.
3. A film as claimed in claim 2 wherein the unfoamed substrate is a polyethylene sheet.
4. A dust-proof film comprising a pellicle film and a photomask spaced apart from each other by a pellicle frame such as to prevent a foreign substance from contacting the photomask, characterised in that the pellicle frame is bonded to the photomask by a tackifier coated on a bonding surface of the frame, and the entire inner surface of the pellicle frame is coated with a paint which
 - (a) is not decomposed or deteriorated by light having a wavelength of 250 to 450 nm,
 - (b) is electroconductive,
 - (c) is a tackifier,
 - (d) has a flow point of higher than 50 °C, and
 - (e) contains a substance having a boiling point of less than 150 °C in an amount of less than 0.0001 mole.



5. A film as claimed in claim 4, wherein the thickness of the layer of tackifier is from 0.1 to 3 mm.
6. A film as claimed in any one of the preceding claims, wherein said photomask comprises a reticle.

5 Patentansprüche

1. Ein staubgeschützter Film, aufweisend:

einen Häutchen-Film und eine Photomaske, welche voneinander durch einen Häutchen-Rahmen beabstandet sind, derart, daß eine Fremdschubstanz daran gehindert ist, in Berührung mit der Photomaske zu gelangen,

dadurch gekennzeichnet,

daß die Photomaske an dem Häutchen-Rahmen mittels eines Klebebandes angebracht ist, welches ein Schaum-Substrat sowie Klebeschichten aufweist, die auf beiden Oberflächen des Schaum-Substrates ausgebildet sind, und daß die innere Oberfläche des Schaum-Substrates und die gesamte innere Oberfläche des Häutchen-Rahmens mit einem Anstrich beschichtet sind, welcher:

- (a) durch Licht mit einer Wellenlänge von 250 bis 450 nm nicht abgebaut oder zersetzt wird,
- (b) elektrisch leitfähig ist,
- (c) ein Klebrigmacher ist,
- (d) einen Fließpunkt von höher als 50 °C aufweist, und
- (e) eine Substanz mit einem Siedepunkt von weniger als 150 °C in einer Menge von weniger als 0,0001 Mol enthält.

2. Ein staubgeschützter Film, aufweisend:

einen Häutchen-Film und eine Photomaske, die voneinander durch einen Häutchen-Rahmen beabstandet sind, derart, daß eine Fremdschubstanz daran gehindert ist, mit der Photomaske in Berührung zu gelangen,

dadurch gekennzeichnet,

daß der Häutchen-Rahmen mit der Photomaske durch ein, Klebeband befestigt ist, welches ein nicht geschäumtes Substrat sowie Klebeschichten aufweist, die auf beiden Oberflächen des Substrates ausgeformt sind, und daß die gesamte innere Oberfläche des Häutchen-Rahmens mit einem Anstrich beschichtet ist, welcher

- (a) durch Licht mit einer Wellenlänge von 250 bis 450 nm nicht abgebaut oder zersetzt wird,
- (b) elektrisch leitfähig ist,
- (c) ein Klebrigmacher ist,
- (d) einen Fließpunkt von höher als 50 °C aufweist, und
- (e) eine Substanz mit einem Siedepunkt von weniger als 150 °C in einer Menge von weniger als 0,0001 Mol enthält.

3. Ein Film, wie in Anspruch 2 beansprucht, bei welchem das nicht geschäumte Substrat eine Polyethylen-Schicht ist.

4. Ein staubgeschützter Film, aufweisend:

einen Häutchen-Film und eine Photomaske, welche gegeneinander durch einen Häutchen-Rahmen beabstandet sind, derart, daß eine Fremdschubstanz daran gehindert ist, mit der Photomaske in Berührung zu gelangen,

dadurch gekennzeichnet,

daß der Häutchen-Rahmen mit der Photomaske mittels eines Klebrigmachers verbunden ist, welcher auf eine Bindungsoberfläche des Rahmens geschichtet ist, und daß die gesamte innere Oberfläche des Häutchen-Rahmens mit einem Anstrich beschichtet ist, welcher

- (a) durch Licht mit einer Wellenlänge von 250 bis 450 nm nicht abgebaut oder zersetzt wird,
- (b) elektrisch leitfähig ist,
- (c) ein Klebrigmacher ist,
- (d) einen Fließpunkt von höher als 50 °C aufweist, und
- (e) eine Substanz mit einem Siedepunkt von weniger als 150 °C in einer Menge von weniger als 0,0001 Mol enthält.

5. Ein Film, wie in Anspruch 4 beansprucht, bei welchem die Dicke der Schicht des Klebrigmachers zwischen 0,1 bis 3 mm liegt.



6. Ein Film, wie in einem der vorhergehenden Ansprüche beansprucht, bei welchem die genannte Photomaske eine Strichplatte aufweist.

Revendications

1. Film protégé contre la poussière comprenant un film en pellicule et un photomasque espacés l'un de l'autre par un cadre de pellicule de manière à empêcher une substance étrangère d'entrer en contact avec le photomasque, caractérisé en ce que le photomasque est attaché au cadre de pellicule par un ruban adhésif comprenant un substrat en mousse et des couches adhésives formées sur les deux surfaces du substrat en mousse, et la surface interne du substrat en mousse et toute la surface interne du cadre de pellicule sont revêtues d'une peinture qui:
- a) n'est pas décomposée ni détériorée par une lumière ayant une longueur d'onde de 250 à 450 nm,
 - b) est conductrice de l'électricité,
 - c) est un agent collant,
 - d) a un point d'écoulement supérieur à 50 °C, et
 - e) contient une substance ayant un point d'ébullition inférieur à 150 °C en une quantité inférieure à 0,0001 mole.
2. Film protégé contre la poussière comprenant un film en pellicule et un photomasque espacés l'un de l'autre par un cadre de pellicule de manière à empêcher une substance étrangère d'entrer en contact avec le photomasque, caractérisé en ce que le cadre de pellicule est attaché au photomasque par un ruban adhésif comprenant un substrat qui n'est pas sous forme de adhésives formées sur les deux surfaces du substrat, et toute la surface interne du cadre de pellicule est revêtue d'une peinture qui
- (a) n'est pas décomposée ni détériorée par une lumière ayant une longueur d'onde de 250 à 450 nm,
 - (b) est conductrice de l'électricité,
 - (c) est un agent collant,
 - (d) a un point d'écoulement supérieur à 50 °C, et
 - (e) contient une substance ayant un point d'ébullition inférieur à 150 °C en une quantité inférieure à 0,0001 mole.
3. Film selon la revendication 2 dans lequel le substrat qui n'est pas sous forme de mousse est une feuille de polyéthylène.
4. Film protégé contre la poussière comprenant un film en pellicule et un photomasque espacés l'un de l'autre par un cadre de pellicule de manière à empêcher une substance étrangère d'entrer en contact avec le photomasque, caractérisé en ce que le cadre de pellicule est lié au photomasque par un agent collant enduit sur une surface de liaison du cadre, et toute la surface interne du cadre de pellicule est revêtue d'une peinture qui
- (a) n'est pas décomposée ni détériorée par une lumière ayant une longueur d'onde de 250 à 450 nm,
 - (b) est conductrice de l'électricité,
 - (c) est un agent collant,
 - (d) a un point d'écoulement supérieur à 50 °C, et
 - (e) contient une substance ayant un point d'ébullition inférieur à 150 °C en une quantité inférieure à 0,0001 mole.
5. Film selon la revendication 4, dans lequel l'épaisseur de la couche d'agent collant est de 0,1 à 3 mm.
6. Film selon l'une quelconque des revendications précédentes, dans lequel ledit photomasque comprend un réticule.