to the shape of the photomask or the reticle.

CITATION LIST

PATENT LITERATURE

[0007]

Patent Literature 1: Japanese Laid-Open Patent Publication No. 2013-004893

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0008]

According to a method for trimming to provide a portion that is required to form a pellicle, the substrate is cut by a mechanical force to provide a pellicle frame. However, this method has a problem that after the substrate is cut to provide the pellicle frame, foreign object particles are generated at the cut surface and attached to the pellicle film, which results in contaminating the pellicle film.

[0009]

Embodiments of the present invention suppress foreign object particles generated at the timing of trimming from being attached to a pellicle film.

SOLUTION TO PROBLEM

[0010]

According to a first aspect of the present invention, there is provided a method for producing a pellicle including a pellicle film and a pellicle frame supporting an outer peripheral portion of the pellicle film, the method including: forming the pellicle film on a substrate, and bonding a pressure-sensitive adhesive sheet to each of two surfaces of the substrate, the pressure-sensitive adhesive sheet being elastic and having a pressure-sensitive adhesive force thereof decreased upon receipt of external

stimulation; making a notch inside a part of the substrate, the part having the pressure-sensitive adhesive sheets bonded thereto; separating a substrate outer peripheral portion outer to the notch of the substrate, in a state where the pressure-sensitive adhesive sheets are bonded to the substrate, to form a pellicle frame; and stimulating the pressure-sensitive adhesive sheets to peel off the pressure-sensitive adhesive sheets.

[0011]

The method for producing a pellicle may further comprise etching the substrate, from a surface opposite to a surface on which the pellicle film is formed, to expose the pellicle film.

[0012]

After the substrate is etched, from a surface opposite to a surface on which the pellicle film is formed, to expose the pellicle film, the pressure-sensitive adhesive sheet may be bonded to each of the two surfaces of a portion of the substrate that is around the exposed portion of the pellicle film.

[0013]

The substrate may have openings provided between a portion of the substrate to be the pellicle frame and the substrate outer peripheral portion may include a bridge portion coupling the portion of the substrate to be the pellicle frame and the substrate outer peripheral portion to each other; and making the notch inside the substrate may be making a notch inside the bridge portion.

[0014]

The pressure-sensitive adhesive sheets may be bonded to cover both of two surfaces and both of two side surfaces of the bridge portion.

[0015]

The bridge portion may be connected to each of four corners of the pellicle frame.

[0016]

The notch may be made inside the substrate by stealth dicing.

[0017]

The pressure-sensitive adhesive sheets may be antistatic.

[0018]

For separating the substrate outer peripheral portion to form the pellicle frame, gas in a portion along which the substrate is separated may be absorbed by an absorption device.

[0018a]

The pellicle film may have a thickness of 10 nm or greater and 50 nm or less.

[0019]

According to a second aspect of the present invention, there is provided a method for producing a pellicle-attached photomask, including joining the pellicle produced by the method for producing a pellicle according to the first aspect, and a photomask, to each other via a frame body attached to the pellicle frame.

ADVANTAGEOUS EFFECTS OF INVENTION

[0020]

A method for producing a pellicle according to embodiments of the present invention suppresses foreign object particles generated at the time of trimming from being attached to a pellicle film.

BRIEF DESCRIPTION OF DRAWINGS

[0021]

[FIG. 1A] FIG. 1A is a schematic view (plan view) of a

CLAIMS

1. A method for producing a pellicle including a pellicle film and a pellicle frame supporting an outer peripheral portion of the pellicle film, the method comprising:

forming the pellicle film on a substrate, and bonding a pressure-sensitive adhesive sheet to each of two surfaces of the substrate, the pressure-sensitive adhesive sheet being elastic and having a pressure-sensitive adhesive force thereof decreased upon receipt of external stimulation;

making a notch inside a part of the substrate, the part having the pressure-sensitive adhesive sheets bonded thereto;

separating a substrate outer peripheral portion outer to the notch of the substrate, in a state where the pressure-sensitive adhesive sheets are bonded to the substrate, to form the pellicle frame; and

stimulating the pressure-sensitive adhesive sheets to peel off the pressure-sensitive adhesive sheets.

2. The method for producing a pellicle according to claim 1, further comprising etching the substrate, from a surface opposite to a surface on which the pellicle film is formed, to expose the pellicle film.

3. The method for producing a pellicle according to claim 1 or 2, wherein:

after the substrate is etched, from a surface opposite to a surface on which the pellicle film is formed, to expose the pellicle film, the pressure-sensitive adhesive sheet is bonded to each of the two surfaces of a portion of the substrate that is around the exposed portion of the pellicle film.

4. The method for producing a pellicle according to any one of claims 1

through 3, wherein:

the substrate has openings provided between a portion of the substrate to be the pellicle frame and the substrate outer peripheral portion includes a bridge portion coupling the portion of the substrate to be the pellicle frame and the substrate outer peripheral portion to each other; and

making the notch inside the substrate is making the notch inside the bridge portion.

5. The method for producing a pellicle according to claim 4, wherein the pressure-sensitive adhesive sheets are bonded to cover both of two surfaces and both of two side surfaces of the bridge portion.

6. The method for producing a pellicle according to claim 4 or 5, wherein the bridge portion is connected to each of four corners of the pellicle frame.

7. The method for producing a pellicle according to any one of claims 1 through 6, wherein the notch is made inside the substrate by stealth dicing.

8. The method for producing a pellicle according to any one of claims 1 through 7, wherein the pressure-sensitive adhesive sheets are antistatic.

9. The method for producing a pellicle according to any one of claims 1 through 8, wherein for separating the substrate outer peripheral portion to form the pellicle frame, gas in a portion along which the substrate is separated is absorbed by an absorption device.

10. The method for producing a pellicle according to any one of claims 1 through 9, the pellicle film has a thickness of 10 nm or greater and 50 nm or less.

11. A method for producing a pellicle-attached photomask, comprising joining the pellicle produced by the method for producing a pellicle according to any one of claims 1 through 10, and a photomask, to each other via a frame body attached to the pellicle frame.