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 exposure apparatus for transferring an image to a device, the exposure apparatus comprising:

an optical assembly,

a device stage for retaining the device, and

an environmental system for controlling an environment in a gap between the optical assembly and the device, the environmental system including a surrounding member which has a first surface facing at least one of the device and the device stage, an immersion fluid system for delivering an immersion fluid within the surrounding member for filling the gap, and an inlet portion on the first surface of the surrounding member to inhibit the immersion fluid from leaking,

characterised in that the exposure apparatus further comprises an apparatus frame by which the optical assembly is supported with optical mount isolators, each of which has a pneumatic cylinder for isolating vibration and an actuator for isolating vibration and controlling the position of the optical assembly; and

in that the device stage includes a stage surface arranged to be in approximately the same plane as an exposure surface of the device.

2. The exposure apparatus of claim 1, wherein the surrounding member is arranged such that a distance between the first surface and at least one of the device and the device stage is shorter than a distance between an end surface of the optical assembly and at least one of the device and the device stage.

3. The exposure apparatus of any one of the preceding claims, wherein the inlet portion is arranged to form a fluid bearing in the gap between the first surface and at least one of the device and the device stage in co-operation with an outlet portion for supplying a bearing fluid to the gap.

4. The exposure apparatus of any one of claims 1 to 3, wherein the environmental system includes an outlet portion on the first surface of the surrounding member.

5. The exposure apparatus of claim 4, wherein the outlet portion is arranged to provide pressurized gas.

6. The exposure apparatus of claim 4 or 5 wherein the outlet portion is arranged to form a gaseous bearing in the gap between the first surface and at least one of the device and the device stage.

7. The exposure apparatus of any one of claims 4 to 6, wherein the outlet portion is disposed outside of the inlet portion relative to the gap adjacent the optical assembly.

8. The exposure apparatus of any one of claims 4 to 7, wherein the environmental system includes a further inlet portion.

9. The exposure apparatus of claim 8, wherein the outlet portion is provided between the inlet portion and the further inlet portion.

10. The exposure apparatus of claim 8, wherein the further inlet portion is provided between the inlet portion and the outlet portion.

11. The exposure apparatus of any one of the preceding claims, further comprising a frame support with which the surrounding member is supported by the apparatus frame.

12. The exposure apparatus of claim 11, wherein the frame support includes one or more support assemblies.

13. The exposure apparatus of claim 12, wherein each of the one or more support assemblies extends between the apparatus frame and the surrounding member.

14. The exposure apparatus of claim 12 or 13, wherein each of the one or more support assemblies is a flexure.

15. The exposure apparatus of claim 12 or 13, wherein each of the one or more support assemblies is an actuator for adjusting a position of the surrounding member.

16. The exposure apparatus of claim 15, wherein the frame support includes a frame measurement system for monitoring the position of the surrounding member.

17. The exposure apparatus of any one of the preceding claims, further comprising a pressure equalizer for allowing the pressure in the gap to be approximately equal to the pressure outside the surrounding member.

18. The exposure apparatus of claim 17 wherein the pressure equalizer is a channel that extends through the surrounding member.

19. The exposure apparatus of any one of the preceding claims, wherein the device stage includes a device holder for retaining the device, a guard for defining the stage surface, and a mover assembly for moving one of the device holder and the guard so that the exposure surface of the device is approximately in the same plane as the stage surface.

20. The exposure apparatus of claim 19, wherein the mover assembly is arranged to move the guard relative to the device and the device holder.

21. A manufacturing process that includes the steps of providing a device and transferring an image to the device with the exposure apparatus of any one of the preceding claims.

22. An exposure method of transferring an image to a device, the method comprising:

supporting an optical assembly by an apparatus frame with optical mount isolators, each of which has a pneumatic cylinder for isolating vibration and an actuator for isolating vibration and controlling the position of the optical assembly;

retaining a device with a device stage, and

controlling an environment in a gap between the optical assembly and the device with an environmental system, wherein

the environmental system includes a surrounding member which has a first surface facing at least one of the device and the device stage, an immersion fluid system to deliver an immersion fluid within the surrounding member for filling the gap, and an inlet portion on the first surface of the surrounding member to inhibit the immersion fluid from leaking,

wherein the device stage includes a stage surface arranged to be in approximately the same plane as an exposure surface of the device.

23. The exposure method of claim 22, wherein the environmental system includes an outlet portion on the first surface of the surrounding member.

24. The exposure method of claim 23, wherein the outlet portion is arranged to provide pressurized gas.

25. The exposure method of claim 23 or 24, wherein the environmental system includes a further inlet portion.

26. The exposure method of claim 25, wherein the outlet portion is provided between the inlet portion and the further inlet portion.

27. The exposure method of claim 25, wherein the further inlet portion is provided between the inlet portion and the outlet portion.

28. The exposure method of any one of claims 22 to 27, further comprising a frame support with which the surrounding member is supported by the apparatus frame, wherein the frame support includes one or more support assemblies.

29. The exposure method of claim 28, wherein each of the one or more support assemblies is an actuator that is used to adjust a position of the surrounding member.

30. The exposure method of claim 29, wherein the frame support includes a frame measurement system that monitors the position of the surrounding member.

31. A manufacturing method comprising:

exposing a device using the apparatus of any one of claims 1 to 20, or using the exposure method of any of claims 22 to 30; and

developing the exposed device.