

Claims

1. An exposure apparatus which exposes a substrate with an exposure beam through a liquid, comprising:

an optical member via which the exposure beam is irradiated to the substrate through the liquid; and

a member which has a lyophilic lower surface provided at least partially around an optical path of the exposure beam,

wherein the substrate is moved below the member during the exposure, and the lyophilic surface of the member is allowed to contact with the liquid on the substrate.

2. The exposure apparatus according to claim 1, wherein the lyophilic surface of the member is inclined with respect to a horizontal plane.

3. The exposure apparatus according to claim 2, wherein the lyophilic surface of the member extends upwardly in a radial direction with respect to the optical path.

Claims

1. An exposure apparatus which exposes a substrate by projecting an image of a pattern through a liquid onto the substrate, the exposure apparatus comprising:
 - a projection optical system having a final optical element, which projects the image of the pattern onto the substrate;
 - a first support member which supports the projection optical system;
 - a measuring device which is supported by the first support member;
 - a liquid supply system including a member having an inlet opening through which the liquid is supplied from above a surface of the substrate positioned below the member having the inlet opening to a space between the surface of the substrate and the final optical element to form a liquid immersion area on a part of the surface of the substrate;
 - a second support member which supports the member having the inlet opening; and
 - an anti-vibration device which is provided between the first and second support members, by which vibration is not transmitted from the member having the inlet opening to the projection optical system and the measuring device.
2. The exposure apparatus according to claim 1, wherein the liquid is supplied onto the substrate simultaneously on both sides of the projection area.
3. The exposure apparatus according to claim 2, wherein shot areas on the substrate are respectively exposed while being moved in a scanning direction, and the liquid supply system supplies the liquid simultaneously from the both sides of the projection area in relation to the scanning direction.
4. The exposure apparatus according to claim 1, further comprising a liquid recovery system including a member having an outlet opening through which the liquid is recovered from the space, wherein the member of the liquid recovery system is supported such that vibration is not transmitted from the member having the outlet opening to the projection system and the measuring device.
5. The exposure apparatus according to claim 4, wherein the outlet opening of the liquid recovery system is arranged so that the inlet opening of the liquid supply system is surrounded by the outlet opening.

6. The exposure apparatus according to claim 1, further comprising a moveable substrate stage which holds the substrate, wherein the measuring device is used to obtain position information about the movable substrate stage.
7. The exposure apparatus according to claim 1, further comprising a moveable substrate stage which holds the substrate and a base member which supports the movable substrate stage, wherein the second support member and the base member are provided such that vibration of the member having the inlet opening is not transmitted to the substrate stage.
8. A method for producing a device, the method comprising:
exposing a substrate using the exposure apparatus as defined in claim 1; and
processing the exposed substrate.
9. An exposure apparatus which exposes a substrate by projecting an image of a pattern through a liquid onto the substrate, the exposure apparatus comprising:
a projection optical system having a final optical element, which projects the image of the pattern onto the substrate;
a first support member which supports the projection optical system;
a measuring device which is supported by the first support member;
a liquid supply system having an inlet opening through which a liquid is supplied to a space between the final optical element and a surface of the substrate to form a liquid immersion area on a part of the surface of the substrate;
a liquid recovery system including a member having an outlet opening through which the liquid is recovered from the space from above the substrate positioned below the member having the outlet opening;
a second support member which supports the member having the outlet opening; and
an anti-vibration device which is provided between the first and second support members, by which vibration is not transmitted from the member having the outlet opening to the projection optical system and the measuring device.
10. The exposure apparatus according to claim 9, further comprising a moveable substrate stage which holds the substrate, wherein the measuring device is used to obtain position information about the movable substrate stage.

11. The exposure apparatus according to claim 9, further comprising a moveable substrate stage which holds the substrate and base member which supports the movable substrate stage, wherein the second support member and the base member are provided such that vibration of the member having the outlet opening is not transmitted to the substrate stage.
12. A method for producing a device, the method comprising:
exposing a substrate using the exposure apparatus as defined in claim 9; and
processing the exposed substrate.
13. An exposure method comprising:
holding a substrate on a moveable substrate stage;
obtaining position information of the substrate or the substrate stage by a measuring device supported by a first support member;
forming a liquid immersion area on a part of a surface of the substrate by supplying a liquid to a space between a final optical element of a projection optical system supported by the first support member and the surface of the substrate from above the substrate from an inlet opening of a member which is supported by a second support member and below which the substrate is positioned preventing vibration from transmitting to the projection system and the measuring device from the member having the inlet opening using an anti-vibration device provided between the first and second support members; and
projecting an image of a pattern through the liquid in the space onto the substrate to expose the substance.
14. The exposure method according to claim 13, wherein the liquid is supplied onto the substrate simultaneously on both sides of the projection area.
15. The exposure method according to claim 13, further comprising recovering the liquid from the space through an outlet opening of a member which is supported such that vibration is not transmitted from the member having the outlet opening to the projection system and the measuring device.
16. An exposure method comprising:
holding a substrate on a moveable substrate stage;
obtaining position information of the substrate or the substrate stage by a measuring device supported by a first support member;
forming a liquid immersion area on a part of a surface of the substrate by supplying a liquid to a space between a final optical element of a projection optical system supported by the first support member and the surface of the substrate from

above the substrate from an inlet opening;

recovering the liquid from the space from above the substrate through an outlet opening of a member which is supported by a second support member and below which the substrate is positioned;

preventing vibration from transmitting to the projection system and the measuring device from the member having the outlet opening using an anti-vibration device provided between the first and second support members; and

projecting an image of a pattern through the liquid in the space onto the substrate to expose the substrate.

17. The exposure apparatus according to claim 1, wherein the measuring device detects an alignment mark of the substrate.

18. The exposure apparatus according to claim 1, wherein the measuring device detects focus information of the substrate.

19. The exposure apparatus according to claim 6, wherein the measuring device includes an interferometer.

20. The exposure apparatus according to claim 1, further comprising a moveable substrate stage which holds the substrate, wherein the moveable substrate stage is supported such that vibration of the member having the inlet opening is not transmitted to the substrate stage.

21. The exposure apparatus according to claim 20, further comprising an anti-vibration device that prevents vibration of the member having the inlet opening from being transmitted to the substrate stage.

22. The exposure apparatus according to claim 9, wherein the measuring device detects an alignment mark of the substrate.

23. The exposure apparatus according to claim 9, wherein the measuring device detects focus information of the substrate.

24. The exposure apparatus according to claim 10, wherein the measuring device includes an interferometer.

25. The exposure apparatus according to claim 9, further comprising a moveable substrate stage which holds the substrate, wherein the moveable substrate stage is supported such that vibration of the member having the outlet opening is not transmitted to the substrate stage.

26. The exposure apparatus according to claim 25, further comprising an anti-vibration device that prevents vibration of the member having the inlet opening from being transmitted to the substrate stage.

27. The exposure apparatus according to claim 4, wherein the liquid supply system has a supply flow passage through which the liquid is supplied and the liquid recovery system has a recovery flow passage through which the supplied liquid is recovered, and wherein at least one of the supply flow passage and the recovery flow passage is formed in a stacked member in which a plurality of elements are stacked.