CLAIMS

1. A liquid immersion lithography apparatus in which a wafer is exposed through a liquid in a space under a lens, the system comprising:

a containment member provided such that the containment member surrounds the space under the lens; and

a seal member provided between the lens and the containment member,

wherein:

the containment member has a first fluid inlet, and

the first fluid inlet removes fluid from a gap between the containment member and the wafer during the exposure..

2. The system according to claim 1, wherein the vacuum is applied to the first fluid inlet.

3. The system according to claim 1, wherein the containment member defines a part of a boundary of the space under the lens.

4. The system according to claim 1, wherein the containment member comes into contact with the liquid in the space.

5. The system according to claim 1, wherein the containment member has a lower surface, and wherein during the exposure, the wafer faces the lower surface of the containment member and the first fluid inlet removes the fluid between the lower surface of the containment member and the wafer.

6. The system according to claim 5, wherein the first fluid inlet is located in the lower surface of the containment member.

7. The system according to claim 6, wherein the first fluid inlet includes a groove formed in the lower surface of the containment member.

8. The system according to claim 5, wherein the containment member is provided such that during the exposure, a distance between the lower surface and the wafer is smaller than a distance between the lens and the wafer.

9. The system according to claim 5, wherein the containment member has an inner side surface which is arranged such that the inner side surface surrounds the space under the lens, the inner side surface extending upwardly from the lower surface, and during the exposure, the inner side surface coming into contact with the liquid in the space.

10. The system according to claim 5, wherein the seal member is disposed above the lower surface.

11. The system according to claim 10, wherein the seal member seal the space.

12. The system according to claim 1, wherein a fluid bearing is formed under the containment member.

13. The system according to claim 12, wherein the liquid flowing under the containment member creates the fluid bearing.

14. The system according to claim 12, wherein the fluid bearing includes a gas bearing.

15. The system according to claim 14, wherein the gas bearing supports the weight of the containment member.

16. The system according to claim 1, wherein the containment member has a gas supply outlet that supplies a gas to between the containment member and the wafer during the exposure.

17. The system according to claim 16, wherein the gas supply outlet is located farther away from the space than the first fluid inlet is.

18. The system according to claim 16, wherein a gas supplied from the gas supply outlet helps to contain the liquid.

19. The system according to claim 16, wherein the containment member has a second fluid inlet that is located farther away from the space than the gas supply outlet is and that removes fluid between the containment member and the wafer during the exposure.

20. The system according to claim 1, wherein the containment member has a second fluid inlet that is located farther away from the space than the first fluid inlet is and that removes fluid between the containment member and the wafer during the exposure.

21. The system according to claim 19, wherein the fluid includes the liquid.

22. The system according to claim 21, wherein the second fluid inlet removes the liquid not removed from the first fluid inlet.

23. The system according to claim 21, wherein the second fluid inlet removed the liquid which leaks beyond the first fluid inlet.

24. The system according to claim 1, wherein the fluid includes the liquid.

25. A liquid immersion lithography method comprising:

containing a liquid in a space under a lens using a containment member and a seal member being disposed between the lens and the containment member;

exposing a wafer through the liquid contained in the space under the lens; and

removing fluid via a first fluid inlet of the containment member from a gap between the containment member and the wafer.

26. The method according to claim 25, wherein vacuum is applied to the first fluid inlet.

27. The method according to claim 25, wherein a fluid bearing is formed under the containment member.

28. The method according to claim 27, wherein the liquid flowing under the containment member creates the fluid bearing.

29. The method according to claim 27, wherein the fluid bearing includes a gas bearing.

30. The method according to claim 25, further comprising supplying a gas via a gas supply outlet of the containment member to between the containment member and the wafer.

31. The method according to claim 30, wherein the gas supply outlet is located farther away from the space than the first fluid inlet is.

32. The method according to claim 30, wherein the gas supplied via the gas supply outlet helps to contain the liquid.

33. The method according to claim 30, further comprising removing fluid via a second fluid inlet of the containment member from between the containment member and the wafer, wherein the second fluid inlet is located farther away from the space than the gas supply outlet is.

34. The method according to claim 25, further comprising removing fluid via a second fluid inlet of the containment member from between the containment member and the wafer, wherein the second fluid inlet is located farther away from the space than the first fluid outlet is.

35. The method according to claim 33, wherein the fluid includes the liquid.

36. The method according to claim 35, wherein the liquid not removed from the first fluid inlet is removed from the second fluid inlet.

37. The method according to claim 35, wherein the liquid which leaks beyond the first fluid inlet is removed from the second fluid inlet.

38. The method according to claim 25, wherein the fluid includes the liquid.

CLAIMS

1. An immersion exposure apparatus for exposing a substrate, the apparatus comprising:

a last optical element arranged to be above the substrate during exposure such that immersion liquid is able to fill a space defined between the last optical element and the substrate; and

a containment member having a first inlet arranged for drawing immersion liquid from beneath the containment member, the containment member being arranged to surround the last optical element characterised in that:

the containment member is movable above the substrate relative to the last optical element; and in that

the containment member is arranged to contain immersion liquid in the space by an inside of the containment member.

2. The immersion exposure apparatus according to claim 1, wherein the first inlet is groove-shaped.

3. The immersion exposure apparatus according to claim 1, wherein the first inlet comprises a plurality of concentric grooves.

4. The immersion exposure apparatus according to any preceding claim, wherein the containment member has a bottom side that is arranged to face the substrate during exposure, the first inlet being arranged to remove liquid from a gap between the bottom side and the substrate.

5. The immersion exposure apparatus according to claim 4, wherein the containment member is provided such that during the exposure, a distance between the bottom side and the substrate is shorter than a distance between a bottom surface of the last optical element and the substrate.

6. The immersion exposure apparatus according to any preceding claim, wherein the apparatus is arranged to provide a fluid bearing under the containment member.

7. The immersion exposure apparatus according to claim 6, wherein the fluid bearing is a gas bearing.

8. The immersion exposure apparatus according to any preceding claim, wherein the containment member has an outlet arranged to be further from the space than the first inlet for supplying a fluid to beneath the containment member.

9. The immersion exposure apparatus according to claim 8, further comprising a fluid supply connected to the outlet.

10. The immersion exposure apparatus according to any preceding claim, wherein the containment member further comprises a second inlet which is located radially outwardly from the space with respect to the first inlet and which is arranged to remove fluid from beneath the containment member.

11. The immersion exposure apparatus according to claim 10 as dependent on claim 8 or 9, wherein the second inlet is located radially outwardly from the space with respect to the outlet.

12. The immersion exposure apparatus according to any preceding claim, further comprising a flexible seal provided between a top of the containment member and the last optical element.

13. The immersion exposure apparatus according to any preceding claim, further comprising an optical assembly of which a bottom surface of the last optical element is an end surface.

14. The immersion exposure apparatus according to any preceding claim, wherein the containment member is arranged to confine the immersion liquid to an immersion region on the surface of the substrate during exposure.

15. The immersion exposure apparatus according to any one of Claims 13 or 14, wherein the immersion region is smaller in area than the surface of the substrate.

16. An immersion exposure method for exposing a substrate via a last optical element arranged above the substrate and via immersion liquid filling a space defined between the last optical element and the substrate, the method comprising:

containing immersion liquid in the space by an inside of a containment member, the containment member being arranged to surround the last optical element, and

drawing immersion liquid from beneath the containment member via a first inlet provided to the containment member, wherein

the containment member is arranged to be movable above the substrate relative to the last optical element.

17. The immersion exposure method according to claim 16, wherein a bottom side of the containment member faces the substrate and the method comprises removing liquid from a gap between the bottom side and the substrate via the first inlet.

18. The immersion exposure method according to claim 17, wherein the method comprises setting a distance between the bottom side and the substrate to be smaller than a distance between a bottom surface of the last optical element and the substrate.

19. The immersion exposure method according to any one of claims 16 to 18, wherein the method comprises providing a fluid bearing under the containment member.

20. The immersion exposure method according to claim 19, wherein the fluid bearing is a gas bearing.

21. The immersion exposure method according to any one of claims 16 to 20, wherein the containment member has an outlet arranged further from the space than the first inlet and the method comprises supplying fluid to beneath the containment member via the outlet.

22. The immersion exposure method according to any one of claims 16 to 21, wherein the containment member has a second inlet which is located radially outwardly from the space with respect to the first inlet and the method comprises removing fluid from beneath the containment member via the second inlet.

23. The immersion exposure method according to claim 22 as dependent on claim 21, wherein the second inlet is located radially outwardly from the space with respect to the outlet.

24. The immersion exposure method according to one of claims 16 to 23, wherein the method comprises applying a vacuum to the first inlet.

25. The immersion exposure method according to one of claims 26 to 24, wherein a bottom surface of the last optical element is an end surface of an optical assembly.

26. The immersion exposure method according to any one of claims 16 to 25, wherein the immersion fluid is confined by the containment member to an immersion region on the surface of the substrate.

27. The immersion exposure method according to any one of Claims 25 or 26, wherein the immersion region is smaller in area than the surface of the substrate.