WHAT IS CLAIMED IS:

1. An apparatus for polishing configured to polish an object by using a polishing pad having a polishing surface, the apparatus comprising:

a polishing table provided to be rotatable and configured to support and rotate the polishing pad;

a holder configured to hold the object and press the object against the polishing pad;

a polishing solution supply device provided with a contact member and configured to supply a polishing solution to an opening in a bottom face of the contact member in a state that the contact member comes into contact with or is adjacent to the polishing pad, thereby spreading the polishing solution on the polishing pad, the polishing solution supply device configured to cause at least part of used polishing solution returned by rotation of the polishing pad to be dammed up by the contact member and configured to set the contact member either in a direction of keeping the dammed up polishing solution on the polishing pad or in a direction of discharging the dammed up polishing solution, according to an angle of the polishing solution supply device with respect to a radial direction of the polishing pad;

an arm linked with the polishing solution supply device;

a rotating mechanism comprising a motor and a rotating shaft fixed to a distal end side of the arm, the rotating shaft being perpendicular to the polishing surface, the polishing solution supply device being directly or indirectly mounted to the rotating shaft, the motor configured to rotate the polishing solution supply device with respect to the arm; and

a controller configured to control the rotating mechanism to change the angle of the polishing solution supply device with respect to the radial direction of the polishing pad and thereby control a discharge amount of the polishing solution by the contact member of the polishing solution supply device.

2. The apparatus according to claim 1, further comprising:

a lifting turning mechanism configured to lift up and lower and turn the arm,

wherein

the controller is configured to change an angle and/or a position of the polishing solution supply device on the polishing pad by combination of rotation of the polishing solution supply device by the rotating mechanism with turning of the arm by the lifting turning mechanism.

3. The apparatus according to either claim 1 or claim 2,

wherein the controller sets the angle of the polishing solution supply device to a first angle during a pre-supply that supplies the polishing solution to the polishing pad prior to polishing of the object, and sets the angle of the polishing solution supply device to a second angle that accelerates discharge of the polishing solution compared with the first angle, for at least part of a time period of polishing of the object.

4. The apparatus according to either claim 1 or claim 2,

wherein the controller sets the angle of the polishing solution supply device to a third angle for a predetermined time period before a start of a pre-supply that supplies the polishing solution to the polishing pad prior to polishing of the object, and sets the angle of the polishing solution supply device to a fourth angle that suppresses discharge of the polishing solution compared with the third angle, during the pre-supply.

5. The apparatus according to any one of claims 1 to 4,

wherein the controller changes over the angle of the polishing solution supply device to a plurality of different angles during polishing of the object.

6. The apparatus according to any one of claims 1 to 5,

wherein the controller changes the angle of the polishing solution supply device, based on a polishing rate and/or a time change of the polishing rate, during polishing of the object.

7. The apparatus according to claim 6, further comprising:

a film thickness sensor placed in the polishing table and configured to measure a film thickness distribution on a surface of the object, wherein

the controller calculates the polishing rate from a time change of the film thickness distribution at a time of polishing the object obtained by the film thickness sensor.

8. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein the polishing solution supply device has a supply port from which the polishing solution is supplied onto the polishing pad, and

the controller controls the angle and/or the position of the polishing solution supply device such as to minimize a change in position of the supply port before and after a change of the angle of the polishing solution supply device.

9. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein the polishing solution supply device has a supply port from which the polishing solution is supplied onto the polishing pad, and

the controller controls the angle and/or the position of the polishing solution supply device such as to minimize a distance between position of the supply port and center of the polishing pad before and after a change of the angle of the polishing solution supply device.

10. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein the controller controls the lifting turning mechanism and the rotating mechanism such as to move the arm, while keeping the angle of the polishing solution supply device constant.

11. The apparatus according to any one of claims 8 to 10,

wherein the controller controls the lifting turning mechanism and the rotating mechanism in a range that an interval between the polishing solution supply device and the holder is equal to or larger than a predetermined value.

12. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein the controller controls the lifting turning mechanism and the rotating mechanism such as to keep an interval between the polishing solution supply device and the holder constant before and after a change of the angle of the polishing solution supply device.

13. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein the controller changes a sequence of performing rotation of the arm by the lifting turning mechanism and rotation of the polishing solution supply device by the rotating mechanism according to angles before and after a change of the angle of the polishing solution supply device.

14. The apparatus according to claim 2 or according to any of claims 3 to 7 depending directly or indirectly on claim 2,

wherein after termination of polishing of the object, the controller causes the arm to be rotated by the lifting turning mechanism, subsequently causes the polishing solution supply device to be rotated to an angle for retreating by the rotating mechanism, subsequently rotates the arm, and moves the polishing solution supply device to a refuge position outside of the polishing pad.

15. A method of polishing an object by using a polishing pad having a polishing surface

and a polishing solution supply device placed on the polishing pad, the method of polishing comprising:

supplying a polishing solution to an opening in a bottom face of a contact member of the polishing solution supply device to spread the polishing solution on the polishing pad in a state that the contact member comes into contact with or is adjacent to the polishing pad, causing at least part of used polishing solution returned by rotation of the polishing pad to be dammed up by the contact member, and keeping the dammed up polishing solution on the polishing pad and/or discharging the dammed up polishing solution, according to an angle of the contact member of the polishing solution supply device with respect to a radial direction of the polishing pad; and

controlling a discharge amount of the polishing solution by the contact member of the polishing solution supply device, by changing an angle and/or a position of the polishing solution supply device on the polishing pad, at least at a time of a pre-supply that supplies the polishing solution to the polishing pad prior to polishing of the object, or during polishing of the object,

wherein changing the angle of the polishing solution supply device with respect to the radial direction of the polishing pad and/or the position of the polishing solution supply device on the polishing pad includes: rotating a rotating shaft of a motor fixed to a distal end side of the arm, the rotating shaft being perpendicular to the polishing surface, thereby to rotate the polishing solution supply device fixed directly or indirectly to the rotating shaft, with respect to the arm.

16. The method according to claim 15,

wherein changing the angle of the polishing solution supply device with respect to the radial direction of the polishing pad and/or the position of the polishing solution supply device on the polishing pad further includes rotating the arm.