

CLAIMS

1. A substrate carrying mechanism for carrying a substrate between a plurality of processing units comprising:

5 a movable base for carrying a substrate between the plurality of processing units;

a substrate holding member placed on the base and capable of holding a substrate and of being advanced and retracted relative to the base;

four or more detecting units respectively for detecting different parts of
10 anthe edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate is retracted; and

a controller that determines whether or not a notch formed in the edge of the substrate has been detected by one of the detecting units on the basis of measurements measured by the four or more detecting units and corrects an
15 error in a transfer position where the substrate is to be transferred to thea succeeding processing unit on the basis of measurements measured by the detecting units excluding the one detecting unit that has detected the notch of the substrate.

20 ~~2. A substrate carrying mechanism comprising:~~

~~a base;~~

~~a substrate holding member capable of holding a substrate and of being advanced and retracted relative to the base;~~

three detecting units that detect different parts of the edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate is retracted; and

a controller that decides whether or not a part of a notch formed in the edge of a

5 substrate received from a processing unit has been detected by one of the detecting units on the basis of measurements measured by the three detecting units, moves the substrate holding unit relative to the detecting units such that no part of the notch will be detected by any one of the detecting units when it is decided that a part of the notch has been detected by one of the detecting units;

10 makes the detecting units detect parts of the edge of the substrate after the substrate holding unit has been moved relative to the detecting units, and determines a transfer position where the substrate is to be transferred to a succeeding processing unit on the basis of measurements measured by the detecting units after the substrate holding unit has been moved relative to the
15 detecting units.

23. The substrate carrying mechanism according to claim 1 or 2, wherein the controller calculates a position of athe center of the substrate by using positions of the parts ofen the edge of the substrate detected by the detecting units, and
20 executes a control operation such that the calculated position of the center of the substrate coincides with a predetermined position.

34. The substrate carrying mechanism according to ~~any one of~~ claims 1 to 3, wherein the controller compares a position to which the substrate holding

member holding the substrate has been retracted with a reference position of the substrate holding member to decide a state of a shape of the substrate holding member.

5 | 45. The substrate carrying mechanism according to ~~any one of claims 1 to 4~~, wherein a plurality of substrate holding members are arranged so as to be superposed, and the detecting units detect a position of anthe edge of athe substrate held by one of the substrate holding members when the substrate holding member holding the substrate is retracted.

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| 56. The substrate carrying mechanism according to ~~any one of claims 1 to 5~~, wherein each of the detecting units includes a light source and a light-sensing device formed by arranging a plurality of light-sensing elements, disposed opposite to each other on the opposite sides, respectively, of a substrate held
15 | by the retracted substrate holding member.

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| 6. A substrate carrying mechanism for carrying a substrate between a plurality of processing units comprising:

| a movable base for carrying a substrate between the plurality of units;

| a substrate holding member capable of holding a substrate and of being advanced and retracted relative to the base;

| three detecting units that detect different parts of an edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate is retracted; and

a controller that decides whether or not a part of a notch formed in an edge of a substrate received from a processing unit has been detected by one of the detecting units on the basis of measurements measured by the three detecting units, moves the substrate holding unit relative to the detecting units such that no part of the notch will be detected by any one of the detecting units when it is decided that a part of the notch has been detected by one of the detecting units, makes the detecting units detect parts of the edge of the substrate after the substrate holding unit has been moved relative to the detecting units, and determines a transfer position where the substrate is to be transferred to the succeeding processing unit on the basis of measurements measured by the detecting units after the substrate holding unit has been moved relative to the detecting units.

7. The substrate carrying mechanism according to claim 6, wherein the controller calculates a position of a center of the substrate by using positions of the parts on the edge of the substrate detected by the detecting units, and executes a control operation such that the calculated position of the center of the substrate coincides with a predetermined position.

8. The substrate carrying mechanism according to claim 6, wherein the controller compares a position to which the substrate holding member holding the substrate has been retracted with a reference position of the substrate holding member to decide a state of a shape of the substrate holding member.

9. The substrate carrying mechanism according to claim 6, wherein a plurality of substrate holding members are arranged so as to be superposed, and the detecting units detect a position of an edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate is retracted.

10. The substrate carrying mechanism according to claim 6, wherein each of the detecting units includes a light source and a light-sensing device formed by arranging a plurality of light-sensing elements, disposed opposite to each other on the opposite sides, respectively, of a substrate held by the retracted substrate holding member.

~~7. The substrate carrying mechanism according to claim 6, wherein the controller measures an amount of light emitted by the light source and received by the light-sensing elements normally not shaded by a substrate held by the substrate holding member, and detects failure of the light source from the measured amount of light.~~

~~8. The substrate carrying mechanism according to claim 6 or 7, wherein the controller measures an amount of light emitted by the light source and received by the light-sensing elements in a state in which the substrate holding member is not holding any substrate and detects failure of the light-sensing elements from the measured amount of light.~~

9. ~~The substrate carrying mechanism according to any one of claims 6 to 8, wherein the light-sensing devices are linear image sensors.~~

10. ~~The substrate carrying mechanism according to any one of claims 1 to 9, wherein the controller decides that a substrate is broken when one of the detecting units detects positions of two different parts on the edge of the substrate.~~

11. ~~The substrate carrying mechanism according to any one of claims 1 to 10, wherein the substrate holding member is provided with suction parts for attracting a substrate by vacuum suction, and the suction parts attract a substrate by vacuum suction to hold the substrate on the substrate holding member.~~

11-12. A substrate carrying method to be carried out by a substrate carrying mechanism for carrying a substrate between a plurality of processing units including a movable base for carrying a substrate between the plurality of processing units, a substrate holding member placed on the base and capable of being advanced and retracted relative to the base, and four or more detecting units for detecting different parts of an edge of a substrate held by the substrate holding member when the substrate holding member holding a substrate received from a processing unit is retracted, said substrate carrying method comprising the steps of:

detecting different parts of the edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate received from the processing unit is retracted;

deciding whether or not a part of a notch formed in anthe edge of a substrate received from a processing unit has been detected by one of the detecting units on the basis of measurements measured by the detecting units; and

determining, if a part of the notch formed in the edge of the substrate received from the processing unit has been detected by one of the detecting units, a transfer position where the substrate is to be transferred to the succeeding processing unit on the basis of the measurements measured by the detecting units excluding the one detecting unit that has detected the part of the notch of the substrate.

~~13. A substrate carrying method, to be carried out by a substrate carrying mechanism including a base, a substrate holding member capable of holding a substrate and of being advanced and retracted relative to the base, and three detecting units that detect different parts of an edge of a substrate held by the substrate holding member when the substrate holding member holding the substrate is retracted, comprising the steps of:~~

~~deciding whether or not a part of a notch formed in the edge of a substrate received from a processing unit has been detected by one of the detecting units on the basis of measurements measured by the three detecting units;~~

moving the substrate holding member relative to the detecting units such that no part of the notch will be detected by any one of the detecting units when it is decided that a part of the notch has been detected by one of the detecting units;

5 remeasuring positions of parts of the edge of the substrate by the detecting units after the substrate holding member has been moved relative to the detecting units; and

10 determining a transfer position where the substrate is to be transferred to the succeeding processing unit on the basis of measurements remeasured by the detecting units after the holding unit has been moved relative to the detecting units.

1244. The substrate carrying method according to claim 1142 or 13, wherein
15 the position of the center of a substrate is calculated by using positions of parts of the edge of the substrate detected by the detecting units, and a control operation is executed such that the calculated position of the center of the substrate coincides with a predetermined position.

1345. The substrate carrying method according to any one of claims 1142 to
20 44, wherein a position to which the substrate holding member holding a substrate has been retracted is compared with a reference position of the substrate holding member to decide a state of the shape of the substrate holding member.

1416. The substrate carrying method according to ~~any one of claims 1112 to~~
 45, wherein a plurality of substrate holding members are arranged so as to be
 superposed, and the detecting units detect a position of ~~an~~the edge of a
 5 substrate held by one of the substrate holding members when the substrate
 holding member holding the substrate is retracted.

1517. The substrate carrying method according to ~~any one of claims 1112 to~~
 46, wherein each of the detecting units includes a light source and a light-
 10 sensing device formed by arranging a plurality of light-sensing elements,
 disposed opposite to each other on the opposite sides, respectively, of a
 substrate held by the retracted substrate holding member.

16. A substrate carrying method, to be carried out by a substrate carrying
 15 mechanism for carrying a substrate between a plurality of processing units
including a movable base for carrying a substrate between the plurality of
processing units, a substrate holding member capable of holding a substrate
and of being advanced and retracted relative to the base, and three detecting
units that detect different parts of an edge of a substrate held by the substrate
 20 holding member when the substrate holding member holding the substrate is
retracted, comprising the steps of:

detecting different parts of the edge of the substrate held by the
substrate holding member when the substrate holding member holding the
substrate received from a processing unit is retracted;

deciding whether or not a part of a notch formed in an edge of a substrate received from a processing unit has been detected by one of the detecting units on the basis of measurements measured by the three detecting units;

5 moving the substrate holding member relative to the detecting units such that no part of the notch will be detected by any one of the detecting units when it is decided that a part of the notch has been detected by one of the detecting units;

10 remeasuring positions of parts of the edge of the substrate by the detecting units after the substrate holding member has been moved relative to the detecting units; and

15 determining a transfer position where the substrate is to be transferred to the succeeding processing unit on the basis of measurements remeasured by the detecting units after the holding unit has been moved relative to the detecting units.

17. The substrate carrying method according to claim 16, wherein a position of a center of the substrate is calculated by using positions of parts of the edge of the substrate detected by the detecting units, and a control operation is executed such that the calculated position of the center of the substrate coincides with a predetermined position.

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18. The substrate carrying method according to claim 16, wherein a position to which the substrate holding member holding a substrate has been retracted

is compared with a reference position of the substrate holding member to
decide a state of a shape of the substrate holding member.

19. The substrate carrying method according to claim 16, wherein a plurality
of substrate holding members are arranged so as to be superposed, and the
detecting units detect a position of an edge of a substrate held by one of the
substrate holding members when the substrate holding member holding the
substrate is retracted.

20. The substrate carrying method according to claim 16, wherein each of
the detecting units includes a light source and a light-sensing device formed by
arranging a plurality of light-sensing elements, disposed opposite to each other
on the opposite sides, respectively, of a substrate held by the retracted
substrate holding member.

~~18. The substrate carrying method according to claim 17, wherein an amount
of light emitted by the light source and received by the light-sensing elements
normally not shaded by a substrate held by the substrate holding member is
measured, and failure of the light source is detected from the measured amount
of light.~~

~~19. The substrate carrying method according to claim 17 or 18, wherein an
amount of light emitted by the light source and received by the light-sensing
elements in a state in which the substrate holding member is not holding any~~

substrate is measured and failure of the light-sensing elements is detected from the measured amount of light.

20. — The substrate carrying method according to any one of claims 17 to 19, wherein the light-sensing devices are linear image sensors.

21. — The substrate carrying method according to any one of claims 12 to 20, wherein it is decided that a substrate is broken when one of the detecting units detects positions of two different parts on the edge of the substrate.

22. — The substrate carrying method according to any one of claims 12 to 21, wherein the substrate holding member is provided with suction parts for attracting a substrate by vacuum suction, and the suction parts attract a substrate by vacuum suction to hold the substrate on the substrate holding member.

23. — A computer-adaptive storage medium storing programs to be executed by a computer to carry out the substrate carrying method stated in any one of claims 12 to 22.