gas is disturbed. In the case where the glass substrate 100 is not below the laser emitter 50 as shown in Figure 5B, the inert gas atmosphere is not formed because there is no gap around the inert gas injector 51.

Further, the flow volume of the inert gas that flows from the inert gas injector for realizing the straight flow is very small, and therefore, the air moving together with the stage cannot be perfectly removed at the laser emitter.

Thus, the laser emitter is fixed in the emission apparatus, and the laser is emitted to the glass substrate in a state where the conveyance stage having the glass substrate loaded is moving. Therefore, there is a problem in producing a local inert gas atmosphere with little disturbance.

[0007]

The invention has been made in the context of the above circumstance, and has an object to provide an atmosphere formation apparatus and a floating conveyance method that make it possible to form a stable atmosphere on the conveyance path regardless of the conveyance position of the workpiece.

[Summary]

[0008]

That is, according to a first aspect of the atmosphere formation apparatus in the invention is an atmosphere formation apparatus that is provided in a floatation conveyance apparatus, the floatation conveyance apparatus conveying a workpiece while performing floating support of the workpiece by gas injection,

the atmosphere formation apparatus including : a large-range atmosphere formation device that forms a large-range atmosphere, the large-range atmosphere being an atmosphere in a large-range region containing a conveyance path along which the conveyance is performed, a small-range atmosphere formation device that forms a small-range atmosphere in a large-range atmosphere, , the small-range atmosphere being an atmosphere in a small-range region containing the conveyance path, the small-range atmosphere being different from the large-range atmosphere,

the small-range atmosphere formation device includes a downward gas injector that injects an atmosphere gas from an upper side in accordance with at least the whole or part of a floating injection gas that is injected from a lower side,

the large-range atmosphere contain a floating injection gas injected for the floating from a lower side, as part of atmosphere gases,

the small-range atmosphere contain a floating injection gas injected for the floating from a lower side and the atmosphere gas injected from a upper side by the downward gas injector, as part of atmosphere gases,

the atmosphere gas injected from upper side and the floating injection gas from the lower side in the small-range atmosphere formation device are nitrogen or an inert gas,

the floating injection gas from a lower side in the large-range atmosphere formation device is an air , or the same component gas of the floating injection gas in small-range atmosphere, having lower purity than the floating injection gas in small-range atmosphere.

[0009]

According to the disclosure, by the small-range atmosphere formation device, the small-range atmosphere different from the large-range atmosphere is formed in the large-range atmosphere, and a stable small-range atmosphere is obtained on the conveyance path regardless of the existence of a workpiece.

[0010]

An atmosphere formation apparatus according to another embodiment, the large-range region and the small-range region are included in a processing chamber in which the workpiece is processed.

[0033]

According to disclosure, the large-range atmosphere and the small-range atmosphere are formed in the processing chamber in which the workpiece is processed.

[0034]

An aspect relates to a floating conveyance method for conveying a workpiece while performing floating support of the workpiece by gas injection,

the floating conveyance method including: a step of forming a small-range atmosphere in a large-range atmosphere, the large-range atmosphere being an atmosphere in a large-range region containing a conveyance path along which the conveyance is performed, the small-range atmosphere being an atmosphere in a small-range region containing the conveyance path along which the conveyance is performed, the small-range atmosphere being different from the large-range atmosphere; and a step of conveying the workpiece along the conveyance path through the large-range atmosphere and the small-range atmosphere, the step of forming the large-range atmosphere contains a floating injection gas from a lower side for the floating support, as part of atmosphere gases,

the step of forming the small-range atmosphere contains a floating injection gas from a lower side for the floating support and an atmosphere gas from an upper side in accordance with at least the whole or part of a floating injection gas that is injected from a lower side, as part of atmosphere gasses,

wherein the atmosphere gas injected from upper side and the floating injection gas from the lower side are nitrogen or an inert gas in the step of forming the small-range atmosphere and,

the floating injection gas from a lower side is an air, or the same component gas of the floating injection gas in small-range atmosphere, having lower purity than the floating injection gas in small-range atmosphere, in the step of forming the large-range range atmosphere.

[0035]

An embodiment of a floating conveyance method includes a step of forming the large-range atmosphere in the large-range region.

[0035a]

An apparatus of another embodiment of the present disclosure comprises a laser emitter emitting a laser light; a stage over which a workpiece is conveyed, the stage being

configured to inject a first inert gas and float the workpiece to which the laser light is shone; a gas injector located over the workpiece and configured to inject a second inert gas to the workpiece; and a wall surface located over the workpiece and under the gas injector, the wall surface overlapping the workpiece in a plan view.

[0035b]

An apparatus of another embodiment of the present disclosure comprises a laser emitter emitting a laser light; a stage over which a workpiece is conveyed, the stage being configured to inject a first inert gas and float the workpiece to which the laser light is shone; a gas
injector located over the workpiece and configured to inject a second inert gas to the workpiece; and a wall surface located over the workpiece and under the gas injector,
the wall surface overlapping the workpiece in a plan view, the wall surface having an opening through which the laser light is shone to the workpiece, wherein a local atmosphere comprising the first inert gas and the second inert gas is formed between the workpiece and the wall surface.

[0036]

That is, the invention has an effect of making it possible to form the small-range atmosphere in a predetermined region and form an atmosphere with no disturbance, regardless of the existence of a workpiece.

[Brief Description of Drawings]

[0037]

[Figure 1] Figure 1 is a diagram for describing a large-range atmosphere and a small-range atmosphere in the invention.

[Figure 2] Figure 2 is a diagram showing a laser processing apparatus that includes an atmosphere formation apparatus according to an embodiment of the invention, similarly.

[Document Name] Claims

[Claim 1]

An atmosphere formation apparatus that is provided in a floatation conveyance apparatus, the floatation conveyance apparatus conveying a workpiece while performing floating support of the workpiece by gas injection,

the atmosphere formation apparatus comprising: a large-range atmosphere formation device that forms a large-range atmosphere, the large-range atmosphere being an atmosphere in a large-range region containing a conveyance path along which the conveyance is performed, a small-range atmosphere formation device that forms a small-range atmosphere in a large-range atmosphere, the small-range atmosphere being an atmosphere in a small-range region containing the conveyance path, the small-range atmosphere being different from the large-range atmosphere,

the small-range atmosphere formation device includes a downward gas injector that injects an atmosphere gas from an upper side in accordance with at least the whole or part of a floating injection gas that is injected from a lower side,

the large-range atmosphere contain a floating injection gas injected for the floating from a lower side, as part of atmosphere gases,

the small-range atmosphere contain a floating injection gas injected for the floating from a lower side and the atmosphere gas injected from a upper side by the downward gas injector, as part of atmosphere gases,

the atmosphere gas injected from upper side and the floating injection gas from the lower side in the small-range atmosphere formation device are nitrogen or an inert gas,

the floating injection gas from a lower side in the large-range atmosphere formation device is an air , or the same component gas of the floating injection gas in small-range atmosphere, having lower purity than the floating injection gas in small-range atmosphere.

[Claim 2]

The atmosphere formation apparatus according to claim 1 , comprising a large-range atmosphere formation device that forms the large-range atmosphere, the large-range atmosphere formation device including a large-range gas introducer that introduces an atmosphere gas from an exterior of the large-range region.

[Claim 3]

The atmosphere formation apparatus according to claim 1 or 2, wherein the small-range atmosphere formation device includes a small-range gas introducer that

introduces an atmosphere gas from an exterior of the large-range region and the small-range region.

[Claim 4]

The atmosphere formation apparatus according to any one of claims 1 to 3, wherein a downward gas injector is positioned such that the conveyance path for the workpiece is positioned between a gas injected from the downward gas injector and a floating injection gas.

[Claim 5]

The atmosphere formation apparatus according to any one of claims 1 to 4, wherein the small-range atmosphere is formed in a region containing a working area for the workpiece.

[Claim 6]

The atmosphere formation apparatus according to any one of claims 1 to 5, wherein the small-range atmosphere contains a region on a conveyance-directional upstream side of a working area for the workpiece.

[Claim 7]

The atmosphere formation apparatus according to any one of claims 1 to 6, wherein the small-range atmosphere contains a region on a conveyance-directional downstream side of a working area for the workpiece.

[Claim 8]

The atmosphere formation apparatus according to any one of claims 5 to 7, wherein the small-range atmosphere formation device is formed so as to cover both vertical sides and both conveyance-directional lateral sides of the workpiece that is conveyed in the small-range atmosphere.

[Claim 9]

The atmosphere forming apparatus according to claim 8, wherein the processing area of the workpiece is located within the small-range atmosphere.

[Claim 10]

The atmosphere formation apparatus according to any one of claims 1 to 9, wherein the large-range region and the small-range region are included in a processing chamber in which the workpiece is processed.

[Claim 11]

A floating conveyance method for conveying a workpiece while performing floating support of the workpiece by gas injection,

the floating conveyance method comprising: a step of forming a small-range atmosphere in a large-range atmosphere, the large-range atmosphere being an atmosphere in a large-range region containing a conveyance path along which the conveyance is performed, the small-range atmosphere being an atmosphere in a small-range region containing the conveyance path along which the conveyance is performed, the small-range atmosphere being different from the large-range atmosphere; and a step of conveying the workpiece along the conveyance path through the large-range atmosphere and the small-range atmosphere, the step of forming the large-range atmosphere contains a floating injection gas from a lower side for the floating support, as part of atmosphere gases,

the step of forming the small-range atmosphere contains a floating injection gas from a lower side for the floating support and an atmosphere gas from an upper side in accordance with at least the whole or part of a floating injection gas that is injected from a lower side, as part of atmosphere gasses,

wherein the atmosphere gas injected from upper side and the floating injection gas from the lower side are nitrogen or an inert gas in the step of forming the small-range atmosphere and,

the floating injection gas from a lower side is an air, or the same component gas of the floating injection gas in small-range atmosphere, having lower purity than the floating injection gas in small-range atmosphere, in the step of forming the large-range range atmosphere.