UNIT FOR REMOVING FOREIGN MATTER AND APPARATUS AND METHOD FOR SEMICONDUCTOR PACKAGING USING THE SAME

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ABSTRACT
An example embodiment relates to a foreign matter removing unit including a body, an injection member, and a suction member. The injection member includes a portion of the body defining at least one injection hole. The suction member includes a part of the body defining at least one suction hole. The injection member of the foreign matter removing unit is configured to inject gas into a suction region in which the suction member is configured to exert a suction force.
Fig. 6

Fig. 7
UNIT FOR REMOVING FOREIGN MATTER AND APPARATUS AND METHOD FOR SEMICONDUCTOR PACKAGING USING THE SAME

CROSS-REFERENCE TO RELATED APPLICATIONS


BACKGROUND

[0002] Some example embodiments relate to a unit for removing foreign matter remaining on a wafer, a semiconductor chip, and/or a wiring substrate, used in a semiconductor packaging process. Other example embodiments relate to an apparatus and method for semiconductor packaging using the same.

[0003] Semiconductor devices may be manufactured through a FAB process that includes forming a pattern on a wafer according to characteristics of the semiconductor device. An EDS process may be used for detecting the electrical characteristics of the pattern formed on the wafer. A packaging process may be used for processing the wafer into a chip unit.

[0004] In the packaging process, the semiconductor chips may be separated from the wafer into individual units and mounted on a wiring substrate. Effort is made to prevent the semiconductor chips from being contaminated by foreign matter, such as particles and/or other debris, generated during the manufacturing and packaging processes and/or from the surrounding environment.

SUMMARY

[0005] Some example embodiments relate to a foreign matter removing unit having improved foreign matter removing efficiency, and an apparatus and method for semiconductor packaging using the same.

[0006] An example embodiment of the inventive concepts relates to a foreign matter removing unit including a body, an injection member including one of (i) a portion of the body defining at least one injection hole and (ii) a tubular member defining at least one injection hole, the injection member configured to inject at least gas onto an object, a suction member including a part of the body defining at least one suction hole, the suction member configured to suck foreign matter scattered from the object by the injected gas injected. The suction member is configured to exert a suction force in a suction region of the object where the injection member is configured to inject gas.

[0007] The injection member may include the portion of the body defining at least one injection hole. The foreign matter removing unit may further include at least one magnet member on a bottom surface of the body facing the object, the at least one magnet member is disposed closer to the at least one suction hole than the at least one injection hole on the bottom surface of the body.

[0008] The injection member may include the portion of the body defining at least two injection holes. The at least one suction hole may be disposed in between the at least two injection holes on a bottom surface of the body,

[0009] The injection member may include that at least one tubular member, and the at least one tubular member may be configured inside the suction hole.

[0010] The injection member may include the tubular member, and the tubular member may include an injection nozzle. The part of the body may define a plurality of first suction holes and a plurality of second suction holes, where the first suction holes are a different size than the second suction holes.

[0011] The injection member may include the tubular member. The tubular member may be disposed parallel to the body, and the tubular member define a plurality of injection holes facing the object.

[0012] The part of the body may define at least one suction hole including a slit shape defined along a length direction of the body on a surface of the body facing the object. The injection member may include the portion of the body defining at least one injection hole, and the at least one injection hole is arranged in a line parallel to the at least one suction hole, and the at least one injection hole may be inclined toward the suction region of the object.

[0013] The part of the body may define at least one suction hole including a slit shape defined along a length direction of the body on a surface of the body facing the object. The injection member may include the portion of the body, the portion of the body defining at least one slit-shaped first injection hole and at least one slit-shaped second injection hole parallel to the suction hole. The first injection hole and the second injection hole may be inclined towards the suction region of the object.

[0014] The injection member may include the tubular member and the tubular member may be disposed perpendicular to the object. The suction member may include an outer tube in which the tubular member of the injection member is inserted, and the outer tube may be configured to suck the foreign matter scattered from the object through a space provided between the outer tube and the inner tube.

[0015] The injection member and the suction member may be disposed above the object to face each other with respect to the suction region. The injection member may include the tubular member and the tubular member may include an injection nozzle inclined toward the suction region. The at least one suction hole may be inclined toward the suction region in a surface of the body facing the object.

[0016] The suction member may include at least one slit-shaped suction hole longitudinally defined along a length direction of the body in a surface of the body facing the object, and the injection member may include a tubular member disposed parallel to the body on a side of the body. The tubular member may define a plurality of injection holes arranged in a length of the tubular member, and the injection holes may be inclined toward the suction region of the object in which the suction force of the suction hole acts.

[0017] The foreign matter removing unit may further include a magnet member on a bottom surface of the body, the magnet member applying a magnetic force to the foreign matter containing metal components scattered from the object by the gas injected onto the object.

[0018] An example embodiment relates to a semiconductor packaging device including a process unit configured to perform a semiconductor packaging process, and a foreign matter removing unit disposed in the process unit and configured to remove foreign matter remaining on an object. The foreign matter removing unit may include a body, an injection mem-
ber including one of (i) a portion of the body defining at least one injection hole and (ii) a tubular member defining at least one injection hole, the injection member configured to inject at least gas into an object, a suction member including a part of the body defining at least one suction hole, the suction member configured to suck foreign matter scattered from the object by the injected gas. The suction member is configured to exert a suction force in a suction region of the object where the injection member is configured to inject gas.

0019. The object may include a wafer on which a back surface thereof is polished, and the process unit may include a wafer chuck on which the wafer is mounted to allow the polished back surface of the wafer to face an upper side, and a dicing tape attach for attaching a dicing tape on the back surface of the wafer mounted on the wafer chuck. The foreign matter removing unit may be connected to the process unit and configured to move in a straight direction above the wafer chuck, and configured to remove the foreign matter remaining on the back surface of the wafer mounted on the wafer chuck.

0020. The injection member and the suction member may be disposed above the wafer chuck. The part of the body may define at least one suction hole including a slit shape along a length direction of the body on a bottom surface of the body. The injection member may include injection holes arranged in a line parallel to the at least one suction hole. The at least one suction hole may be inclined toward the suction region of the body so that it is disposed at a side opposite to those of the injection holes with respect to the suction hole, the magnet member configured to apply a magnetic force to the foreign matter containing metal components scattered from the back surface of the wafer by the gas.

0021. The object may include semiconductor chips separated into an individual unit and a wiring substrate to which the semiconductor chips are attached. The process unit may include a guide rail configured to support the wiring substrate, a transfer member configured to transfer the wiring substrate along the guide rail, a tape expander on which a wafer ring configured to maintain the semiconductor chips is disposed, the tape expander disposed at a side of the guide rail, and a chip bonder configured to pick up the semiconductor chips maintained by the wafer ring to attach the semiconductor chips to the wiring substrate. The foreign matter removing unit may be configured to remove the foreign matter remaining on the semiconductor chips and the wiring substrate.

0022. The injection member and the suction member may be disposed on a front end of the guide rail. The part of the body may define at least one suction hole including a slit shape defined along a direction crossing the guide rail in a bottom surface of the body. The injection member may include the portion of the body and the portion of the body may define at least one slit-shaped first injection hole and at least one slit-shaped second injection hole parallel to the suction hole. The first injection hole may be on one side of the suction hole and the second injection hole may be on another side of the suction hole. The first injection hole and the second injection hole may be inclined toward the suction region of the wiring substrate.

0023. The semiconductor packaging devices may further include a magnet member disposed on the bottom surface of the body so that it is disposed outside the injection holes, the magnet member configured to apply a magnetic force to the foreign matter containing metal components scattered from the wiring substrate by the gas.

0024. The injection member and the suction member may be movably connected to the guide rail. The injection member and the suction member may be configured to move horizontally above a standby position of the wiring substrate between a front end and a rear end of the guide rail. The injection member may include the tubular member and the tubular member may be disposed perpendicular to the wiring substrate. The suction member may include an outer tube in which the tubular member of the injection member is inserted. The outer tube may be configured to suck the foreign matter scattered from the wiring substrate through a space provided between the outer tube and the tubular member.

0025. The injection member and the suction member may be disposed face each other above the semiconductor chips maintained by the wafer ring. The injection member may include the tubular member and the tubular member may include an injection nozzle inclined toward the semiconductor chips to be picked up by the chip bonder. The suction holes may be inclined toward the semiconductor chips in a bottom surface of the body.

0026. The injection member and the suction member may be disposed face each other above the semiconductor chips maintained by the wafer ring. The injection member may include the tubular member and the tubular member may include an injection nozzle inclined toward the semiconductor chips to be picked up by the chip bonder. The suction holes may be inclined toward the semiconductor chips in a bottom surface of the body.

0027. The object may include a wiring substrate to which semiconductor chips are attached. The process unit may include a guide rail configured to support the wiring substrate, a transfer member configured to transfer the wiring substrate along the guide rail, and a wire bonder configured to electrically connect the semiconductor chips attached to terminals of the wiring substrate. The body and the at least one suction hole may extend longitudinally in a direction crossing the guide rail. The injection member may include the tubular member and the tubular member may be disposed parallel to the body on a side of the body. The tubular member may define a plurality of injection holes arranged in a length direction of the tubular member. The injection holes may be inclined toward the suction region of the wiring substrate in which a suction force of the suction hole acts.

BRIEF DESCRIPTION OF THE DRAWINGS

0028. The accompanying drawings are included to provide a further understanding of non-limiting example embodiments of the inventive concepts, and are incorporated in and constitute a part of this specification. The drawings illustrate example embodiments of the inventive concepts and, together with the description, serve to explain some principles of the inventive concepts. The drawings are not necessarily to scale, emphasis instead being placed upon illustrating the principles of the inventive concepts. In the drawings:

0029. FIG. 1 is a plan view of a semiconductor packaging device according to an example embodiment of the inventive concepts;
0030. FIG. 2 is a side view of a foreign matter removing unit of FIG. 1;
0031. FIG. 3 is a bottom view of the foreign matter removing unit of FIG. 1;
0032. FIG. 4 is a sectional view taken along line IV-IV' of FIG. 2;
0033. FIG. 5 is a plan view of a semiconductor packaging device according to an example embodiment of the inventive concepts;
FIG. 6 is an enlarged view of a first foreign matter removing unit of FIG. 5, according to an example embodiment of the inventive concepts;

FIG. 7 is a bottom view of the first foreign matter removing unit;

FIG. 8 is a sectional view taken along line VIII-VIII' of FIG. 6;

FIG. 9 is a side view of a second foreign matter removing unit of FIG. 5, according to an example embodiment of the inventive concepts;

FIG. 10 is a bottom view of the second foreign matter removing unit;

FIG. 11 is a sectional view of the second foreign matter removing unit;

FIG. 12 is a side view of a third foreign matter removing unit of FIG. 5, according to an example embodiment of the inventive concepts;

FIG. 13 is a bottom view of a suction member of FIG. 12;

FIG. 14 is a sectional view of the suction member of FIG. 12;

FIG. 15 is a plan view of a semiconductor packaging device according to another example embodiment of the inventive concepts;

FIG. 16 is a perspective view of a foreign matter removing unit of FIG. 15, according to an example embodiment of the inventive concepts;

FIG. 17 is a perspective view of an injection member of FIG. 16;

FIG. 18 is a sectional view of the foreign matter removing unit of FIG. 16;

FIG. 19 is a bottom view of the suction member of FIG. 16.

**DETAILED DESCRIPTION**

Example embodiments will now be described more fully with reference to the accompanying drawings, in which some example embodiments are shown. Example embodiments, may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey concepts of example embodiments to those of ordinary skill in the art. In the drawings, the thicknesses of layers and regions are exaggerated for clarity. Like reference numerals in the drawings denote like elements, and thus their description will be omitted.

Hereinafter, a unit for removing foreign matter and an apparatus and method for semiconductor packaging using the same according to some example embodiments of the inventive concepts will be described more fully with reference to the accompanying drawings, in which some example embodiments are shown. Example embodiments, may, however, be embodied in many different forms and should not be construed as being limited to the embodiments set forth herein; rather, these embodiments are provided so that this disclosure will be thorough and complete, and will fully convey concepts of example embodiments to those of ordinary skill in the art. In the drawings, the thicknesses of layers and regions may be exaggerated for clarity. Regarding the reference numerals assigned to the elements in the drawings, it should be noted that like reference numerals are used for like elements. Also, in the description of example embodiments, detailed description of well-known related structures or functions are not provided when it is deemed that such description will cause ambiguous interpretation of the inventive concepts.

It will be understood that when an element is referred to as being "connected" or "coupled" to another element, it can be directly connected or coupled to the other element or intervening elements may be present. In contrast, when an element is referred to as being "directly connected" or "directly coupled" to another element, there are no intervening elements present. As used herein the term "and/or" includes any and all combinations of one or more of the associated listed items. Other words used to describe the relationship between elements or layers should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," "on" versus "directly on").

It will be understood that, although the terms "first", "second", etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another element, component, region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of example embodiments.

Spatially relative terms, such as "beneath," "below," "lower," "above," "upper" and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. It will be understood that the spatially relative terms are intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the exemplary term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

The terminology used herein is for the purpose of describing particular embodiments only and is not intended to be limiting of example embodiments. As used herein, the singular forms "a," "an" and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises", "comprising", "includes" and/or "including," if used herein, specify the presence of stated features, integers, steps, operations, elements and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components and/or groups thereof.

Example embodiments are described herein with reference to cross-sectional illustrations that are schematic illustrations of idealized embodiments (and intermediate structures) of example embodiments. As such, variations from the shapes of the illustrations as a result, for example, of manufacturing techniques and/or tolerances, are to be expected. This, example embodiments should not be construed as limited to the particular shapes of regions illustrated herein but are to include deviations in shapes that result, for example, from manufacturing. Thus, the regions illustrated in
the figures are schematic in nature and their shapes are not intended to illustrate the actual shape of a region of a device and are not intended to limit the scope of example embodiments.

Unless otherwise defined, all terms (including technical and scientific terms) used herein have the same meaning as commonly understood by one of ordinary skill in the art to which example embodiments belong. It will be further understood that terms, such as those defined in commonly-used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

The semiconductor packaging device according to some example embodiments of the inventive concepts may include a process unit for performing a semiconductor packaging process and a foreign matter removing unit provided in the process unit to remove foreign matter remaining on an object to be processed.

According to an example embodiment, a semiconductor packaging device may be a dicing tape attaching device. The dicing tape attaching device may include a process unit (i.e., a dicing tape attaching unit) for attaching a dicing tape on a polished back surface of a wafer and a foreign matter removing unit for removing foreign matter remaining on the polished back surface of the wafer.

According to another example embodiment, a semiconductor packaging device may be a semiconductor chip attaching device. The semiconductor attaching device may include a process unit (i.e., a semiconductor chip attaching unit) for attaching semiconductor chips separated into an individual unit from a wafer to a wiring substrate and a foreign matter removing unit for removing foreign matter remaining on a wiring substrate and/or semiconductor chips.

According to another embodiment, a semiconductor packaging device may be a wire bonding device. The wire bonding device may include a process unit (i.e., a wire bonding unit) for electrically connecting semiconductor chips attached to a wiring substrate to terminals of the wiring substrate and a foreign matter removing unit for removing foreign matter remaining on the wiring substrate and/or the semiconductor chips attached to the wiring substrate.

Hereinafter, the semiconductor packaging devices (the dicing tape attaching device, the semiconductor chip attaching device, and the wire bonding device) according to some example embodiments will be described in detail.

(Dicing Tape Attaching Device)

FIG. 1 is a plan view of a semiconductor packaging device 100 according to an example embodiment of the inventive concepts.

Referring to FIG. 1, the semiconductor packaging device 100 may be a dicing tape attaching device, but example embodiments are not limited thereto. FIG. 1 illustrates the semiconductor packaging device 100, such as a dicing tape attaching device, including a dicing tape attaching unit 120 and a foreign matter removing unit 140. The dicing tape attaching unit 120 attaches a dicing tape on a polished back surface of a wafer W. The foreign matter removing unit 140 may remove foreign matter (e.g., particles and/or debris) remaining on the polished back surface of the wafer W before the dicing tape is attached. Also, the foreign matter removing unit 140 may remove foreign matter remaining on a wafer chuck 122 on which the wafer W is placed.

The dicing tape attaching unit 120 includes the wafer chuck 122 and a dicing tape attaching unit 124. The wafer chuck 122 may be disposed at a center of a chamber 110. The wafer W is placed on the wafer chuck 122 to allow the polished back surface of the wafer W to face an upper side. The dicing tape attaching unit 124 may be a roller type attaching unit, but example embodiments are not limited thereto. The dicing tape attaching unit 124 may be disposed above a side of the wafer chuck 122 so that a length direction of a roller 125 around which the dicing tape is wound faces a first direction I. The dicing tape attaching unit 124 may ascend or descend by a driving member (not shown) and be straightly moved in a second direction II perpendicular to the first direction I. The dicing tape attaching unit 124 attaches the dicing tape on a top surface of the wafer W while moving in the second direction II in a state where the dicing tape attaching unit 124 presses the top surface (i.e., the polished back surface) of the wafer W placed on the wafer chuck 122.

During the attachment of the dicing tape, foreign matter may cause cracks when foreign matter exists on the top surface of the wafer W because foreign matter can concentrate a pressing force of the dicing tape attaching unit 124. Thus, to reduce the occurrence of the cracks, the foreign matter removing unit 140 may be used to remove the foreign matter existing on the top surface of the wafer W before the dicing tape is attached. Examples of foreign matter include but are not limited to organic components such as rayon and nylon and/or metal components such as iron, nickel, chrome, aluminum, and titanium.

The foreign matter removing unit 140 may be disposed above a side of the wafer chuck 122 to prevent it from interfering with the dicing tape attaching unit 124. Also, the foreign matter removing unit 140 is straightly moved along the second direction II by a transfer member 160. The transfer member 160 includes a guide rail 162, a slide 164, and a connection member 166, but example embodiments are not limited thereto. The guide rail 162 is disposed at a side of the wafer chuck 122 to allow a length direction thereof to face the second direction II. The slide 164 is coupled to the guide rail 162 to straightly move along the guide rail 162. A driver (not shown) for providing a straight driving force may be disposed on the slide 164. The connection member 166 connects the slide 164 to the foreign matter removing unit 140.

The transfer member 160 straightly moves the foreign matter removing unit 140 in the second direction II in a space above the wafer chuck 122. The foreign matter removing unit 140 injects gas onto the top surface of the wafer W placed on the wafer chuck 122 to suck the foreign matter scattered by the injected gas.

FIG. 2 is a side view of the foreign matter removing unit 140 of FIG. 1. FIG. 3 is a bottom view of the foreign matter removing unit 140 of FIG. 1. FIG. 4 is a sectional view taken along line IV-IV' of FIG. 2.

Referring to FIGS. 1 and 2 to 4, the foreign matter removing unit 140 includes a body 142, an injection member 144, a suction member 146, and a magnet member 148. The body 142 may have a rectangular parallelepiped shape, but example embodiments are not limited thereto. Also, the body 142 is disposed above an upper space of a side of the wafer chuck 122 to allow a length direction thereof to extend in the first direction I. The injection member 144 and the suction member 146 may be integrated with the body 142. The injection member 144 injects gas, e.g., air onto the top surface of
the wafer W, and the suction member 146 sucks the foreign matter scattered from the top surface of the wafer W by the injected gas.

[0070] The suction member 146 includes a part 142-s of the body defining at least one suction hole 146-1 having a slit shape longitudinally defined in a length direction of the body 142 on a bottom surface of the body 142. The part 142-s of the body further defines a suction space 146-2 that is fluid-communicating with the suction hole 146-1 is defined within the body 142. A plurality of discharge ports 146-3a, 146-3b, and 146-3c are coupled to a top surface (or alternatively side surface) of the body 142 to connect the discharge ports 146-3a, 146-3b, and 146-3c to the suction space 146-2. A suction (not shown) is connected to the discharge ports 146-3a, 146-3b, and 146-3c by vacuum lines (not shown).

[0071] The injection member 144 includes a portion 142-i of the body that defines a plurality of injection holes 144-1 in the bottom surface of the body 142. The injection holes (or alternatively openings) 144-1 are arranged in a line parallel to the suction holes (or alternatively orifices) 146-1 on a bottom surface of the body 142. The injection holes 144-1 are inclined toward a suction region of the wafer W, in which a suction force of the suction hole 146-1 acts. The portion 142-i of the body further defines a buffer space 144-2 that is fluid-communicating with the injection holes 144-1 defined within the body 142. Inflow ports 144-3a and 144-3b are respectively coupled to left and right side surfaces of the body 142 to communicate with the buffer space 144-2. A gas supply (not shown) is connected to the inflow ports 144-3a and 144-3b by a supply line (not shown).

[0072] The magnet member 148 is disposed on the bottom surface of the body 142 so that it is disposed on a side opposite to those of the injection holes 144-1 with respect to the suction hole 146-1. The magnet member 148 may have a rod shape, but example embodiments are not limited thereto. The magnet member 148 applies a magnetic force to the foreign matter containing the metal components scattered from the top surface of the wafer W by the gas injected through the injection holes 144-1. The scattered foreign matter containing the metal components may be attached on the magnet member 148 by the magnetic force of the magnet member 148.

[0073] The gas supplied from the gas supply (not shown) is introduced into the buffer space 144-2 through a plurality of inflow ports 144-3a and 144-3b. The gas within the buffer space 144-2 is injected onto a desired (or alternatively predetermined) region of the top surface of the wafer W, i.e., the suction region of the wafer W, in which the suction force of the suction hole 146-1 acts, through the injection holes 144-1. The injected gas scatters the foreign matter remaining on the top surface of the wafer W. The scattered foreign matter may be sucked into the suction hole 146-1 by the suction force acting through the suction hole 146-1. The foreign matter sucked into the suction hole 146-1 may be discharged through the discharge ports 146-3a, 146-3b, and 146-3c via the suction space 146-2. A portion of the foreign matter containing the metal components of the scattered foreign matter is introduced into the suction hole 146-1 and the other portion is attached to the magnet member 148.

[0074] In the foreign matter removing unit 140 according to an example embodiment of the inventive concepts, the gas is injected into the suction region of the wafer W in which the suction force of the suction hole 146-1 acts. Thus, the scattered foreign matter may be introduced into the suction hole 146-1 along an air current due to the suction force of the suction hole 146-1. Accordingly, the suction member 146 may prevent the scattered foreign matter from attaching again to the top surface of the wafer W or from diffusing into the other region within the chamber 110.

[0075] (Semiconductor Chip Attaching Device)

[0076] FIG. 5 is a plan view of a semiconductor packaging device 200 according to another example embodiment of the inventive concepts.

[0077] Referring to FIG. 5, the semiconductor packaging device 200 may be a semiconductor attaching device, but example embodiments are not limited thereto. FIG. 5 illustrates the semiconductor packaging device 200, for example a semiconductor attaching device, may include a semiconductor chip attaching unit 220, and foreign matter removing units 240, 240', and 240", but example embodiments are not limited thereto and may include more or fewer foreign matter removing units. The semiconductor chip attaching unit 220 attaches semiconductor chips C separated from a wafer on which a dicing tape is attached into an individual unit to a wiring substrate P. The foreign matter removing units 240, 240', and 240" may remove foreign matter remaining on the wiring substrate P and/or the semiconductor chips C before a semiconductor chip attaching process is performed.

[0078] The semiconductor chip attaching unit 220 includes a guide rail 221, a transfer member 222, a supply vessel 223, a receiving vessel 224, an expander 225, and a chip bonder 226, but example embodiments are not limited thereto.

[0079] The guide rail 221 supports the wiring substrate P and guides the wiring substrate P transferred by the transfer member 222. The guide rail 221 is aligned so that a length direction thereof faces a transfer direction of the wiring substrate P, i.e., a first direction I and supports an edge of a side disposed along a length direction of four sides of the wiring substrate P. The transfer member 222 is disposed on the guide rail 221 to transfer the wiring substrate P supported by the guide rail 221 in the first direction I.

[0080] The supply vessel 223 is disposed at a front side of the guide rail 221 with respect to the first direction I. The receiving vessel 224 is disposed at a rear side of the guide rail 221. The supply vessel 223 receives the wiring substrate P to which the semiconductor chips C are attached, and the wiring substrate P within the supply vessel 223 is supplied onto the guide rail 221 by a separate supply member (not shown). The receiving vessel 224 receives the wiring substrate P to which the semiconductor chips C are attached and which is transferred along the guide rail 221.

[0081] The tape expander 225 is disposed at a side of the guide rail 221. Also, a wafer ring R for maintaining the semiconductor chips C is disposed on the tape expander 225. The tape expander 225 may be moved in the first direction I and the second direction II perpendicular to the first direction I by a driving member (not shown). The chip bonder 226 picks up the semiconductor chips C maintained by the wafer ring R to attach the semiconductor chips C on the wiring substrate P.

[0082] When the semiconductor chips C are attached to the wiring substrate P or stacked on existing semiconductor chips, foreign matter may cause cracks in the wiring substrate P and/or semiconductor chips C if foreign matter exist on a top surface of the wiring substrate P or a top surface of the semiconductor chips C. The foreign matter may cause cracks because foreign matter can concentrate a pressing force of the chip bonder 226 into the semiconductor chips C. Thus, to reduce the occurrence of the cracks, a plurality of foreign
matter removing units 240, 240' and 240" may be used to remove foreign matter existing on the wiring substrate and/or the top surfaces of the semiconductor chips C before the semiconductor chips C are attached. The foreign matter may include but is not limited to organic components such as rayon and nylon and/or metal components such as iron, nickel, chrome, aluminum, and titanium.

The foreign matter removing units 240, 240' and 240" may be disposed on a plurality of positions disposed on the guide rail 221 and above the wafer ring R. The foreign matter removing unit 240 may be disposed on a front end of the guide rail 240 to remove foreign matter remaining on the wiring substrate P transferred from the supply vessel 222 to the guide rail 221, but example embodiments are not limited thereto. The second foreign matter removing unit 240' may be disposed on a standby position of the wiring substrate P between the front end and a rear end of the guide rail 221 to remove foreign matter remaining on the wiring substrate P that is in a standby state, but example embodiments are not limited thereto. The third foreign matter removing unit 240" may be disposed above the wafer ring R to remove foreign matter remaining on the semiconductor chips C to be attached to the wiring substrate P, but example embodiments are not limited thereto. The foreign matter removing units 240, 240' and 240" inject gas onto the wiring substrate P and/or the semiconductor chips C and suck foreign matter scattered by the injected gas.

Fig. 6 is an enlarged view of a first foreign matter removing unit 240 of Fig. 5. Fig. 7 is a bottom view of the first foreign matter removing unit 240. Fig. 8 is a sectional view taken along line VIII-VIII of Fig. 6.

Referring to Figs. 5 and 6 to 8, the first foreign matter removing unit 240 includes a body 242, an injection member 244, a suction member 246, and a magnet member 248. The body 242 may have a rectangular parallelepiped shape, but example embodiments are not limited thereto. Also, the body 242 may be disposed on a front end of the guide rail 221 to allow a length direction thereof to face the second direction II. The injection member 244 and the suction member 246 may be integrally formed with the body 242. The injection member 244 injects gas, e.g., air onto the top surface of the wiring substrate P, and the suction member 246 sucks the foreign matter scattered from the top surface of the wiring substrate P by the injection gas.

The suction member 246 includes a part 242-s of the body 242 that defines a suction hole 246-1 having a slit shape longitudinally defined in a length direction of the body 242 in a center of a bottom surface of the body 142. The part 242-s of the body 242 further defines a suction space 244-2a that is fluid-communicating with the first injection holes 244-1a and defined within the portion 242-i of the body 242. A first inflow port 244-3a is coupled to the top surface of the body 242 to communicate with the first buffer space 244-2a. The first inflow port 244-3a is connected to a gas supply (not shown) by a supply line (not shown). The portion 242-i of the body 242 further defines a second buffer space 244-2b that is fluid-communicating with the second injection hole 244-1b and defined within portion 242-i of the body 242. A second inflow port 244-3b is coupled to the top surface of the body 242 to communicate with the second buffer space 244-2b. A gas supply (not shown) is connected to the second inflow port 244-3b by a supply line (not shown).

The magnet member 248 is disposed on the bottom surface of the body 242 so that the magnet member 248 is disposed outside the injection holes 244-1a and 244-1b with respect to the suction hole 246-1. The magnet member 248 applies a magnetic force to the foreign matter containing the metal components scattered from the top surface of the wiring substrate P by the gas injected through the injection holes 244-1a and 244-1b. The scattered foreign matter containing the metal components are attached on the magnet member 248 by the magnetic force of the magnet member 248.

The gas supplied from the gas supply (not shown) is introduced into the buffer spaces 244-2a and 244-2b through the inflow ports 244-3a and 244-3b. The gas within the buffer spaces 244-2a and 244-2b is injected onto a predetermined region of the top surface of the wiring substrate P, i.e., the suction region of the wiring substrate, in which the suction force of the suction hole 246-1 acts, through the injection holes 244-1a and 244-1b. The injected gas scatters the foreign matter remaining on the top surface of the wiring substrate P. The scattered foreign matter is sucked into the suction hole 246-1 by the suction force acting through the suction hole 246-1. The foreign matter sucked into the suction hole 246-1 are discharged through the discharge port 246-3 via the suction space 246-2. A portion of the scattered foreign matter containing the metal components is introduced into the suction hole 246-1 and the other portion is attached to the magnet member 248.

In the foreign matter removing unit 240 according to an example embodiment of the inventive concepts, the injection member 244 injects gas into the suction region of the wiring substrate P in which the suction force of the suction hole 246-1 acts. The injected gas may scatter foreign matter. The scattered foreign matter may be introduced into the suction hole 246-1 along an air current occurring by the suction force of the suction hole 246-1. Thus, a foreign matter removal unit may prevent scattered foreign matter, which may act as a contamination source, from being attached again to the top surface of the wiring substrate P and/or diffused into the other region within equipment.

Fig. 9 is a side view of the second foreign matter removing unit 240 of Fig. 5. Fig. 10 is a bottom view of the second foreign matter removing unit 240. Fig. 11 is a sectional view of the second foreign matter removing unit 240.

Referring to Figs. 5 and 9 to 11, the second foreign matter removing unit 240 may be disposed above a standby position of the wiring substrate P between the front end and the rear end of the guide rail 221. Also, the second foreign matter removing unit 240 may be horizontally moved in the first and second directions I and II by a driving member (not shown) above the wiring substrate P. The second foreign matter removing unit 240 includes a body 242, an injection
member 244", and a suction member 246. The injection mem-
ber 244 injects gas, e.g., air onto the top surface of the wiring
substrate P, and the suction member 246 sucks the foreign
matter scattered from the top surface of the wiring substrate P
by the gas injected by the injection member 244.

[0093] The injection member 244" includes a tubular mem-
ber (e.g., an inner tube) 244'-1 defining an injection hole and
an inflow port 244'-2. The inner tube 244'-1 is in the body 242'
in a vertical direction and may be disposed perpendicular to
the wiring substrate P disposed on the guide rail 221 to inject
gas toward the wiring substrate P. The inflow port 244'-2 is
coupled to an upper end of the inner tube 244'-1 and may be
positioned at an upper surface of the body 242'. The inflow port
244'-2 may be connected to a gas supply (not shown) by a
supply line (not shown).

[0094] The suction member 246" includes a part 242"-s of
the body 242" defining an outer tube 246'-1, and a discharge
port 246'-2. The outer tube 246'-1 surrounds the inner tube
244'-1 to allow the inner tube 244'-1 to be inserted therein.
The discharge port 246'-2 is coupled to an outer side surface
of the outer tube 246'-1. The discharge port 246'-2 is con-
nected to a suction (not shown) by a vacuum line (not shown).
The discharge port 246'-2 may be positioned on a side of the
body 242". The foreign matter scattered from around the wir-
ing substrate P may be sucked into a space between the outer
tube 246'-1 and the inner tube 244'-1. Here, an end of the inner
tube 244'-1 may be disposed inside an end of the outer tube
246'-1 in a length direction of the outer tube 246'-1. While
FIGS. 9-11 illustrate one inflow port 244'-2 and one discharge
port 246'-2 connected to the body 242", example embodi-
ments are not limited thereto and may include a plurality of
inflow ports 244'-2 and/or discharge ports 246'-2. Further,
at least one magnet member 248" may be disposed on a bottom
surface of the body 242" to aid in the collection of scattered
foreign matter containing metal.

[0095] The gas supplied from the gas supply (not shown) is
introduced into the inner tube 244'-1 through the inflow port
244'-2. The gas within the inner tube 244'-1 is injected onto
the top surface of the wiring substrate P. The injected gas
scatters the foreign matter remaining on the top surface of
the wiring substrate P. The scattered foreign matter is sucked
into the space between the outer tube 246'-1 and the inner tube
244'-1 by a suction force acting through the space between the
outer tube 246'-1. The foreign matter sucked into the space
between the outer tube 246'-1 and the inner tube 244'-1 is discharged through the discharge port
246'-2.

[0096] FIG. 12 is a side view of the third foreign matter
removing unit 240" of FIG. 5. FIG. 13 is a bottom view of the
suction member of FIG. 12. FIG. 14 is a sectional view of the
suction member of FIG. 12;

[0097] Referring to FIGS. 5 and 12 to 14, the third foreign
matter removing unit 240" includes an injection member 244"
and a suction member 246". The injection member 244" and
the suction member 246" are disposed facing each other with
respect to the chip bonder 226 above the semiconductor chips
C maintained by the wafer ring R. The injection member 244"
includes a tubular member that may serve as an injection
nozzle, which inclines to inject gas toward the semiconductor
chips C to be picked up by the chip bonder 226. The suction
member 246" includes a part 242"-s of the body including a lower part 242"-1 and an upper part 242"-2. The lower and upper part of the body 242"-1 and 242"-2 define an inner space 240"-2a and 240"-2b and suction holes 246"-1a
and 246"-1b. Suction holes 246"-1a and 246"-1b are inclined
toward the semiconductor chips C and are on a bottom surface
of the lower body 242"-1, and a discharge port 246"-3
coupled to a top surface of the upper body 242"-2. The suction
holes 246"-1a and 246"-1b may be different sizes and/or
different shapes.

[0098] The injection member 244" includes a tubular member
injects gas, e.g., air onto the top surfaces of the semi-
conductor chips C to be picked up by the chip bonder 226. The
injected gas scavenges foreign matter remaining on the top
surfaces of the semiconductor chips C. The scattered foreign
matter is sucked into the inner space of the body 242"-1 and
242"-2 of the suction member 246" by a suction force acting
through the suction holes 246"-1a and 246"-1b of the suction
member 246". The foreign matter sucked into the inner space
of the body 242"-1 and 242"-2 are discharged through the
discharge port 246"-3. A magnet member 248" may be dis-
posed on the bottom surface of the lower body 242"-1 to aid
in the collection of scattered foreign matter containing met-
als.

(Wire Bonding Device)

[0099] FIG. 15 is a plan view of a semiconductor packaging
device 300 according to an example embodiment of the inventive
concepts;

[0100] Referring to FIG. 15, the semiconductor packaging
device 300 may be a wire bonding device, but example embodi-
ments are not limited thereto. The semiconductor packaging
device 300, such as a wire bonding device, may include a wire bonding unit 320 and at least one foreign
matter removing unit 340. The wire bonding unit 320 con-
nects pads of semiconductor chips C attached to a wiring
substrate P to terminals of the wiring substrate P, respectively.
The foreign matter removing unit 340 may remove foreign
matter remaining on the wiring substrate P and/or the semi-
conductor chips C before a wire bonding process is per-
formed. Although not shown in FIG. 15, the semiconductor
packaging device 300 may also include one or more foreign
matter removal units according to other aforementioned
example embodiments.

[0101] The wire bonding unit 320 includes a guide rail 321,
a transfer member 322, a supply vessel 323, a receiving vessel
324, and a wire bonder 325. The guide rail 321 supports the
wiring substrate P to which the semiconductor chips C are
attached and guides the wiring substrate P transferred by the
transfer member 322. The guide rail 321 is aligned so that a
length direction thereof faces a transfer direction of the wiring
substrate P, i.e., a first direction I and supports an edge of a
side disposed along a length direction of four sides of the
wiring substrate P. The transfer member 322 is disposed on the
guide rail 321 to transfer the wiring substrate P supported by
the guide rail 321.

[0102] The supply vessel 323 is disposed at a front side of
the guide rail 321 with respect to the first direction I. The
receiving vessel 324 is disposed at a rear side of the guide rail
321. The supply vessel 323 receives the wiring substrate P
to which the semiconductor chips C are attached, and the wiring
substrate P within the supply vessel 323 is supplied onto the
guide rail 321 by a separate supply member (not shown). The
receiving vessel 324 receives the wiring substrate P in which
the wire bonding is performed, transferred through the guide
rail 321. The wire bonder 325 electrically connects pads of the
semiconductor chips C attached to the wiring substrate P to
terminals of the wiring substrate P.
During the wire bonding process, when foreign matter exist on the pads of the semiconductor chips \( C \) and the terminals of the wiring substrate \( P \), the foreign matter may reduce an adhesion force between the pads and terminals and wires to cause defects in the wire bonding process. To prevent the occurrence of the defects, the foreign matter removing unit \( 340 \) may be used to remove foreign matter remaining on the pads of the semiconductor chips \( C \) and the terminals of the wiring substrate \( P \) before the wire bonding process is performed. The foreign matter may include but is not limited to organic components such as rayon and nylon or metal components such as iron, nickel, chrome, aluminum, and titanium.

The foreign matter removing unit \( 340 \) is disposed on a front end of the guide rail \( 321 \) to remove the foreign matter remaining on the wiring substrate \( P \) to which the semiconductor chips \( C \) transferred from the supply vessel \( 323 \) to the guide rail \( 321 \) are attached. The foreign matter removing unit \( 340 \) injects gas onto the wiring substrate \( P \) to which the semiconductor chips \( C \) are attached to suck the foreign matter scattered by the injected gas.

FIG. 16 is a perspective view of the foreign matter removing unit \( 340 \) of FIG. 15. FIG. 17 is a perspective view of an injection member \( 344 \) of FIG. 16. FIG. 18 is a sectional view of the foreign matter removing unit \( 340 \) of FIG. 15, and FIG. 19 is a bottom view of the suction member of FIG. 16.

Referring to FIGS. 15 and 16 to 19, the foreign matter removing unit \( 340 \) includes an injection member \( 344 \) and a suction member \( 346 \). The injection member \( 344 \) and the suction member \( 346 \) are disposed on the front end of the guide rail \( 321 \) to allow their length directions face a second direction II. The injection member \( 344 \) injects gas, e.g., air onto the wiring substrate \( P \) to which the semiconductor chips \( C \) are attached, and the suction member \( 346 \) sucks the foreign matter scattered from the wiring substrate \( P \) by the gas injected by the injection member \( 344 \).

The suction member \( 346 \) includes a part \( 342-2 \) of the body \( 342 \) with lower \( 342-1 \) and upper \( 342-2 \) parts. The part \( 342-2 \) of the body defines at least one suction hole \( 346-1 \), and connects to at least one discharge port \( 346-3 \). The body \( 342 \) longitudinally extends in the second direction II (see FIG. 15). A part \( 342-1 \) defines a suction space \( 346-2 \) within the body \( 342-1 \). The body's lower and upper portions \( 342-1 \) and \( 342-2 \) are disposed on the front end of the guide rail \( 321 \). As shown in FIG. 19, the suction hole \( 346-1 \) has a slit shape along a length direction of the body \( 346-1 \) in a bottom surface of the body's lower portion \( 342-1 \). The discharge port \( 346-3 \) is disposed on a top surface of the body's upper portion \( 342-2 \), but example embodiments are not limited thereto, to communicate with the suction space.

The injection member \( 344 \) includes a tubular member (i.e., injection tube body) \( 342-3 \) that defines a plurality of injection holes \( 344-1 \). The injection tube body \( 342-3 \) is disposed at a side of the body's lower and upper portions \( 342-1 \) and \( 342-2 \) in parallel to the body's lower and upper portions \( 342-1 \) and \( 342-2 \). The injection tube body \( 342-3 \) may be connected to the body's lower and upper portions \( 342-1 \) and \( 342-2 \) by a connection member \( 347 \). The tubular member \( 342-3 \) may define a plurality of injection holes \( 344-1 \) defined in a line along a length direction of the injection tube body \( 342-3 \). The injection tube body \( 342-3 \) may be disposed to allow the injection holes \( 344-1 \) face a suction region in the wiring substrate \( P \), in which a suction force of the suction hole \( 346-1 \) acts.

The injection member \( 344 \) injects gas, e.g., air onto the wiring substrate \( P \). The semiconductor chips \( C \) are attached to the wiring substrate \( P \) and transferred from the supply vessel \( 323 \) to the guide rail \( 321 \). The injected gas scatters the foreign matter remaining on the semiconductor chips \( C \) and the wiring substrate \( P \). The scattered foreign matter may be sucked into the suction space \( 346-2 \) within the body's lower and upper portions \( 342-1 \) and \( 342-2 \) of the suction member \( 346 \) by the suction force acting through the suction hole \( 346-1 \) of the suction member \( 346 \). The foreign matter sucked into the suction space \( 346-2 \) of the body's lower portion \( 342-1 \) are discharged through the discharge port \( 346-3 \). As shown in FIG. 19, a magnet member \( 348 \) may be disposed on the bottom surface of the lower body \( 342-1 \) to aid in the collection of scattered foreign matter containing metals.

Also, a foreign matter removal unit and/or semiconductor packaging device according to example embodiments of the inventive concepts may reduce the extent of foreign matter contaminating wafers, semiconductor chips separated from the wafers, and the wiring substrate on which the semiconductor chips are mounted.

Also, a foreign matter removal unit and/or semiconductor packaging device according to example embodiments of the inventive concepts may reduce the occurrence of the defects due to the foreign matter in the semiconductor packaging process.

Also, a foreign matter removal unit and/or semiconductor packaging device according to example embodiments of the inventive concepts may improve the cleanliness level of a semiconductor packaging process.

While some example embodiments have been shown and described, it will be understood by one of ordinary skill in the art that variations in form and detail may be made without departing from the spirit and scope of the claims. The above-discussed subject matter is to be considered illustrative and not restrictive. The appended claims are intended to cover all such modifications, enhancements, and other example embodiments, which fall within the spirit and scope of the example embodiments of the inventive concepts. Thus, to the maximum extent allowed by law, the spirit and scope of the example embodiments of the inventive concepts are to be determined by the broadest permissible interpretation of the following claims and their equivalents, and shall not be limited by the foregoing description of some example embodiments of the inventive concepts.

What is claimed is:

1. A foreign matter removing unit comprising:
   - a body;
   - an injection member including one of (i) a portion of the body defining at least one injection hole and (ii) a tubular member defining at least one injection hole, the injection member configured to inject at least gas onto an object; and
   - a suction member including a part of the body defining at least one suction hole, the suction member configured to suck at least foreign matter scattered from the object by the injected gas, and the suction member configured to exert a suction force in a suction region of the object where the injection member is configured to inject gas.

2. The foreign matter removing unit of claim 1, wherein the injection member includes the portion of the body defining at least one injection hole,
the foreign matter removing unit further includes at least one magnet member on a bottom surface of the body facing the object, and
the at least one magnet member is disposed closer to the at least one suction hole than the at least one injection hole on the bottom surface of the body.
3. The foreign matter removing unit of claim 1, wherein the injection member includes the portion of the body and the portion of body defines at least two injection holes, and
the at least one suction hole is disposed in between the at least two injection holes on a bottom surface of the body.
4. The foreign matter removing unit of claim 1, wherein the injection member includes the at least one tubular member, and
the at least one tubular member is configured inside the suction hole.
5. The foreign matter removing unit of claim 1, wherein the injection member includes the tubular member, the tubular member includes an injection nozzle, the part of the body defines a plurality of first suction holes and a plurality of second suction holes, and
the first suction holes are a different size than the second suction holes.
6. The foreign matter removing unit of claim 1, wherein the injection member includes the tubular member, the tubular member is disposed parallel to the body, and the tubular member defines a plurality of injection holes facing the object.
7. The foreign matter removing unit of claim 1, wherein the part of the body defines at least one suction hole including a slit shape defined along a length direction of the body and on a surface of the body facing the object, the injection member includes the portion of the body defining at least one injection hole, the at least one injection hole is arranged in a line parallel to the at least one suction hole, and
the at least one injection hole is inclined toward the suction region.
8. The foreign matter removing unit of claim 1, wherein the part of the body defines at least one suction hole including a slit shape defined along a length direction of the body and on a surface of the body facing the object, the injection member includes the portion of the body, the portion of the body defines at least one slit-shaped first injection hole and at least one slit-shaped second injection hole parallel to the suction hole, the first injection hole is on one side of the suction hole, the second injection hole is on another side of the suction hole, and
the first injection hole and the second injection hole are inclined toward the suction region of the object.
9. The foreign matter removing unit of claim 1, wherein the injection member includes the tubular member, the tubular member is disposed perpendicular to the object, the suction member includes an outer tube in which the tubular member of the injection member is inserted, and the outer tube is configured to suck the foreign matter scattered from the object through a space provided between the outer tube and the tubular member.
10. The foreign matter removing unit of claim 1, wherein the injection member and the suction member are disposed above the object to face each other with respect to the suction region, the injection member includes the tubular member, the tubular member includes an injection nozzle inclined toward the suction region, and
the at least one suction hole is inclined toward the suction region in a surface of the body facing the object.
11. The foreign matter removing unit of claim 1, wherein the suction member includes at least one slit-shaped suction hole longitudinally defined along a length direction of the body in a surface of the body facing the object, the injection member includes the tubular member, the tubular member is disposed parallel to the body on a side of the body, and
the tubular member defines a plurality of injection holes arranged in a length direction of the tubular member, and the injection holes are inclined toward the suction region of the object in which the suction force of the suction hole acts.
12. The foreign matter removing unit of claim 1, further comprising:
a magnet member disposed on a bottom surface of the body, the magnet member applying a magnetic force to the foreign matter containing metal components scattered from the object by the gas injected onto the object.
13. A semiconductor packaging device comprising:
a process unit configured to perform a semiconductor packaging process; and
a foreign matter removing unit disposed in the process unit and configured to remove foreign matter remaining on an object, the foreign matter removing unit including,
a body,
an injection member including one of (i) a portion of the body defining at least one injection hole and (ii) a tubular member defining at least one injection hole, the injection member configured to inject at least gas onto the object, and
a suction member including a part of the body defining at least one suction hole, the suction member configured to suck foreign matter scattered from the object by the injected gas, and
the suction member configured to exert a suction force in a suction region of the object where the injection member is configured to inject gas.
14. The semiconductor packaging device of claim 13, wherein
the object includes a wafer on which a back surface thereof is polished, and
the process unit includes,
a wafer chuck on which the wafer is mounted to allow the polished back surface of the wafer to face an upper side,
a dicing tape attacher configured to attach a dicing tape on the back surface of the wafer mounted on the wafer chuck, and
the foreign matter removing unit is connected to the process unit and configured to move in a straight direction above the wafer chuck and configured to remove the foreign matter on the back surface of the wafer mounted on the wafer chuck.
15. The semiconductor packaging device of claim 13, wherein
the injection member and the suction member are disposed above the wafer chuck,
the part of the body defines at least one suction hole including a slit shape along a length direction of the body and on a bottom surface of the body, the injection member includes the portion of the body defining at least one injection hole, the at least one injection hole is arranged in a line parallel to the at least one suction hole, and the at least one injection hole is inclined toward the suction region of the back surface of the wafer in which the suction force of the suction hole acts.

16. The semiconductor packaging device of claim 13, wherein the object includes semiconductor chips separated into an individual unit and a wiring substrate to which the semiconductor chips are attached, the process unit includes, a guide rail configured to support the wiring substrate; a transfer member configured to transfer the wiring substrate along the guide rail; a tape expander on which a wafer ring configured to maintain the semiconductor chips is disposed, the tape expander disposed at a side of the guide rail; and a chip bonder configured to pick up the semiconductor chips maintained by the wafer ring to attach the semiconductor chips to the wiring substrate, and the foreign matter removing unit is configured to remove the foreign matter remaining on the semiconductor chips and the wiring substrate.

17. The semiconductor packaging device of claim 16, wherein the injection member and the suction member are disposed on a front end of the guide rail, the part of the body defines at least one suction hole including a slit shape defined along a direction crossing the guide rail in a bottom surface of the body, the injection member includes the portion of the body, the portion of the body defines at least one slit-shaped first injection hole and at least one slit-shaped second injection hole parallel to the suction hole, the first injection hole is on one side of the suction hole, the second injection hole is on an other side of the suction hole, and the first injection hole and the second injection hole are inclined toward the suction region of the wiring substrate.

18. The semiconductor packaging device of claim 16, wherein the injection member and the suction member are movably connected to the guide rail, the injection member and the suction member are configured to move horizontally above a standby position of the wiring substrate between a front end and a rear end of the guide rail, the injection member includes the tubular member, the tubular member is disposed perpendicular to the wiring substrate, the suction member includes an outer tube in which the tubular member of the injection member is inserted, and the outer tube is configured to suck the foreign matter scattered from the wiring substrate through a space provided between the outer tube and the tubular member.

19. The semiconductor packaging device of claim 16, wherein the injection member and the suction member are disposed face each other above the semiconductor chips maintained by the wafer ring, the injection member includes the tubular member, the tubular member includes an injection nozzle inclined toward the semiconductor chips to be picked up by the chip bonder, and the suction holes are inclined toward the semiconductor chips in a bottom surface of the suction body.

20. The semiconductor packaging device of claim 13, wherein the object includes a wiring substrate on which semiconductor chips are attached, the process unit includes: a guide rail configured to support the wiring substrate; a transfer member configured to transfer the wiring substrate along the guide rail; and a wire bonder configured to electrically connect the semiconductor chips to terminals of the wiring substrate, the body and the at least one section hole extend longitudinally in a direction crossing the guide rail, the injection member includes the tubular member, the tubular member is disposed parallel to the body on a side of the body, the tubular member defines a plurality of injection holes arranged in a length direction of the tubular member, and the injection holes are inclined toward the suction region of the wiring substrate in which a suction force of the suction hole acts.

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