

INTEGRATED COUPLING MODULE AND COUPLING SYSTEM INCLUDING THE SAME

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] The embodiments relate to an integrated coupling module capable of opening and closing a cap of a container and discharging a liquid and a coupling system including the same.

Description of the Related Art

[0002] Various types of chemicals used in semiconductor factories or chemical plants are supplied in a state of being stored in containers such as drums. Therefore, supplying the semiconductor factories and the like with the delivered chemicals requires opening drum caps, coupling couplers thereto, and storing the chemicals in storage tanks in the factories. Or conversely, couplers may be coupled to empty drums to fill the same with chemicals.

[0003] However, an opening/closing module opening and closing a cap of a drum and a coupler fixing module are separately provided in the coupling module in the related art, which poses problems of the size of the coupling

module getting larger size and the operation getting more cumbersome.

[0004] In addition, the coupling module in the related art is composed of a first step in which an opening/closing module moves to the top of a drum, opens a cap, and then, withdraws from the top of the drum, a second step in which a coupler fixing module moves to the top of the drum and inserts the coupler into the drum, a third step in which a chemical is filled into, or discharged from, the drum through the coupler of the coupler fixing module, a fourth step in which the coupler fixing module withdraws from the top of the drum, and a fifth step in which the opening/closing module moves to the top the drum and couples the cap. However, the opening/closing module and the coupler fixing module need to alternately move to the operation position, which poses a problem of a relatively slow operation speed.

[0005] In addition, the inability of the coupling module in the related art to adjust the tilt angle poses another problem of difficulties in accurately gripping the cap or accurately inserting the coupler into the outlet of the drum when the cap or the outlet is tilted.

SUMMARY OF THE INVENTION

[0006] Therefore, the present invention has been made in view of the above problems, and it is an object of the present invention to provide an integrated coupling module in which an opening/closing module and a coupler fixing module are integrated.

[0007] In addition, an integrated coupling module capable of adjusting the angle of the opening/closing module and the coupler fixing module is provided.

[0008] The object that the embodiments aim to achieve is not limited thereto and includes the purpose or effects to be understood from the means to solve the problem and the embodiments thereof.

[0009] To accomplish the above object, according to one aspect of the present invention, an integrated coupling module comprises: an opening/closing module including a cap gripping unit gripping a cap of a container; and a coupler fixing module fixing a coupler discharging a liquid in the container to the outside, wherein the coupler is lowered from over the cap gripping unit to be coupled to the container.

[0010] The cap gripping unit may include a space portion formed in an axial direction and the coupler may be lowered

under the cap gripping unit through the space portion.

[0011] The cap gripping unit may include a support portion in which a first through-hole is formed and a plurality of grippers disposed to surround the first through-hole to form the space portion.

[0012] The opening/closing module may include a second rotating unit rotating the cap gripping unit; and a first housing disposed over the cap gripping unit, wherein the coupler fixing module may be inserted into the first housing.

[0013] A position adjusting module disposed between the cap gripping unit and the first housing may be included, wherein the position adjusting module may include a first position adjusting module moving the position of the cap gripping unit in a first direction and a second position adjusting module moving the position of the cap gripping unit in a second direction intersecting the first direction.

[0014] The coupler fixing module may include a first rotating unit rotating the coupler or a key code of the coupler and a driving module moving the coupler up and down, wherein the coupler may be lowered under the cap gripping unit by the driving module.

[0015] A lifting/lowering module moving the opening/closing module and the coupler fixing module up and down together

may be included, wherein the coupler may be lifted and lowered together with the cap gripping unit by the lifting/lowering module and be lowered under the cap gripping unit by the driving module of the coupler fixing module.

[0016] An angle-adjusting module connected to the opening/closing module to adjust the angle of the opening/closing module may be included, wherein the angle-adjusting module may include a first adjusting unit moving the opening/closing module and the coupler fixing module together in a first direction and a second adjusting unit moving the opening/closing module and the coupler fixing module together in a second direction intersecting the first direction.

[0017] The angle-adjusting module may include an angle-adjusting element simultaneously adjusting the tilt angle of the opening/closing module and the coupler fixing module.

[0018] A sensing module sensing the position and the tilt of the cap may be included, wherein the sensing module may include a first sensing unit sensing the position of the cap and a second sensing unit sensing the tilt of the cap.

[0019] A coupling system according to an aspect of the present invention comprises a pair of first transport members facing each other in a first direction; a pair of

second transport members facing each other in a direction intersecting the first direction; an integrated coupling module disposed on at least one of the pair of second transport members; and a control unit controlling the first transport members, the second transport members, and the integrated coupling module, wherein the integrated coupling module includes an opening/closing module including a cap gripping unit gripping a cap of a container; and a coupler fixing module fixing a coupler discharging a liquid in a container to the outside, wherein the coupler is lowered from over the cap gripping unit to be coupled to the container.

[0020] A coupling method according to an aspect of the present invention includes separating a cap from a container by rotating a cap gripping unit of an opening/closing module; lowering a coupler disposed inside the opening/closing module to expose the same under the cap gripping unit; discharging a liquid stored in the container by inserting the coupler into an outlet of the container; lifting the coupler over the cap gripping unit; and fastening the cap to the container by the cap gripping unit.

[0021] The opening/closing module may move to a holder disposed adjacent to the container to place the separated cap on the holder in a step of separating the cap, and the

opening/closing module may move to the holder and grip the cap placed on the holder again to fasten the cap to the container in the step of closing the cap to the container.

[0022] According to the embodiment, the integration of the opening/closing module and the coupler fixing module may speed up the operation and reduce the installation area.

[0023] In addition, since the tilt angle of the opening/closing module and the coupler fixing module may be adjusted in accordance with the tilt of the cap and the outlet of the container, the cap may be accurately gripped and the coupler may be accurately inserted into the outlet.

[0024] Various beneficial advantages and effects of the present invention are not limited to the above description and will be more easily understood in the course of describing specific embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] FIG. 1 is a conceptual view of a coupling system according to an embodiment of the present invention.

[0026] FIG. 2 is a conceptual view of an integrated coupling module according to an embodiment of the present invention.

[0027] FIG. 3 is a perspective view of the integrated coupling module in FIG.2 viewed from another direction.

[0028] FIG. 4 is a perspective view of an opening/closing module and a coupler fixing module taken apart from each other.

[0029] FIG. 5 is a side view of a cap gripping unit.

[0030] FIG. 6A is a longitudinal view of an integrated coupling module.

[0031] FIG. 6B is a longitudinal view showing a state of a coupler lowered under a cap gripping unit.

[0032] FIGS. 7A and 7B are views showing a process of bringing a plurality of containers to at least one integrated coupling module.

[0033] FIG. 8 is a view showing a process of sensing a position of a cap coupled to a container.

[0034] FIG. 9 is a view showing a process of sensing the evenness of a cap coupled to a container.

[0035] FIG. 10 is a view showing an angle-adjusting module.

[0036] FIG. 11 is a view showing an adjusting element of an angle-adjusting module.

[0037] FIG. 12 is a side view of an integrated coupling module.

[0038] FIG. 13 is a view showing a state of an integrated coupling module tilted to one side by an angle-adjusting module.

[0039] FIG. 14 is a view showing a state of an integrated

coupling module tilted to the other side by an angle-adjusting module.

[0040] FIG. 15 is a view showing an integrated couple module according to another embodiment.

[0041] FIG. 16 is a view showing a state of a cap gripping unit lowered to be coupled to a cap.

[0042] FIG. 17 is a view showing a state of a cap gripping unit separating a cap from a container.

[0043] FIG. 18 is a view showing a state of the cap gripping unit placing a cap on a holder.

[0044] FIG. 19 is a view showing a state of a coupler exposed under a cap gripping unit.

[0045] FIG. 20 is a view showing a state of a key code of a coupler and a groove of an outlet aligned with each other.

[0046] FIG. 21 is a view showing a top surface of an outlet.

[0047] FIG. 22 is a view showing a state of a coupler inserted into an outlet of a container.

[0048] FIG. 23 is a view showing a state of a coupler lifted over a cap gripping unit.

[0049] FIG. 24 is a view showing a state of a cap gripping unit gripping a cap placed on a holder again.

[0050] FIG. 25 is a view showing a state of a cap gripping unit rotated to couple a cap to a container.

[0051] Fig. 26 is a view showing a state of a cap gripping

unit lifted to complete an operation.

DETAILED DESCRIPTION OF THE INVENTION

[0052] Since the present invention may be modified in various ways and have various embodiments, specific embodiments will be illustrated in the drawings and described. However, this is not intended to limit the present invention to the specific embodiments and should be construed as including all modifications, equivalents, and substitutes included in the spirit and technical scope of the present invention.

[0053] Terms such as first and/or second may be used to describe various components, but the components should not be limited by the terms. The terms only serve the purpose of distinguishing one component from other components. For example, the first component may be referred to as the second component, and similarly, the second component may also be referred to as the first component without deviating from the scope of the right according to the concept of the present invention. The term and/or includes a combination of a plurality of related items listed or an item among a plurality of related items listed.

[0054] When a component is referred to as being "connected" or "coupled" to another component, it may be directly

connected or coupled to the another component, but it should be understood that other components may exist in between. On the other hand, when a component is referred to as being "directly connected" or "directly coupled" to another component, it should be understood that there is no other component in between.

[0055] The terms used in the present application are only used to describe specific embodiments and are not intended to limit the present invention. Singular expressions include plural expressions unless the context explicitly indicates otherwise. In the present specification, terms such as "comprise" or "have" are intended to designate the presence of implemented features, numbers, steps, actions, components, parts, or combinations thereof and should not be understood to preclude the presence or additional possibilities of one or more of other features, numbers, steps, actions, components, parts or combinations thereof in advance.

[0056] Unless otherwise defined, all terms used herein, including technical or scientific terms, have the same meanings as are generally understood by those with common knowledge in the art to which the present invention pertains. The terms such as those defined in a generally used dictionary should be interpreted as having meanings

consistent with the meanings in the context of the related technology and should not be interpreted as an idealistic or excessively formal meaning unless explicitly defined in the present specification.

[0057] Hereinafter, the embodiments will be described in detail with reference to the accompanying drawings. The same reference numerals are assigned to the same or equivalent components regardless of the reference numerals and repetitive description thereof is omitted.

[0058] FIG. 1 is a conceptual view of a coupling system according to an embodiment of the present invention.

[0059] FIG. 1 shows that a coupling system according to an embodiment may include a pair of first transport members 210 disposed to face each other in a first direction (X-axis direction), a pair of second transport members 220 disposed to face each other in a second direction (Y-axis direction) perpendicular to the first direction, at least one integrated coupling module 400 disposed on the second transport member 220, and a control unit 300 controlling the first transport members, the second transport members, and the integrated coupling module.

[0060] The integrated coupling module 400 may be connected to the second transport member 220 to move in the first direction (X-axis direction) by a second transport module

221. In addition, the second transport member 220 may move by a first transport module 211 in the second direction (Y-axis direction).

[0061] Therefore, the integrated coupling module 400 may freely move in the first direction and the second direction by the first transport module 211 and the second transport module 221. The integrated coupling module 400 may be disposed on each of the pair of second transport members 220 but is not necessarily limited thereto.

[0062] A plurality of containers 10 may be disposed on a holder 20. The container 10 may store chemicals for a semiconductor display but is not necessarily limited thereto, and various liquids may be stored therein. The container 10 may have various sizes and shapes to accommodate various liquids.

[0063] A cap 11 may be coupled to an outlet 12 in the container 10. Therefore, the control unit 300 may control the integrated coupling module 400 so as to open the cap 11, insert the coupler into the outlet of the container to discharge the liquid stored in the container 10 to the outside, and then, close the cap 11 back.

[0064] FIG. 2 is a conceptual view of an integrated coupling module according to an embodiment of the present invention, FIG. 3 is a perspective view of FIG. 2 viewed

from another direction, FIG. 4 is a perspective view of an opening/closing module and a coupler fixing module taken apart from each other, and FIG. 5 is a side view of a cap gripping unit.

[0065] FIGS. 2 to 4 show that the opening/closing module 410 opening and closing the cap 11 of the container 10 and the coupler fixing module 430 supporting the coupler 420 may be coupled to each other to form one integrated coupling module 400.

[0066] The opening/closing module 410 may include a cap gripping unit 411, a second rotating unit 414, and a first housing 416. The opening/closing module 410 may be lowered to grip the cap 11 of the container 10, rotated to separate the cap 11 from the container 10, and lifted up while gripping the cap 11. Various structures that may perform such functions may apply to the opening/closing module 410 with no limitation.

[0067] The cap gripping unit 411 may include a plurality of grippers 412 capable of gripping the cap 11 and a support portion 413 to which the plurality of grippers 412 are connected. The plurality of grippers 412 may be configured to spread out as they are lowered and be fastened to the cap 11. Such a hinge structure is not limited to a particular structure. Various fastening structures that

may grip the cap may apply to the hinge structure with no limitation.

[0068] The second rotating unit 414 may rotate the cap gripping unit 411 to separate, or fasten, the cap 11 from, or to, the container 10. The second rotating unit 414 may rotate a driving belt 415 connected to a second housing 418 disposed over the cap gripping unit 411. The second housing 418 may rotate together with the cap gripping unit 411. However, the configuration of the second rotating unit is not necessarily limited thereto. Various power transmitting structures may apply.

[0069] A first housing 416 may be disposed over the cap gripping unit 411 and the second housing 418 and an accommodating space may be formed therein. The coupler fixing module 430 may be partially inserted into the first housing 416. This configuration allows the central axis of the opening/closing module 410 and the central axis of the coupler fixing module 430 to coincide with each other.

[0070] The coupler 420 may include a nozzle 421 to be inserted into the container 10, a transport tube 426 connected to the nozzle 421, and at least one key code 425. The key code 425 may be inserted into a groove formed on the outlet of the container 10.

[0071] The coupler fixing module 430 may include a holder

431 fixing the coupler 420, a first rotating unit 433 rotating the coupler 420 or the key code 425 of the coupler 420, and a driving module 435 lifting and lowering the coupler 420 in the opening/closing module 410.

[0072] Since the coupler fixing module 430 is inserted into the first housing 416 of the opening/closing module 410, the coupler 420 may be disposed inside the opening/closing module 410. Therefore, the nozzle 421 may also be disposed inside the opening/closing module 410 not to be exposed to the outside.

[0073] The driving module 435 may move the coupler 420 up and down. The driving module 435 may have a cylinder structure but is not necessarily limited thereto. Any structure that may move the coupler 420 up and down may apply with no limitation.

[0074] When the coupler 420 is lowered by the driving module 435, the nozzle 421 of the coupler 420 may be lowered under the cap gripping unit 411 to be exposed to the outside. When the integrated module is lowered while the nozzle 421 of the coupler 420 is exposed under the cap gripping unit 411, the nozzle 421 of the coupler 420 may be inserted into the outlet of the container 10.

[0075] An angle-adjusting module 450 may axially rotate (or tilt) the opening/closing module 410 and the coupler

fixing module 430 together with respect to the first direction (X-axis direction) and the second direction (Y-axis direction). The opening/closing module and the coupler fixing module of the conventional structure are separately manufactured, which poses a problem that a configuration for adjusting the angle of the opening/closing module and a configuration for adjusting the angle of the coupler fixing module are required separately.

[0076] However, the opening/closing module 410 and the coupler fixing module 430 may be integrally manufactured according to the embodiment such that an advantage is that the angle of the cap gripping unit 411 and the coupler 420 may be adjusted by one angle-adjusting module 450 at a time. Therefore, manufacturing costs may be cut and downsizing may be made possible.

[0077] The angle-adjusting module 450 may include a first adjusting unit moving the position of the opening/closing module 410 and the coupler fixing module 430 in the first direction and a second adjusting unit moving the opening/closing module 410 and the coupler fixing module 430 in the second direction. This configuration allows adjustment of the opening/closing module 410 and the coupler fixing module 430 to the desired angle.

[0078] A sensing module 460 may be disposed adjacent to the opening/closing module 410 and include a first sensing unit 461 and a second sensing unit 462. The first sensing unit 461 may acquire an image of a top image of the container 10 to sense the position of the cap 11.

[0079] The control unit 300 may acquire position coordinates of the cap 11 through the image of the top image and output a drive signal to the first transport module 211 and the second transport module 221 to move the cap gripping unit 411 to over the cap 11. The first sensing unit 461 may be a camera capable of capturing images but is not necessarily limited thereto. Diverse equipment capable of checking the position of the cap may be selected.

[0080] The second sensing unit 462 may measure the evenness of the cap 11. For example, the second sensing unit 462 may be composed of a plurality of height sensors that respectively measure the height from the cap 11. The control unit 300 may use a plurality of height signals from the sensing unit 462 to check how tilted the cap 11 is. The number of height sensors is not particularly limited. For example, four height sensors may be disposed, but fewer or more height sensors may be disposed.

[0081] A lifting/lowering module 470 may include a

connecting unit 473 connected to the second transport member 220, a sliding unit 472 disposed on the connecting unit 473 and connected to the angle-adjusting module 450, and a lifting/lowering driving unit 471 lifting and lowering the sliding unit 472.

[0082] The cap gripping unit 411 and the coupler 420 may be lifted and lowered by the lifting/lowering module 470. According to an embodiment, the coupler 420 may be lifted and lowered together with the cap gripping unit 411 by the lifting/lowering module 470 and be lowered under the cap gripping unit 411 by the driving module 435.

[0083] FIGS. 1 and 5 show that a position adjusting module 417 may be disposed between the cap gripping unit 411 and the second housing 418. When the cap 11 is tilted or not aligned, the position adjusting module 417 may adjust the cap gripping unit 411 to be tilted in accordance with the tilt of the cap 11 or align the cap gripping unit to a right position.

[0084] This configuration allows the position adjusting module 417 to tilt or move the cap gripping unit 411 to accurately grip the cap 11 even when the cap 11 is tilted or is not gripped at the correct position.

[0085] The position adjusting module 417 may include a first position adjusting module 417a moving the position of

the cap gripping unit 411 in the first direction (X-axis direction) and a second position adjusting module 417b moving the position of the cap gripping unit 411 in the second direction (Y-axis direction) intersecting the first position, both the first and second position adjusting modules being disposed over the support portion 413.

[0086] The first position adjusting module 417a may include a first position adjusting element 417a-1 and a first support plate 417a-2 disposed on top of the first position adjusting element 417a-1. The first position adjusting element 417a-1 may move the cap gripping unit 411 in the first direction with respect to the first support plate 417a-2.

[0087] The second position adjusting module 417b may include a second position adjusting element 417b-1 and a second support plate 417b-2 disposed on top of the second position adjusting element 417b-1. The second position adjusting element 417b-1 may move the cap gripping unit 411 in the second direction with respect to the second support plate 417b-2.

[0088] The first position adjusting element 417a-1 and the second position adjusting element 417b-1 may be LM blocks but are not necessarily limited thereto. Various moving structures that may move the cap gripping unit 411 in the

first direction or the second direction may apply. For example, the first position adjusting element and the second position adjusting element may have an elastic block or a hinge structure.

[0089] The plurality of grippers 412 may be connected to the support portion 413 by an elastic member (not shown). Therefore, when pressing the cap 11, the grippers 412 may spread out by the elastic member while rising in the vertical direction. Therefore, the cap 11 may be gripped accurately even when the cap 11 is tilted.

[0090] The plurality of grippers 412 may include a first gripper 412a connected to the support portion 413 and a second gripper 412b connected to the first gripper 412a to grip the cap 11 by the side. The second gripper 412b may be provided with a slit 412c into which the protrusion of the cap 11 may be inserted.

[0091] The position adjusting module 417 may be driven independently of the angle-adjusting module 450 described above and either may be omitted if so needed.

[0092] FIG. 6A is a longitudinal view of the integrated coupling module, and FIG. 6B is a longitudinal view showing a state of the coupler lowered under the cap gripping unit.

[0093] FIG. 6A shows that the cap gripping unit 411 may have a space portion H1 in which the coupler 420 is lowered

in the axial direction. The support portion 413 of the cap gripping unit 411 may have a first through-hole H11 and a plurality of grippers 412 may be disposed to surround the first through-hole H11.

[0094] In addition, the position adjusting module 417 may have a second through-hole H12 matching the first through-hole H11 and the second housing 418 may have a third through-hole H13. Accordingly, the space portion H1 may be formed at the center of the cap gripping unit 411 in the axial direction so that the coupler 420 disposed inside the opening/closing module 410 may be lowered.

[0095] The second housing 418 may be inserted into the first housing 416. A bearing 419 may be disposed in the area into which the second housing 418 is inserted so that the rotation of the second housing 418 may be supported.

[0096] The coupler fixing module 430 may include a holder 431 fixing a support tube 427 into which the coupler 420 is inserted. One side 427a and the other side 427b of the support tube 427 may be exposed to the outside of the coupler fixing module. A plurality of protrusions (427c in FIG. 4) may be formed on the outer circumferential surface of the support tube 427 to extend in the axial direction. The holder 431 may be coupled to the support tube 427 and rotated by the first rotating unit 433 so that the coupler

420 or the key code 425 may be rotated.

[0097] FIG. 6B shows that the nozzle 421 of the coupler 420 may be exposed under the plurality of grippers 412 when the coupler 420 is lowered by the driving module 435. Therefore, the nozzle 421 of the coupler 420 may be inserted into the outlet of the container 10. In addition, when the discharge of the liquid is completed, the coupler 420 may be lifted by the driving module 435 to be accommodated inside the opening/closing module 410 again.

[0098] The driving module 435 may include a fixing chuck 435a coupled to the support tube 427 into which the coupler 420 is inserted and a driving unit lifting and lowering the fixing chuck 435a. The driving unit may use the air to lift and lower the fixing chuck but is not necessarily limited thereto. Various lifting/lowering structures may apply with no limitation.

[0099] FIGS. 7A and 7B are views showing a process of bringing a plurality of containers to at least one integrated coupling module.

[0100] FIGS. 7A and 7B show that a plurality of containers 10 may be brought to an operation position defined by a pair of first transport members 210 and a pair of second transport members 220. The plurality of containers 10 may be brought to the operation position by transport members

while being placed on the holder 20. Various transport means such as a conveyor, a roller, a conveyor belt, a forklift, a hand lift, an electric lift, a hand cart, a bogie, a rail, and the like that may move the container 10 may apply with no limitation.

[0101] Two containers 10 may be disposed in a first row and two containers 10 may be disposed in a second row. A first integrated coupling module 400A may perform a coupling operation on the two containers 10 disposed in the first row and a second integrated coupling module 400B may perform a coupling operation on the two containers 10 disposed in the second row. However, the present invention is not necessarily limited thereto, and the number of containers 10 that can be operated on at a time may change in consideration of the amount of chemical to be used or an operation space. For example, three or less, or five or more containers 10 may be disposed.

[0102] FIG. 8 is a view showing a process of sensing the position of the cap coupled to the container, and FIG. 9 is a view showing a process of sensing the evenness of the cap coupled to the container.

[0103] FIG. 8 shows that the first sensing unit 461 may acquire an image of the top image of the container 10 to check the position of the cap 11. The control unit 300 may

acquire the position coordinates of the cap 11 through the image of the top image and output a drive signal to the first transport member 210 and the second transport member 220 to move the cap gripping unit 411 over the cap 11.

[0104] The first sensing unit 461 may be a camera capable of capturing images but is not necessarily limited thereto. The control unit 300 may use the image of the top image acquired by the first sensing unit 461 to obtain the position coordinates of the cap 11 and check a protrusion position of the cap 11. This process may be performed by various image analysis methods.

[0105] FIG. 9 shows that the second sensing unit 462 may measure the evenness of the cap 11. For example, the second sensing unit 462 may be composed of a plurality of height sensors that respectively measure the height from the cap 11. The control unit 300 may use a plurality of height signals from the second sensing unit 462 to check how tilted the cap 11 is. The number of height sensors is not particularly limited. For example, four height sensors may be disposed, but fewer or more sensors may be disposed.

[0106] The control unit 300 may use the information measured by the plurality of height sensors to calculate how tilted the cap 11 is with respect to the X-axis and Y-axis. When the tilt of cap 11 is calculated, the tilt

angle of the integrated coupling module 400 may be adjusted. If the measurement result of the evenness reveals that the tilt of the cap 11 is out of a predetermined tilt range, an error message may be output without performing separation operation of the cap 11.

[0107] FIG. 10 is a view showing the angle-adjusting module, FIG. 11 is a view showing an adjusting element of the angle-adjusting module, FIG. 12 is a side view of the integrated coupling module, FIG. 13 is a view showing a state of the integrated coupling module tilted to one side by the angle-adjusting module, FIG. 14 is a view showing a state of the integrated coupling module tilted to the other side by an angle-adjusting module, and FIG. 15 is a view showing an integrated couple module according to another embodiment.

[0108] FIGS. 10 and 11 show that the angle-adjusting module 450 may include a first fixing plate 451, a plurality of angle-adjusting elements 454a, 454b, 454c, 454d, a second fixing plate 452, the first adjusting unit 455, the second adjusting unit 456, and a third fixing plate 453.

[0109] The first adjusting unit 455 may move the opening/closing module 410 and the coupler fixing module 430 in the first direction, and the second adjusting unit 456 may move the opening/closing module 410 and the coupler

fixing module 430 in the second direction. The first adjusting unit 455 and the second adjusting unit 456 may be motors or cylinders but are not necessarily limited thereto. Various structures that may move the opening/closing module in the first direction and the second direction may apply with no limitation.

[0110] The angle-adjusting elements 454a, 454b, 454c, 454d may be disposed between the first fixing plate 451 and the second fixing plate 452. The angle-adjusting elements 454a, 454b, 454c, 454d may be air chucks and may adjust the angle of the first fixing plate 451 connected to the opening/closing module 410 by the predetermined pressure and flow rate applied by separate electropneumatic regulators (not shown). However, the present invention is not necessarily limited thereto. Various structures that may tilt the integrated coupling module 400 with respect to the X-axis and Y-axis may apply with no limitation.

[0111] FIGS. 12 and 13 show that different controlling of the pressure and flow rate applied to the plurality of angle-adjusting elements 454 may tilt the opening/closing module 410 and the coupler fixing module 430 forward. In addition, FIG. 14 shows that the plurality of angle-adjusting elements 454 may tilt the opening/closing module 410 and the coupler fixing module 430 backward. This

structure allows one angle-adjusting module 450 to freely tilt the opening/closing module 410 and the coupler fixing module 430.

[0112] The cap coupled to the container may be disposed tilted for a variety of reasons. A container like a drum may require chemical resistance depending on the type of chemical so that resin materials (for example, PP, PE) with relatively weak strength may be used. Therefore, there is a possibility that a cap or an outlet is tilted when the container is made.

[0113] In addition, a mistake in adjusting the pressure of the gas injected after the container is filled with a chemical may cause a tilt and a failure to discharge gas from the container when the chemical is filled may cause a tilt. In addition, a failure to adjust the pressure when a small amount of pressurized gas is filled to maintain proper pressure while the chemical is discharged from the container may cause the container to shrink to generate a tilt in the cap or the outlet.

[0114] When the cap is disposed tilted for a variety of reasons as described, it may be difficult to accurately grip the tilted cap if the cap gripping unit is vertically lowered. Therefore, the integrated coupling module according to an embodiment employs the angle-adjusting

module 450 to adjust the angle of the cap gripping unit 411 and/or the coupler 420.

[0115] According to the embodiment, the cap gripping unit of the opening/closing module 410 rotates freely to have a tilt matching the tilt of the cap to accurately grip the cap.

[0116] In addition, when the coupler 420 is exposed under the cap gripping unit 411, the coupler rotates freely to have a tilt matching the tilt of the cap so that the coupler may be accurately inserted into the outlet of the container.

[0117] The angle-adjusting module 450 may also be composed of the first fixing plate 451, a plurality of angle-adjusting elements 454a, 454b, 454c, 454d, and the second fixing plate 452. That is, the angle-adjusting module 450 may only adjust the tilt of the opening/closing module by an angle-adjusting element or may add a further configuration of the first adjusting unit and the second adjusting unit to move the opening/closing module.

[0118] FIG. 15 shows that the lifting/lowering module 470 may also be disposed between the angle-adjusting module 450 and the opening/closing module 410. This configuration allows the angle-adjusting module 450 to tilt the lifting/lowering module 470 and the opening/closing module

410 together so that the opening/closing module 410 and the coupler fixing module 430 may be lowered obliquely. Therefore, the cap 11 may be gripped or the nozzle 421 may be inserted into the container 10 more accurately.

[0119] FIG. 16 is a view showing a state of the cap gripping unit lowered to be coupled to a cap, FIG. 17 is a view showing a state of the cap gripping unit separating the cap from the container, and FIG. 18 is a view showing a state of the cap gripping unit placing the cap on a holder.

[0120] FIG. 16 shows that the cap gripping unit 411 may be coupled to the cap 11 of the container 10 as the opening/closing module 410 is lowered by the lifting/lowering module 470. Then, the cap 11 may be separated from the container 10 as the cap gripping unit 411 is rotated by the second rotating unit 414.

[0121] FIG. 17 shows that the cap gripping unit 411 may be lifted while holding the cap 11 as the opening/closing module 410 is lifted by the lifting/lowering module 470. Therefore, the outlet 12 of the container 10 may be exposed.

[0122] FIG. 18 shows that the opening/closing module 410 moves outside the container 10 to place the cap 11 on a holder 13 disposed adjacent to the container 10. This is because the coupler 420 may not be lowered while the cap 11 is gripped by the cap gripping unit 411.

[0123] The structure in which the cap gripping unit 411 places the cap 11 on the holder 13 is not particularly limited. For example, the cap 11 may be placed on the holder 13 as the grippers 412 of the cap gripping unit 411 may be spread out by a separate driving unit. However, the method for the cap gripping unit 411 to place the cap 11 on the holder 13 is not particularly limited. For example, a screw thread may be formed in the holder 13 such that the cap 11 may be placed on the holder 13 in the way the cap is coupled to the outlet.

[0124] In addition, instead of placing the cap 11 on the holder 13, the cap gripping unit 411 may rotate or move to a position where lowering of the coupler 420 is not disturbed.

[0125] FIG. 19 is a view showing a state of the coupler exposed under a cap gripping unit, FIG. 20 is a view showing a state of the key code of the coupler and a groove of the outlet aligned with each other, FIG. 21 is a view showing a top surface of the outlet, FIG. 22 is a view showing a state of the coupler inserted into the outlet of the container, and FIG. 23 is a view showing a state of the coupler lifted over the cap gripping unit.

[0126] FIGS. 19 to 21 show that the nozzle 421 of the coupler 420 may be lowered under the cap gripping unit 411

by the driving module 435 of the coupler fixing module 430.

[0127] The first sensing unit 461 may acquire an image of the outlet 12 image from which the cap 11 is removed and check whether the key code 425 is aligned with the groove 12b of the outlet 12. If it is determined that the key code 425 and the groove 12b are not aligned, the key code 425 may be rotated by the first rotating unit 433.

[0128] For example, the key code 425 may be rotated clockwise or counterclockwise with respect to the reference point R1 disposed on the top surface in the image of the outlet 12 image so that the key code may be inserted into one or more open grooves among a plurality of grooves 12b. However, the present invention is not necessarily limited thereto. Various aligning methods using a vision may apply to the alignment of the key code 425.

[0129] When it is determined that the key code 425 is aligned, the coupler 420 may be lowered by the lifting/lowering module 470 to insert the nozzle 421 of the coupler 420 into the discharge groove 12a of the outlet 12 as shown in FIG. 22. At this time, the second sensing unit 462 may be employed to measure the tilt of the outlet 12 and the nozzle 421 may be rotated to tilt in accordance with the tilt of the outlet 12, and then, be inserted.

[0130] When the insertion of the coupler 420 into the

outlet of the container 10 is completed, the liquid stored in the container 10 may be discharged to a storage tank. Various liquid transport methods may apply to the transportation of the liquid in the container 10 to the storage tank with no limitation.

[0131] FIG. 23 shows that the integrated coupling module 400 may be lifted again by the lifting/lowering module 470 when discharge is completed.

[0132] FIG. 24 is a view showing a state of the cap gripping unit gripping the cap placed on the holder again, FIG. 25 is a view showing a state of the cap gripping unit rotated to couple the cap to the container, and Fig. 26 is a view showing a state the cap gripping unit lifted to complete the operation.

[0133] FIG. 24 shows that the opening/closing module 410 may move to the holder 13 and grip the cap 11 placed on the holder 13 again. FIG. 25 shows that the cap gripping unit 411 gripping the cap 11 may be lowered by the lifting/lowering module 470 and the cap gripping unit 411 may couple the cap 11 to the outlet 12 again while being rotated by the second rotating unit 414 to complete the operation.

[0134] FIG. 26 shows that the cap gripping unit 411 may be lifted again and the integrated coupling module 400 may

move to the top of the next container 10 to perform the same operation.

[0135] Thus far, description has focused on the embodiments, which only serve as illustrative examples and do not limit the present invention. Configurations of various embodiments described in the drawings may apply with no limitation.

[0136] Those with common knowledge in the related art to which the present invention pertains will understand that various modifications and applications not exemplified above are possible without departing from the fundamental characteristics of the present embodiments. For example, each component specific to the embodiments may be modified for implementation. And differences relating to such modifications and applications should be construed as being included in the scope of the present invention defined in the accompanying claims.

DESCRIPTION OF REFERENCE NUMERALS

10: container

11: cap

400: integrated coupling module

410: opening/closing module

411: cap gripping unit

414: second rotating unit
420: coupler
425: key code
430: coupler fixing module
433: first rotating unit
435: driving module
450: angle-adjusting module
470: lifting/lowering module

WHAT IS CLAIMED IS:

Claim 1. An integrated coupling module comprising:
an opening/closing module including a cap gripping unit gripping a cap of a container; and

a coupler fixing module fixing a coupler discharging a liquid in the container to an outside, wherein the coupler is lowered from over the cap gripping unit to be coupled to the container,

wherein the cap gripping unit includes a space portion formed in an axial direction, and the coupler is lowered under the cap gripping unit through the space portion.

Claim 2. The integrated coupling module according to claim 1, wherein the cap gripping unit includes a support portion in which a first through-hole is formed and a plurality of grippers disposed to surround the first through-hole to form the space portion.

Claim 3. An integrated coupling module comprising:
an opening/closing module including a cap gripping unit gripping a cap of a container; and

a coupler fixing module fixing a coupler discharging a liquid in the container to an outside, wherein the

coupler is lowered from over the cap gripping unit to be coupled to the container,

wherein the opening/closing module includes a second rotating unit rotating the cap gripping unit and a first housing disposed over the cap gripping unit and

the coupler fixing module is inserted into the first housing.

Claim 4. The integrated coupling module according to claim 3 comprising a position adjusting module disposed between the cap gripping unit and the first housing, wherein the position adjusting module includes a first position adjusting module moving the position of the cap gripping unit in a first direction and a second position adjusting module moving the position of the cap gripping unit in a second direction intersecting the first direction.

Claim 5. The integrated coupling module according to claim 3, wherein the coupler fixing module includes a first rotating unit rotating the coupler or a key code of the coupler and a driving module moving the coupler up and down, wherein the coupler is lowered under the cap gripping unit by the driving module.

Claim 6. The integrated coupling module according to claim 1 comprising a lifting/lowering module moving the opening/closing module and the coupler fixing module up and down together, wherein the coupler is lifted and lowered together with the cap gripping unit by the lifting/lowering module and is lowered under the cap gripping unit by a driving module of the coupler fixing module.

Claim 7. An integrated coupling module comprising:
an opening/closing module including a cap gripping unit gripping a cap of a container;

a coupler fixing module fixing a coupler discharging a liquid in the container to an outside, wherein the coupler is lowered from over the cap gripping unit to be coupled to the container and an angle-adjusting module connected to the opening/closing module to adjust the angle of the opening/closing module, wherein the angle-adjusting module includes a first adjusting unit moving the opening/closing module and the coupler fixing module together in a first direction and a second adjusting unit moving the opening/closing module and the coupler fixing module together in a second direction intersecting the first direction wherein the coupler fixing module may be partially inserted into a first housing of the

opening/closing module.

Claim 8. The integrated coupling module according to claim 1 comprising an angle-adjusting module connected to the opening/closing module to adjust the angle of the opening/closing module, wherein the angle-adjusting module includes an angle-adjusting element simultaneously adjusting tilt angle of the opening/closing module and the coupler fixing module.

Claim 9. The integrated coupling module according to claim 1 comprising a sensing module sensing a position and a tilt of the cap, wherein the sensing module includes a first sensing unit sensing the position of the cap and a second sensing unit sensing the tilt of the cap.

Claim 10. A coupling method using the integrated coupling module of any one of claims 1 to 9, comprising:

separating a cap from a container by rotating a cap gripping unit of an opening/closing module;

lowering a coupler disposed inside the opening/closing module to expose the same under the cap gripping unit;

discharging a liquid stored in the container by

inserting the coupler into an outlet of the container;
lifting the coupler over the cap gripping unit; and
fastening the cap to the container by the cap
gripping unit.

Claim 11. The coupling method according to claim 10,
wherein the opening/closing module moves to a holder
disposed adjacent to a container to place the separated cap
on the holder in the step of separating the cap, and

the opening/closing module moves to the holder
and grips the cap placed on the holder again to fasten the
cap to the container in the step of fastening the cap to
the container.