WHAT IS CLAIMED IS:

1. A substrate processing apparatus comprising:

a polishing table to which a polishing pad for polishing a substrate is attachable;

a polishing head for holding and pressing the substrate against the polishing pad;

a retainer member disposed surrounding the polishing head;

a retainer member pressurization chamber disposed adjacent to the retainer member;

an arm for holding and turning the polishing head; and

a slip out detector for detecting a slipout of the substrate from the polishing head based on a turning torque of the arm or based on a flow rate of a fluid supplied to the retainer member pressurization chamber, and

an arm torque detector for detecting a physical quantity correlated to the turning torque of the arm, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head based on a change in the physical quantity detected by the arm torque detector.

2. The substrate processing apparatus according to claim 1, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head when an amount of change per unit time of the physical quantity detected by the arm torque detector exceeds a preset threshold value.

3. The substrate processing apparatus according to claim 1 or 2, wherein

the arm torque detector is an ammeter configured to detect a drive current of an electric motor for turning the arm.

4. The substrate processing apparatus according to any one of the claims 1 to 3, further comprising

a speed detector for detecting a turning speed of the arm, wherein

the slip out detector is configured to stop the detection of the slipout of the substrate from the polishing head based on the speed detected by the speed detector.

5. The substrate processing apparatus according to claim 4, wherein

the slip out detector is configured to stop the detection of the slipout of the substrate from the polishing head when the speed detected by the speed detector is less than a preset threshold value.

6. The substrate processing apparatus according to any one of claim 1 to 5, further comprising:

a supply source for supplying a fluid to the retainer member pressurization chamber; and

a flow rate detector for detecting the flow rate of the fluid supplied to the retainer member pressurization chamber, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head based on a change in the flow rate detected by the flow rate detector.

7. The substrate processing apparatus according to claim 6, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head when an amount of change per unit time of the flow rate of the fluid detected by the flow rate detector exceeds a preset threshold value.

8. The substrate processing apparatus according to any one of claims 1 to 7, further comprising

a setting change detector configured to detect an issuance of a setting change command to change at least one setting value of a height of the polishing head with respect to the polishing pad, pressures of a plurality of substrate pressurization chambers formed in the polishing head, a pressure of the retainer member pressurization chamber, a rotational speed of the polishing table, a rotational speed of the polishing head, or a turning speed of the arm, wherein

the slip out detector is configured to stop the detection of the slipout of the substrate from the polishing head for a predetermined period when the setting change detector detects the issuance of the setting change command.

9. The substrate processing apparatus according to any one of claim 1 to 8, further

comprising

a table torque detector for detecting a physical quantity correlated to a rotating torque of the polishing table, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head based on a change in the physical quantity detected by the table torque detector.

10. The substrate processing apparatus according to any one of claims 1 to 9, further comprising

a polishing head torque detector for detecting a physical quantity correlated to a rotating torque of the polishing head, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head based on a change in the physical quantity detected by the polishing head torque detector.

11. The substrate processing apparatus according to any one of claims 1 to 10, further comprising

a light emitting member for emitting a light to the polishing pad and a light receiving member for receiving a light reflected by the polishing pad, wherein

the slip out detector is configured to detect the slipout of the substrate from the polishing head based on a change in light amount or color of a reflected light received by the light receiving member.

12. A substrate processing method comprising:

a polishing step of holding a substrate using a polishing head and pressing the substrate against a polishing pad attached to a polishing table; and

a slip out detection step of detecting a slipout of the substrate from the polishing head based on a turning torque of an arm for turning the polishing head or based on a flow rate of a fluid supplied to a retainer member pressurization chamber disposed adjacent to a retainer member disposed surrounding the polishing head,

wherein the slip out detection step detects the slipout of the substrate from the

polishing head based on a change in a physical quantity correlated to a rotating torque of the polishing table or a change in a physical quantity correlated to a rotating torque of the polishing head.