

TITLE OF INVENTION: CHEMICAL SAMPLING DEVICE

REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the priority to Korean patent application No. 10-2021-0102130, filed 3 August 2021; Korean patent application No. 10-2021-0131100, filed 1 October 2021; and Korean patent application No. 10-2021-0131110, filed 1 October 2021, the contents of which are each incorporated herein by reference.

TECHNICAL FIELD

[0002] The embodiment relates to a chemical sampling device.

BACKGROUND

[0003] Companies that handle chemicals harmful to the human body, for example, companies that manufacture semiconductors, LCDs, OLEDs, pharmaceuticals, and the like, or companies that manufacture chemicals such as paint companies, use various types of chemicals in one or multiple unit processes.

[0004] In general, chemicals are supplied to a main storage tank through a tank lorry and the like, and some of the chemicals stored in the main storage tank are divided and stored in a plurality of sub storage tanks, so that the chemicals can be sequentially supplied to one unit process or individually to a plurality of unit processes.

[0005] As another example, if there is a small amount of chemicals or if a tank lorry cannot be used due to the nature of the chemical itself, the chemical may

be directly supplied to the sub storage tank through a drum, a bottle, and the like.

[0006] If chemicals are contaminated in tank lorries, drums, containers, storage tanks, pipes, and the like, defects may occur in the unit process that receives the contaminated chemicals.

5 **[0007]** Therefore, a degree of chemical contamination needs to be managed at an appropriate level for each major location such as a tank lorry, a drum, a container, a storage tank, a pipe and the like, and accordingly, a sampling device capable of sampling chemicals at a major location has been developed.

[0008] A conventional sampling device includes a sampling booth, a plurality
10 of sampling lines respectively connected to a plurality of main locations for supplying chemicals to a sampling container accommodated in the sampling booth, and valves respectively installed at the plurality of sampling lines.

[0009] An operator was able to perform the sampling operation as follows using a conventional sampling device.

15 **[0010]** For example, the operator manually opened the lid of the sampling container and put the sampling container into the sampling booth, operated the valve on the sampling line connected to the main location to be sampled, filled the sampling container with chemicals, collected the chemical-filled sampling container from the sampling booth, closed the lid of the sampling container, and
20 then transported the sampling container to a chemical contamination level analysis site.

[0011] As described above, most of the sampling operations was generally performed manually by the operator.

[0012] Therefore, there is a problem that there is a high possibility that
25 chemical contamination occurs due to the carelessness of the operator during

the sampling operations, and there is also a problem that the operator is highly likely to be exposed to the chemical.

[0013] These problems are particularly likely to occur in the process of opening and closing the lid of the sampling container by the operator himself.

5 **[0014]** On the other hand, when chemical contamination occurs during the sampling operations, the reliability of the chemical contamination level analysis result may be reduced. In addition, for the protection of the operator, the inconvenience of preparing, wearing, and taking off safety equipment of the highest level of protection may occur.

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SUMMARY

[0015] The embodiment provides a chemical sampling device for automating a sampling process that has been done manually.

15 **[0016]** The problem to be solved in the embodiment is not limited thereto, and it will be said that the purpose or effect that can be grasped from the means to solve the problem or embodiment described below is also included.

[0017] A chemical sampling device according to one aspect of the present invention includes a lid detachable unit that separates a lid of a container; and a chemical charging unit that charges chemicals in the container, wherein the
20 chemical charging unit includes a drain module from which residual chemicals remaining in a plurality of sampling lines is discharged; and a plurality of sampling driving modules each independently moving the plurality of sampling lines, wherein the plurality of sampling driving modules moves the plurality of sampling lines to an upper portion of the drain module or the container.

25 **[0018]** Among the plurality of sampling driving modules, only the sampling

driving module coupled to the sampling line on which sampling is to be performed may be selectively driven to move the sampling line from the drain module to the upper portion of the container, and the remaining sampling driving modules may not operate.

- 5 **[0019]** The plurality of sampling driving modules may include a horizontal movement module that horizontally moves the sampling lines from the upper portion of the drain module to the upper portion of the container.

[0020] The plurality of sampling driving modules may include a vertical movement module that vertically moves the sampling lines.

- 10 **[0021]** The drain module may include a plurality of outlets respectively corresponding to the plurality of sampling lines.

[0022] The plurality of outlets is each independently partitioned by a blocking wall formed in the drain module.

- 15 **[0023]** The drain module may include a plurality of chemical discharge lines individually connected to the plurality of outlets, the chemicals each discharged to the plurality of outlets may be individually discharged to an outside through the plurality of chemical discharge lines.

- [0024]** The drain module may include a plurality of washing water supply lines and a plurality of gas supply lines individually connected to the plurality of outlets, 20 the plurality of outlets or the sampling lines may be each independently washed and dried.

- [0025]** The plurality of sampling lines may be respectively connected to a pipe of a chemical tank in which the chemicals to be sampled is stored, a bypass line that discharges the chemicals by bypassing the drain module may be formed 25 between the pipe of the chemical tank and the sampling lines.

[0026] A diameter of the sampling lines is smaller than a diameter of the bypass line.

[0027] The chemical charging unit may include a transport unit that moves the container; and a rail on which the transport unit slides, wherein the transport unit
5 may stop at a lower portion of the sampling line on which sampling is to be performed among the plurality of sampling lines, an upper end of the container disposed on the lower portion of the sampling line on which the sampling is to be performed may have a height corresponding to a height of an upper end of the drain.

10 **[0028]** A chemical sampling device according to another aspect of the present invention includes a lid detachable unit that separates a lid of a container; and a chemical charging unit that charges chemicals in the container, wherein the chemical charging unit includes a drain module through which residual chemicals remaining in a sampling line are discharged; and a sampling driving
15 module that moves the sampling line, wherein the sampling driving module moves the sampling line to an upper portion of the drain module or the container.

[0029] According to an embodiment, it is possible to automate most operations of the sampling process, it is possible to prevent chemical contamination during the sampling operation, and it is possible to reduce the risk
20 of the operator being exposed to chemicals.

[0030] In addition, since the space for inserting the container and the space for collecting the container are separated, it is possible to reduce contamination of the container, and it is possible to reduce confusion when the operator inserts or collects the container.

25 **[0031]** In addition, since the internal configuration of the drain module is

separated, it is possible to reduce contamination by other chemicals.

[0032] In addition, by providing a means for gripping, transporting, and rotating the sampling container and the lid, and a means for transporting the nozzle, it is possible to obtain the effect of easily automating the process of removing the lid from the sampling container or recombining the lid with the container.

[0033] Various and beneficial advantages and effects of the present invention are not limited to the above, and will be more easily understood in the course of describing specific embodiments of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] [FIG. 1] is a view showing a chemical storage facility according to an embodiment of the present invention.

[0035] [FIG. 2] is a view showing a chemical sampling device according to an embodiment of the present invention.

[0036] [FIG. 3] is a plan view of [FIG. 2].

[0037] [FIG. 4] is a view showing an input area according to an embodiment of the present invention.

[0038] [FIG. 5] is a view showing a first accommodation unit according to an embodiment of the present invention.

[0039] [FIG. 6] is a cross-sectional view taken along the A-A direction of [FIG. 5].

[0040] [FIG. 7] is a view showing a state in which a container of a first accommodation unit is fixed.

[0041] [FIG. 8] is a view showing a state in which a first pickup module grips a

container according to an embodiment of the present invention.

[0042] [FIG. 9] is a view showing a configuration of a first pickup module according to an embodiment of the present invention.

[0043] [FIG. 10] is a view showing a state in which a first pickup module picks
5 up a container according to an embodiment of the present invention.

[0044] [FIG. 11] is a view showing a configuration of a pickup unit according to an embodiment of the present invention.

[0045] [FIG. 12] is a view showing a state in which a container is mounted on a pickup unit according to an embodiment of the present invention.

10 **[0046]** [FIG. 13] is a view showing a process of sensing a container.

[0047] [FIG. 14a] is a view showing a configuration of a sensing unit according to an embodiment of the present invention.

[0048] [FIG. 14b] is a view showing a state in which a label is automatically attached to a container by a label output device.

15 **[0049]** [FIG. 14c] is a view showing a container with a label attached thereto.

[0050] [FIG. 15] is a view showing a state in which a first pickup module rotates according to an embodiment of the present invention.

[0051] [FIG. 16a] to [FIG. 16c] are views showing a state in which a first door is opened and closed by a first opening and closing unit according to an
20 embodiment of the present invention.

[0052] [FIG. 17] is a view showing a state in which a first pickup module transports a container to a work area according to an embodiment of the present invention.

[0053] [FIG. 18] is a partially enlarged view of [FIG. 17].

25 **[0054]** [FIG. 19] is a perspective view showing a lid detachable unit and a

chemical charging unit according to an embodiment of the present invention.

[0055] [FIG. 20] is a front view showing a lid detachable unit and a chemical charging unit according to an embodiment of the present invention.

[0056] [FIG. 21] is a view showing a lid detachable unit according to an
5 embodiment of the present invention.

[0057] [FIG. 22] is a cross-sectional view of a lid detachable unit according to an embodiment of the present invention.

[0058] [FIG. 23] is a view showing a state in which a fixing module of a lid detachable unit is fixed to the side of a container according to an embodiment of
10 the present invention.

[0059] [FIG. 24] is a view showing a state in which a lid detachable unit separates a lid of a container according to an embodiment of the present invention.

[0060] [FIG. 25] is a view showing a state in which a container with a lid
15 removed moves to a chemical charging unit.

[0061] [FIG. 26] is a perspective view of a chemical charging unit according to an embodiment of the present invention.

[0062] [FIG. 27] is a front view of [FIG. 26].

[0063] [FIG. 28a] to [FIG. 28d] are views showing a process of charging a
20 container with chemicals after discharging the chemicals remaining in a sampling nozzle.

[0064] [FIG. 29a] is a view showing a drain module according to an embodiment of the present invention.

[0065] [FIG. 29b] is a view showing a state in which an end of a sampling line
25 is washed.

[0066] [FIG. 30] is a view showing a pipe system connected to a drain module.

[0067] [FIG. 31] is a view showing a state in which chemical is charged in a container.

[0068] [FIG. 32] is a view showing a state in which a container is rearranged
5 on the lower portion of a lid detachable unit.

[0069] [FIG. 33] is a view showing a state in which a lid is coupled to a container.

[0070] [FIG. 34] is a view showing a state in which a container to which a lid is coupled is separated from a work area.

10 **[0071]** [FIG. 35] is a view showing a discharge area according to an embodiment of the present invention.

[0072] [FIG. 36] is a view showing a state in which a second pickup module rotates to pick up a container disposed in a work area according to an embodiment of the present invention.

15 **[0073]** [FIG. 37] is a view showing a state in which a container is mounted on a pickup unit of a second pickup module according to an embodiment of the present invention.

[0074] [FIG. 38] is a view showing a state in which a second pickup module lifts a container to separate the container from a transport unit according to an
20 embodiment of the present invention.

[0075] [FIG. 39] is a view showing a state in which a second pickup module rotates toward a second accommodation unit according to an embodiment of the present invention.

25 **[0076]** [FIG. 40] is a view showing a state in which a second pickup module transports a container to a second accommodation unit according to an

embodiment of the present invention.

[0077] [FIG. 41] is a view showing a state in which a second pickup module returns to its original location according to an embodiment of the present invention.

5 **[0078]** [FIG. 42] is a view showing a state in which a container is accommodated in a second accommodation unit.

[0079] [FIG. 43] is a view showing a state in which an upper guide is raised so that an operator can collect a container.

10 DETAILED DESCRIPTION

[0080] Hereinafter, preferred embodiments of the present invention will be described in detail with reference to the accompanying drawings.

[0081] However, the technical spirit of the present invention is not limited to some embodiments described, but may be implemented in various different
15 forms, and as long as it is within the scope of the technical spirit of the present invention, it is possible to selectively combine and substitute one or more of the components between the embodiments.

[0082] In addition, terms (including technical and scientific terms) used in the embodiments of the present invention may be generally understood by those of
20 ordinary skill in the art to which the present invention belongs, unless specifically defined and described explicitly. Terms commonly used, such as terms defined in the dictionary, may be interpreted in consideration of the contextual meaning of the related art.

[0083] In addition, the terms used in the embodiments of the present invention
25 are for describing the embodiments and are not intended to limit the present

invention. For example, the “sampling container” used for the description of the embodiment may mean a container for storing or transporting substances such as liquid, solid, and gaseous phases. Therefore, the scope of rights should not be reduced by the terms described in this embodiment.

5 **[0084]** In this specification, the singular form may also include the plural form unless otherwise specified in the phrase, and when it is described as “at least one (or more than one) of A and (with) B, C”, it may include one or more of all combinations that can be combined with A, B, and C.

10 **[0085]** In addition, in describing the components of the embodiment of the present invention, terms such as first, second, A, B, (a), (b), etc. may be used.

[0086] These terms are only for distinguishing the components from other components, and are not limited to the essence, order, or order of the components by the terms.

15 **[0087]** Further, when it is described that a component is 'connected', 'coupled' or 'contacted' to another component, this may include the case where the component is directly connected, coupled or contacted to the other component, as well as the case where the component is 'connected', 'coupled' or 'contacted' by another component between the component and the other component.

20 **[0088]** In addition, when it is described as being formed or disposed on “upper (above) or lower (below)” of each component, the upper (above) or lower (below) includes the case where two components are in direct contact with each other, as well as the case where one or more other components are formed or disposed between two components. In addition, when expressed as “upper (above) or lower (below)”, a meaning of not only an upward direction but also a
25 downward direction based on one component may be included.

[0089] [FIG. 1] is a view showing a chemical storage facility according to an embodiment of the present invention.

[0090] Referring to [FIG. 1], a chemical storage facility 1 includes an ACQC unit 2, a first chemical storage tank 3, a chemical distributor 4 and a plurality of second chemical storage tanks 5, 6.

[0091] The automatic clean quick coupler (ACQC) unit 2 can transport the chemical supplied from a tank lorry to the first chemical storage tank 3. The chemical distributor 4 may divide and supply some of the chemicals stored in the first chemical storage tank 3 to the plurality of second chemical storage tanks 5, 6.

[0092] A chemical sampling device 41 may be connected to the plurality of chemical storage tanks 3, 5, 6 through the plurality of sampling lines L1, L2, L3.

[0093] In this embodiment, the sampling lines L1, L2, L3 are described as being connected to the chemical storage tank, but is not necessarily limited thereto, and they may be connected to any kind of chemical sources that supply, store or transport chemicals such as tank lorries, drums, containers, storage tanks, pipes, and the like.

[0094] In addition, the sampling lines L1, L2, L3 are shown as three, but the sampling line is not necessarily limited thereto, and may be one, two, or four or more depending on the number of chemical storage tanks.

[0095] In addition, the sampling lines L1, L2, L3 may sample the same type of chemicals stored in different tanks, but are not limited thereto, and may sample a plurality of different types of chemicals. For example, the first sampling line L1 may sample a first chemical, and the second sampling line L2 may sample a chemical different from the first chemical.

[0096] An opening and closing valve V and a pump P may be installed in each of the plurality of sampling lines L1, L2, L3.

[0097] The pump P is for transporting the chemical through the sampling lines L1, L2, L3, but is not necessarily limited thereto, and it may include a gas supply device that causes the chemicals from a chemical source to be transported through the sampling lines L1, L2, L3 by supplying gas such as nitrogen or air to the chemical source.

[0098] The case 42 constituting the chemical sampling device 41 may be disposed in the chemical distributor 4, but is not necessarily limited thereto. A controller 7 may be a lower control module for controlling the chemical sampling device, or an integrated control module for controlling the entire system.

[0099] When the controller 7 receives a signal indicating that the chemical is input into the chemical tank connected to the chemical sampling device, the controller 7 may control the chemical sampling device 41 to sample the chemical input into the corresponding chemical tank. The input signal can be received through a detection sensor installed in each tank or the ACQC.

[0100] For example, whenever a tank lorry vehicle enters and a drug is input into the first chemical storage tank 3 or the plurality of second chemical storage tanks 5, 6, it can be controlled to automatically perform sampling. Alternatively, the sampling may be performed automatically whenever the chemical is added to a new tank. According to this configuration, there is an advantage of preventing the risk of chemical contamination in advance by performing sampling whenever an event occurs. However, the present invention is not necessarily limited thereto, and equipment unrelated to the process of inputting the chemicals into the chemical storage tank may also be connected to the

sampling device for sampling. Exemplarily, even when the drug is directly transported from a drug container to a place of use, it may be connected to the sampling device so that the drug to be transported to the place of use may be sampled.

5 **[0101]** [FIG. 2] is a view showing a chemical sampling device according to an embodiment of the present invention. [FIG. 3] is a plan view of [FIG. 2].

[0102] Referring to [FIG. 2] and [FIG. 3], the chemical sampling device may include an input area P1 into which a plurality of containers 10 is put, a work area P2 in which the container 10 is charged with chemicals, and a discharge
10 area P3 in which the container 10 charged with chemicals is collected.

[0103] Further, the chemical sampling device may include the case 42 accommodating the input area P1, the work area P2, and the discharge area P3, a first partition wall disposed inside the case 42 to partition the input area P1 and the work area P2, and a second partition wall 44 disposed inside the case
15 42 to partition the work area P2 and the discharge area P3.

[0104] The first opening and closing unit 130 may be disposed on the first partition wall 43 to open or close the input area P1 and the work area P2. Also, the second opening and closing unit 430 may be disposed on the second partition wall 44 to open or close the discharge area P3 and the work area P2.
20 Accordingly, the input area P1, the work area P2, and the discharge area P3 may be selectively opened or closed by the first opening and closing unit 130 and the second opening and closing unit 430.

[0105] The input area P1 is an area in which an empty container 10 for sampling chemicals is accommodated, and the first pickup module 110 and the
25 first accommodation unit 120 may be disposed therein. A plurality of containers

10 may be disposed in the first accommodation unit 120, and the first pickup module 110 may pick up the containers 10 and transport them to the work area P2. An operator may put the container 10 into the first accommodation unit 120 through a first window 14.

5 **[0106]** The work area P2 is an area for charging the container 10 with chemicals, and a lid detachable unit 200 and the chemical charging unit 300 are disposed therein. In the work area P2, the process of separating the lid 11 from the container 10, the process of discharging the chemicals remaining in the sampling line in advance, the process of charging the container 10 with
10 chemicals, and the process for refastening the lid 11 to the container 10 may be performed.

[0107] The discharge area P3 is an area for storing the container 10 charged with chemicals so that the operator can collect the container, and a second pickup module 410 and a second accommodation unit 420 may be disposed
15 therein. The container 10 charged with chemical may be disposed in the second accommodation unit 420, and the operator may collect the container 10 through a second window 15.

[0108] Chemicals are toxic chemicals, so when exposed to the outside, a big problem can occur. Accordingly, detection sensors SA1, SA2, SA3 may be
20 disposed in the input area P1, the work area P2, and the discharge area P3, respectively. The detection sensors SA1, SA2, SA3 may be disposed at a point capable of first sensing chemical exposure in each area. Exemplarily, the detection sensors SA1, SA2, SA3 may be installed on a floor, but the location at which the detection sensor is installed is not particularly limited.

25 **[0109]** As the detection sensors SA1, SA2, SA3, a general sensor capable of

detecting chemical (e.g., an optical sensor, an infrared sensor, a capacitive sensor) may be used, and the present invention is not limited by the types of the detection sensors SA1, SA2, SA3 or a sensing method.

[0110] In addition, when chemical leakage is detected by the detection sensors SA1, SA2, SA3, the controller 7 may generate an alarm signal capable of recognizing a chemical leakage situation to the operator.

[0111] Here, the alarm signal may include at least one of an audible alarm signal by a commonly used sound means and a visual alarm signal by a commonly used warning light, and in addition to that signal, a variety of other alarm signals that can make the operator aware of the chemical leak situation may be used.

[0112] According to an embodiment, the input area P1 and the discharge area P3 may be separated. Since the input position and the discharge position are located in different places, the problem of contamination of the empty container 10 by the chemical-charged container 10 can be solved, and it is also possible to reduce the risk that the operator is mistaken for another container 10.

[0113] In addition, since the operator can check the quantity of an empty container at a glance, it is easy to replenish the container in advance, and the operator can check the remaining discharge space at a glance, so that the container that has been sampled can be quickly collected.

[0114] In addition, there is an advantage in that the empty container can be charged or collected without interference during work progress and discharge progress.

[0115] Although it is illustrated in the drawing that the input area P1 and the discharge area P3 face each other with the work area P2 interposed

therebetween, the present invention is not limited thereto. Based on the work area P2, the input area P1 and the discharge area P3 may be disposed not to face each other. That is, the input area P1 and the discharge area P3 may be disposed at various positions according to an environment in which the chemical sampling device is installed.

[0116] [FIG. 4] is a view showing an input area according to an embodiment of the present invention. [FIG. 5] is a view showing a first accommodation unit according to an embodiment of the present invention. [FIG. 6] is a cross-sectional view taken along the A-A direction of [FIG. 5].

[0117] Referring to [FIG. 4], the input area P1 may include the first accommodation unit 120 in which the plurality of containers 10 is accommodated, and the first pickup module 110 that picks up any one of the plurality of containers 10 and transports it to the work area P2. In addition, the input area P1 may include the first opening and closing unit 130 connected to the work area P2.

[0118] The first pickup module 110 may be disposed on a worktable 160 to pick up the container 10 disposed in the first accommodation unit 120. A sensor 152 capable of recognizing the identification code of the container may be disposed on the lower portion of the worktable 160.

[0119] Referring to [FIG. 5] and [FIG. 6], the first accommodation unit 120 may include a transport member 122 on which the plurality of containers 10 is seated, a first driving module 128 for driving the transport member 122, a pair of side supports 123, 124 for supporting the side surface of the container 10, and an upper guide 125 for supporting the upper surface of the container 10.

[0120] The transport member 122 may be a conveyor belt extended in one

direction, but is not limited thereto, and various members capable of moving the plurality of containers 10 in one direction may be selected. The first driving module 128 may include a motor for rotating the conveyor belt.

[0121] The pair of side supports 123, 124 may stably support the side surface of the container 10. In this case, the height of the first side guide 123 and the height of the second side guide 124 may be formed to be different from each other, but the height is not necessarily limited thereto and may be formed to be the same.

[0122] According to an embodiment, since the first accommodation unit 120 stably supports both side surfaces and the upper surface of the container 10 moving along the transport member 122, it is possible to prevent the container 10 from collapsing or dislodging from its initial position during being transported.

[0123] [FIG. 7] is a view showing a state in which a container of a first accommodation unit is fixed. [FIG. 8] is a view showing a state in which a first pickup module grips a container according to an embodiment of the present invention. [FIG. 9] is a view showing the configuration of a first pickup module according to an embodiment of the present invention. [FIG. 10] is a view showing a state in which a first pickup module picks up a container according to an embodiment of the present invention.

[0124] Referring to [FIG. 7], the container 10 disposed closest to the first pickup module 110, among the plurality of the transport members 122, may be fixed by a first gripper 127 and a stopper 126. According to this configuration, when the container 10 is gripped by the first pickup module 110, it is possible to prevent the container 10 from falling over or being pushed. Referring to [FIG. 8], the pickup unit 112 of the first pickup module 110 may extend to grip the

container 10 fixed to the first gripper.

[0125] Referring to [FIG. 9] and [FIG. 10], the first pickup module 110 may include a body 111, a first driving unit 114 for moving the body 111, the pickup unit 112 for picking up the container 10, and a second driving unit 115 for moving the pickup unit 112 forward or backward.

[0126] The body 111 may have a size into which the second driving unit 115 may be inserted. The second driving unit 115 may move the pickup unit 112 forward or backward by adjusting the length of the extension unit 117. The second driving unit 115 and the extension unit 117 may include all various structures in which lengths can be adjusted.

[0127] In this case, the extension unit 117 exposed to the outside of the body 111 may be shielded from the outside by a cover 116. Accordingly, it is possible to prevent chemical fumes from penetrating into the extension unit 117 and the body 111. The cover 116 may include a plurality of cylindrical members having different diameters, but is not limited thereto. The cover 116 may be made of a material capable of blocking metal components.

[0128] The first driving unit 114 may be disposed on the lower portion of the worktable 160 of the input area P1. The first driving unit 114 may raise and lower a rotating shaft 113 connected to the body 111 and rotate the rotating shaft 113. The pickup unit 112 of the first pickup module 110 may axially rotate and is raised and lowered by the first driving unit 114, and may move forward or backward by the second driving unit 115.

[0129] [FIG. 11] is a view showing the configuration of a pickup unit according to an embodiment of the present invention. [FIG. 12] is a view showing a state in which a container is mounted on a pickup unit according to an embodiment of

the present invention.

[0130] Referring to [FIG. 11] and [FIG. 12], the pickup unit 112 may include a pair of guides 112a, 112b into which the container 10 is inserted, and a round portion 112c connected to the ends of the pair of guides 112a, 112b.

5 **[0131]** The pair of guides 112a, 112b may extend in a direction in which the container 10 is inserted to guide the insertion of the container 10, and may be formed to face each other. The round portion 112c may connect one ends of the pair of guides 112a, 112b. The pair of guides 112a, 112b and the round portion 112c may form a space 112g in which the container 10 is mounted.

10 **[0132]** The pair of guides 112a, 112b and the round portion 112c may include a protrusion 112d protruding into the space 112g and a seating groove 112e formed on the protrusion 112d. The lid 11 of the container 10 may slide along the protrusion 112d formed on the pair of guide portions 112a, 112b and then be seated in the seating groove 112e.

15 **[0133]** Since the pickup unit 112 is not a structure to grip the container 10, but a structure in which the container 10 is inserted, if there is no seating groove 112e, the container 10 may fall from the pickup unit 112 during the rotation of the first pickup module 110.

[0134] According to an embodiment, since the lid 11 of the container 10 is
20 stably inserted into the seating groove 112e, the container 10 can be stably gripped even when the first pickup module 110 rotates. However, in the case where the pickup unit 112 has a robot arm structure gripping both side surfaces of the container 10, a configuration such as the seating groove 112e may be omitted.

25 **[0135]** A side support 112f for supporting the side surface of the container 10

may be formed on the lower portion of the pickup unit 112. The side support 112f may stably support the side surface of the container 10 by having the same curvature as the outer circumferential surface of the container 10.

[0136] [FIG. 13] is a view showing a process of sensing a container. [FIG. 14a]

5 is a view showing a configuration of a sensing unit according to an embodiment of the present invention.

[0137] Referring to [FIG. 13] and [FIG. 14a], the pickup unit 112 of the first pickup module 110 can raise and lower the container while gripping the container 10 to transport the container 10 over the worktable 160. The sensor 10 152 capable of reading the identification code of the container 10 is disposed on the worktable 160, and a light-transmitting substrate may be disposed on the sensor 152.

[0138] A light source 151 may be disposed on the upper portion of the sensor 152. The light source 151 may irradiate light to the container 10 so that the 15 sensor 152 may acquire the identification information disposed on the container 10. The light source may be an LED, but is not limited thereto, and various light sources may be used. In addition, the location of the light source may be changed according to the material of the container and the characteristics of the sensor. Exemplarily, the light source 151 may be disposed on the lower portion 20 of the container. Alternatively, the light source may be omitted if necessary.

[0139] The first pickup module 110 may pick up any one of the plurality of containers 10, place it on the sensor 152, and read the identification code formed at the bottom of the container to obtain information on the container 10. Thereafter, the first pickup module 110 may transport the container 10 to the 25 work area P2.

[0140] In an embodiment, although it has been described that the identification code is placed at the bottom of the container 10, the location of the identification code is not particularly limited. When the location of the identification code is changed, the sensor 152 may also be disposed at an appropriate location to read the identification code of the container 10.

[0141] The identification code may be a one-dimensional or two-dimensional code, but is not particularly limited. Exemplarily, the identification code may be a barcode or a QR code. The information stored in the identification code may be a unique number of the container.

[0142] The controller may store the unique number of the container in a memory and output the information (a chemical name, a sampling date, an operator's unique number) of the chemical charged in the container on a work screen or transmit it to a high level PC.

[0143] [FIG. 14b] is a view showing a state in which a label is automatically attached to a container by a label output device. [FIG. 14c] is a view showing a container with a label attached thereto.

[0144] Referring to [FIG. 14b], when the operator selects the chemical to be sampled through an interface device (e.g., a computer, a work screen) connected to the sampling device, the corresponding information may be transmitted to the label output device 50. Accordingly, the label output device 50 may output a label paper 51 on which various information (a unique number of the container, a type of chemical to be charged in the container, a sampling date, and an unique number of the operator who requests for sampling) is written.

[0145] The printed label paper 51 may be automatically attached to the container 10. Therefore, the operator can easily check the information on the

sampling container 10, so that the risk of confusing the container 10 can be prevented.

[0146] A method for attaching the label paper 51 to the container 10 is not particularly limited. The label paper 51 may be output in the path along which the container 10 moves and may be attached to the container 10. Alternatively, a separate robot arm may be installed to attach the label paper 51 to the container 10. In addition, a known method and configuration of attaching a label can be employed without limitation.

[0147] The label output device 50 may be disposed in the input area P1 or may be discharged to the discharge area P3. Accordingly, the label paper 51 may be pre-attached in the input area and then sampled, or the label paper 51 may be attached in the discharge area after sampling is completed.

[0148] [FIG. 15] is a view showing a state in which a first pickup module rotates according to an embodiment of the present invention. [FIG. 16a] to [FIG. 16c] are views showing a state in which a first door is opened and closed by a first opening and closing unit according to an embodiment of the present invention. [FIG. 17] is a view showing a state in which a first pickup module transports a container to a work area according to an embodiment of the present invention. [FIG. 18] is a partially enlarged view of [FIG. 17].

[0149] Referring to [FIG. 15], the first pickup module 110 may rotate to move the container 10 in the direction of the work area P2, and the first opening and closing unit 130 may open the first door 131. Accordingly, the first pickup module 110 may transport the container 10 to the work area P2 through the first door 131. In this case, as described above, since the container 10 is inserted into the seating groove 112e of the pickup unit 112, it can be stably supported.

[0150] Referring to [FIG. 16a] to [FIG. 16c], the first opening and closing unit 130 may include a first door 131 disposed on the first partition wall 43, a first blocking plate 132 coupled to the first door 131, and a door driving unit 133 for moving the first blocking plate 132.

5 **[0151]** The first door 131 may include a first inclined surface SF1, and the first blocking plate 132 may include a second inclined surface SF2 that is coupled to the first inclined surface SF1 to seal the first door 131. A sealing pad 132a may be disposed on the second inclined surface SF2 of the first blocking plate 132. Accordingly, the first blocking plate 132 may slide to be in close contact with the
10 first inclined surface SF1 of the first door 131.

[0152] If the first blocking plate 132 and the first door 131 are flat, a gap may be generated between the first blocking plate 132 and the first door 131 even when the first blocking plate 132 slides. However, according to an embodiment, since the first blocking plate 132 and the first door 131 have inclined surfaces,
15 the first blocking plate 132 may be in closer contact with the first door 131 as the first blocking plate 132 slides toward the first door 131. Accordingly, the adhesion between the first blocking plate 132 and the first door 131 is increased to prevent the fume in the work area P2 from being diffused into the input area P1.

20 **[0153]** The configuration in which the first opening and closing unit 130 shields the first door 131 proceeds in the order of [FIG. 16c], [FIG. 16b], and [FIG. 16a], and the configuration in which the first opening and closing unit 130 opens the door may be performed in the reverse order. In this case, the controller may open the first door 131 only when there is no abnormality as a
25 result of detecting the fume in the input area P1 and/or the work area P2.

[0154] Referring to [FIG. 17] and [FIG. 18], the first pickup module 110 may mount the container 10 on a transport unit 20 disposed inside the work area P2. The transport unit 20 may be disposed on a rail to move the container 10 within the working area P2.

5 **[0155]** [FIG. 19] is a perspective view showing a lid detachable unit and a chemical charging unit according to an embodiment of the present invention. [FIG. 20] is a front view showing a lid detachable unit and a chemical charging unit according to an embodiment of the present invention. [FIG. 21] is a view showing a lid detachable unit according to an embodiment of the present invention.

10 **[0156]** Referring to [FIG. 19] and [FIG. 20], the working area P2 may include a lid detachable unit 200, a chemical charging unit 300, and a rail 30 for moving the transport unit 20. The transport unit 20 in which the container 10 is accommodated may move along the rail 30 in the direction of the chemical charging unit 300 or in the reverse direction thereof from the lid detachable unit
15 200.

[0157] The lid detachable unit 200 may serve to separate the lid 11 coupled to the container 10 or refasten the lid 11 to the container 10. The chemical charging unit 300 may serve to charge the container 10 with chemicals.

[0158] In an embodiment, although it is illustrated that the lid detachable unit
20 200 is disposed closer to the input area P1, the present invention is not limited thereto. For example, the chemical charging unit 300 may be disposed closer to the input region P1.

[0159] Referring to [FIG. 21], the lid detachable unit 200 may be disposed on the upper portion of the container 10, and first and second side supports 280,
25 290 may be disposed on the side surface of the container 10.

[0160] The first and second side supports 280, 290 may play a fixing role so that the container 10 does not rotate together when the lid detachable unit 200 rotates the lid 11 to separate the lid 11 from the container 10. The first and second side supports 280, 290 may include supports 281, 291 for supporting the side surface of the container and driving units 282, 292 for pressing the supports 281, 291 to the container 10.

[0161] The lid detachable unit 200 may be lowered and rotate the lid 11 to separate it from the container 10, or may be lowered while gripping the lid 11 to couple the lid 11 to the container 10.

[0162] [FIG. 22] is a cross-sectional view of a lid detachable unit according to an embodiment of the present invention.

[0163] Referring to [FIG. 22], the lid detachable unit 200 may include a gripping unit 210 to be coupled to the lid, a rotation unit 220 rotating the gripping unit 210, and a lifting unit 230 lifting the gripping unit 210.

[0164] The gripping unit 210 may grip the lid, and for this purpose, it may further include a plurality of grippers 212, a frame 213, and a plate member 218.

[0165] The plurality of grippers 212 may be rotatably coupled to the frame 213 to support the side surface of the lid.

[0166] The frame 213 is connected to a piston 217 to move in the vertical direction, that is, in the Z direction. The frame 213 and the plurality of grippers 212 may be connected by a connection link (not shown). A vertical linear motion of the frame 213 may be converted into a rotational motion of the gripper 212 by the connection link (not shown).

[0167] Accordingly, when the frame 213 is raised, the plurality of grippers 212 is opened and separated from the lid, and when the frame 213 is lowered, the

plurality of grippers 212 comes close to each other to grip the lid. However, the present invention is not limited thereto, and the plurality of grippers 212 may be designed to approach each other when the frame 213 is lowered, and the plurality of grippers 212 may be designed to move away from each other when
5 the frame 213 is raised.

[0168] The plate member 218 may be disposed on the lower portion of the frame 213 and coupled to be movable up and down. The plate member 218 may include an elastic member. For example, the elastic member may be a spring, but is not necessarily limited thereto, and the elastic member may use a magnet.

10 **[0169]** The lower surface of the plate member 218 may be disposed to face the upper surface of the lid gripped by the plurality of grippers 212. Therefore, it is possible to suppress damage due to collision with the container or the lid when the gripping unit 210 is raised and lowered, and even if the container is in a partially inclined state, it can be converted to an upright state.

15 **[0170]** The frame lifting unit for raising and lowering the frame 213 may include a cylinder 216 and a piston 217. The piston 217 is disposed in the inner space C1 of the cylinder 216 and can move up and down according to the inflow of fluid.

[0171] The piston 217 may include a first rod 217a extending upwardly into
20 which the fluid is injected, and a second rod 217b extending downwardly connected to the frame 213.

[0172] A cylinder holder 240 may be provided with fluid ports 241, 342 for injecting the fluid into the inner space C1 of the cylinder 216. In addition, fluid passages 217a-1, 317a-2 connected to the fluid ports 241, 342 of the cylinder
25 holder 240 may be formed in the first rod 217a.

[0173] Exemplarily, when the fluid is injected into the first fluid passage 217a-1, the fluid is discharged into the lower space R1 of the piston 217, so that the piston 217 is raised. Conversely, when the fluid is injected into the second fluid passage 217a-2, the fluid is injected into the upper space R2 of the piston 217, so that the piston 217 is lowered. With this configuration, the gripper 212 can be driven by raising or lowering the piston 217.

[0174] However, the configuration for raising or lowering the piston 217 is not necessarily limited thereto and may be variously modified. For example, it may be configured as a motor. In addition, a structure for gripping the lid using the gripper 212 may be variously modified.

[0175] The cylinder 216 may be coupled to the rotation shaft of the rotation unit 220 to rotate. The cylinder holder 240 may support the rotating cylinder 216. A first fastening member 243 and a second fastening member 233 may fix the cylinder holder 240 to the connection frame 232. The end of the cylinder 216 may protrude from the cylinder holder 240 and be connected to a buffer unit 250.

[0176] The buffer unit 250 may include a buffer housing 251 having a space C3 formed on one side thereof, a buffer cover 254 covering one side of the buffer housing 251, a motion member 252 disposed inside the space C3, and an elastic member 253 disposed between the motion member 252 and the buffer cover 254.

[0177] The buffer housing 251 may include the space C3 into which the motion member 252 is inserted. The motion member 252 may be slid up and down inside the space C3 by the buffer cover 254. One end of the elastic member 253 may be fixed to the buffer cover 254.

[0178] Since the end of the cylinder 216 is connected to the motion member

252, the motion member 252 may be lowered by the weight of the gripping unit 210. Accordingly, since the elastic member 253 is pressed by the motion member 252, it may have an elastic force in the upwardly lifting direction. Accordingly, the weight applied to the container by the gripping unit 210 by the
5 elastic member 253 may be reduced. As a result, when the lid is gradually raised while being separated from the container, the gripping unit 210 may be raised by the lifting force of the lid.

[0179] In addition, the gripping unit 210 may be lowered while the lid is fastened to the container. However, the structure of the buffer unit 250 is not
10 limited thereto, and various buffer structures capable of controlling the weight of the gripping unit 210 may be used.

[0180] The buffer housing 251 may include a protrusion 255 protruding from the other side and connected to the rotating unit 220. The protrusion 255 may be connected to the rotation shaft of the rotation unit 220 by the connection module
15 221.

[0181] The cylinder 216 of the gripping unit 210 may be fixed to the motion member 252. Accordingly, when the rotation unit 220 rotates, the buffer unit 250 and the gripping unit 210 may rotate together.

[0182] However, the configuration of the lid detachable unit is not necessarily
20 limited thereto, and various mechanical structures capable of separating the lid from the container by rotating after gripping the lid of the container may be used without limitation.

[0183] [FIG. 23] is a view showing a state in which a fixing module of a lid detachable unit is fixed to a side of a container according to an embodiment of
25 the present invention. [FIG. 24] is a view showing a state in which a lid

detachable unit separates a lid of a container according to an embodiment of the present invention. [FIG. 25] is a view showing a state in which a container with a lid removed moves to a chemical charging unit.

[0184] Referring to [FIG. 23] and [FIG. 24], in a state in which the first and second side supports 280, 290 fix the side surface of the container 10, the lid detachable unit 200 is lowered, so that the gripping unit 210 may grip the lid 11. Thereafter, the lid 11 may be separated from the container 10 while the gripping unit 210 rotates.

[0185] Referring to [FIG. 25], the lid detachable unit 200 is raised while gripping the separated lid 11 as it is, and the first and second side supports 280, 290 may retract laterally. Thereafter, the transport unit 20 may move along the rail 30 and be disposed on the lower portion of the chemical charging unit 300.

[0186] [FIG. 26] is a perspective view of the chemical charging unit 300 according to an embodiment of the present invention. [FIG. 27] is a front view of [FIG. 26].

[0187] Referring to [FIG. 26] and [FIG. 27], the chemical charging unit 300 may include a drain module 340 from which residual chemicals remaining in the plurality of sampling lines L1, L2 are discharged, and a plurality of sampling driving modules 310 moving the plurality of sampling lines L1, L2.

[0188] The chemical charging unit 300 may discharge the residual chemicals remaining in the sampling lines L1, L2 before the container 10 is charged with chemicals. The chemicals remaining in the sampling lines L1, L2 are highly likely to stagnate after a certain period of time to generate deposits or to be contaminated through an open outlet. In addition, the residual chemicals remaining in the sampling lines L1, L2 may affect the analysis of the chemical

that is newly charged for sampling. Therefore, by sufficiently discharging the chemicals remaining in the pipe and the sampling lines L1, L2 before sampling, it is possible to accurately analyze the chemical contamination level and components in the tank.

5 **[0189]** The number of the sampling lines L1, L2 and the number of the sampling driving module 310 are not particularly limited. The sampling lines L1, L2 and the sampling driving module 310 may be one or two or more. Hereinafter, as an example, a case in which the sampling lines L1, L2 and the sampling driving module 310 are two will be described.

10 **[0190]** The sampling driving module 310 may be respectively disposed for each sampling line L1, L2, and each sampling driving module 310 may independently drive the connected sampling lines L1, L2.

15 **[0191]** Exemplarily, a first sampling driving module 320 may independently move the first sampling lines L1, L2, and a second sampling driving module 330 may independently move the second sampling lines L1, L2.

20 **[0192]** In the case of a structure in which all sampling lines move to the drain module to discharge the chemicals remaining in one sampling line, the remaining sampling lines may be contaminated by the discharged chemicals.

25 **[0193]** However, according to an embodiment, only the sampling line requiring sampling moves to the drain module 340 to discharge the residual chemicals, thereby preventing contamination of the remaining sampling lines. If one sampling line is being performed, only one sampling line may discharge the residual chemicals, and if three sampling lines are being performed, three sampling lines may discharge the residual chemicals.

30 **[0194]** [FIG. 28a] to [FIG. 28d] are views showing a process of charging a

container with chemicals after discharging the chemicals remaining in a sampling nozzle.

[0195] Hereinafter, the second sampling line L2 and the second sampling driving module 330 will be described as a reference, but the remaining sampling lines and the remaining sampling driving modules may have the same configuration.

[0196] Referring to [FIG. 28a], the sampling driving module 330 may include horizontal movement modules 331, 332 disposed on a fixed plate 311 and vertical movement modules 333, 334 disposed on the horizontal movement modules 331, 332.

[0197] The horizontal movement modules 331, 332 may include a base 331 disposed on the fixing plate 311 and a first sliding unit 332 moving in the horizontal direction on the base 331. However, the present invention is not limited thereto, and various structures capable of moving the sampling line in the horizontal direction may be used.

[0198] The vertical movement modules 333, 334 may include a support frame 333 disposed on the first sliding unit 332, and a second sliding unit 334 to drive the support frame 333 up and down. A holder 335 for fixing the sampling line may be connected to the second sliding unit 334. However, the present invention is not limited thereto, and various structures capable of moving the sampling line in a vertical direction may be used. Exemplarily, an integrated driving module capable of moving simultaneously in a vertical direction and a horizontal direction is also possible, and a tilting module capable of tilting the sampling line may be further added.

[0199] A sealing unit 350 may be disposed at an end of the sampling line L2.

The sealing unit 350 may include an elastic member 351 made of an elastic material such as rubber on the bottom surface thereof. Accordingly, when the end of the sampling line L2 is inserted into the drain module 340, the sealing unit 350 is in close contact with the drain module 340 to prevent the residual chemicals from scattering. The elastic member 351 may be an O-ring or a quad ring, but is not limited thereto.

[0200] Referring to [FIG. 28b], when the discharge of residual chemicals is completed, the vertical movement modules 333, 334 of the sampling driving module raise the sampling line L2 to separate the end of the sampling line L2 from the drain module 340.

[0201] Referring to [FIG. 28c], the horizontal movement modules 331, 332 of the sampling driving module may move the sampling line L2 to the upper portion of the container 10 disposed adjacent to the drain module 340. According to an embodiment, the transport unit 20 that has moved to the chemical charging unit 300 along the rail 30 may be disposed adjacent to the drain module 340. Accordingly, the movement distance of the sampling line L2 may be minimized.

[0202] Referring to [FIG. 28d], the vertical movement modules 333, 334 may lower the sampling line L2 to insert the sampling line L2 into the container 10. In this case, the sealing unit 350 may be in close contact with the container 10 to prevent scattering of the chemicals. However, the present invention is not necessarily limited thereto, and the vertical movement modules 333, 334 may lower the sampling line L2 only until the sampling line L2 is inserted into the container 10, and instead of the sampling line L2 being lowered, the container 10 may be raised.

[0203] According to an embodiment, the height of the upper end of the

container 10 and the height of the upper end of the drain module 340 may be arranged to be similar (or identical). Accordingly, the vertical movement distance of the sampling line L2 may be minimized.

[0204] [FIG. 29a] is a view showing a drain module according to an embodiment of the present invention. [FIG. 29a] is a view showing a state in which an end of a sampling line is washed. [FIG. 30] is a view showing a pipe system connected to a drain module. [FIG. 31] is a view showing a state in which chemicals are charged in a container.

[0205] Referring to [FIG. 29a] and [FIG. 29b], the drain module 340 may include a plurality of outlets 343 corresponding to the plurality of sampling lines L2, and the plurality of outlets 343 may be separated from each other by a blocking wall 345. Accordingly, the first chemical discharged from the first sampling line L2 may be discharged only through a first discharge port 343a and a second discharge port 343b may not be contaminated with the first chemical.

Chemicals are toxic chemicals, so even a small amount of exposure can easily contaminate the surroundings. For accurate inspection of sampled chemicals, it may be important to avoid contamination as much as possible within the sampling device.

[0206] According to an embodiment, even when the first chemical is discharged from the first sampling line L1 and the second chemical is discharged from the second sampling line L2, the first discharge port 343a and the second discharge port 343b may be separated by the blocking wall 345, so it may not affect different sampling lines.

[0207] Chemical discharge lines 351a, 351b, washing water supply lines 354a, 354b, and nitrogen supply lines 352a, 352b may be respectively connected to

the outlet 343 of the drain module 340. That is, the first chemical discharge line 351a, the first washing water supply line 354a, and the first nitrogen supply line 352a may be connected to the first outlet 343a, respectively. The second chemical discharge line 351b, the second washing water supply line 354b, and
5 the second nitrogen supply line 352b may be connected to the second outlet 343b, respectively.

[0208] Each of the outlets 343a, 343b and the chemical discharge lines 351a, 351b may be washed with washing water after the chemicals are discharged and may be independently dried with nitrogen gas.

10 **[0209]** In this case, the washing water supply lines 354a, 354b may spray the washing water at a position where the end LEP1 of the sampling line L2 is inserted into the drain module 340. Accordingly, the end LEP1 of the sampling line L2 may be washed by the washing water, and at the same time, the inside of the drain module 340 may also be washed. Also, the sampling line L2 and the
15 drain module 340 may be dried by nitrogen gas. Accordingly, the contamination of the chemical charging unit may be minimized. In addition, even when washing water and nitrogen gas are sprayed to each outlet 343, they are separated from each other by the partition wall, so that the adjacent outlet 343 can be prevented from being contaminated.

20 **[0210]** A top plate 341 may be disposed on the drain module 340. Accordingly, it is possible to prevent the chemicals from scattering and contamination of the surroundings when the residual chemicals are discharged.

[0211] Injection holes 341a, 341b into which the end of the sampling line can be inserted may be formed in the upper plate 341. The injection holes 341a,
25 341b may be disposed adjacent to the washing water supply lines 354a, 354b

so that the end LEP1 of the sampling line L2 can be washed with the washing water when the sampling line L2 is inserted.

[0212] In the drain module 340 according to an embodiment, since the outlet 343 is independently divided according to the number of sampling lines, the reliability of chemical analysis can be improved by fundamentally preventing the sampling line from being contaminated by other chemicals.

[0213] Referring to [FIG. 30], the plurality of sampling lines, the washing water supply line, and the nitrogen supply line may be connected to the drain module. As described above, it is illustrated that the second sampling line L2 is connected to the second outlet of the drain module 340 by way of example.

[0214] The sampling line L2 may be connected to a pipe L100 of a chemical tank. In this case, a bypass line L21 may be connected between the sampling line L2 and the pipe L100. Therefore, when the chemicals are discharged from the pipe L100 of the chemical tank in order to discharge the chemicals remaining in the pipe L100 and the sampling line L2, some of the chemicals may be discharged to the sampling line L2 and the rest of the chemicals may be discharged to the bypass line L21.

[0215] A diameter of the bypass line L21 may be greater than a diameter of the sampling line L2. Exemplarily, when the diameter of the pipe L100 of the chemical tank is 100 %, the diameter of the sampling line L2 may be 50 % of the diameter of the pipe L100 of the chemical tank, the diameter of the bypass line L21 may be the same as the diameter of the pipe L100 of the chemical tank. However, the present invention is not limited thereto, and the diameter of the sampling line L2 and the diameter of the bypass line L21 may be different from this. Exemplarily, the diameter of the sampling line L2 may be 20 % or 60 % of

the diameter of the pipe L100 of the chemical tank.

[0216] The sampling line may have a relatively small diameter. If the diameter of the sampling line is too large, the amount of chemicals discharged increases, so it may be difficult to inject a quantification into the container. In addition, since
5 the discharge amount of the chemical is increased, the chemical may be scattered around the container and the surroundings may be easily contaminated. In addition, the chemicals may adhere to the outer surface of the container.

[0217] Therefore, the sampling line needs to discharge the chemicals into the
10 container at low pressure to minimize external influences. The controller may control a regulator VB1 of the sampling line L2 to lower the pressure discharged into the container.

[0218] However, in order to accurately analyze the chemical contamination level in the chemical tank, it is necessary to discharge the chemicals remaining
15 in the pipe to the outside before sampling. However, there is a problem in that it takes a long time to discharge all the chemicals remaining in the pipe L100 of the chemical tank only with the sampling line L2 having a small diameter. In addition, if the flow rate of the chemicals is slow, the residual chemicals may not be sufficiently discharged.

[0219] Therefore, by separately forming the bypass line L21 having a
20 diameter approximately equal to the diameter of the pipe L100 of the chemical tank, it is possible to quickly discharge most of the residual chemicals to the outside. In this case, the dilution water discharged from a dilution water supply line 355 may be mixed and discharged to the outside. The dilution water may be
25 neutral water, but is not necessarily limited thereto, and may be the same DI

water as the washing water.

[0220] When all of the chemicals remaining in the pipe 100 and the sampling line L2 are discharged, the washing water is sprayed into the washing water spray line 352b to wash the outlet from which the residual chemicals are discharged. Thereafter, nitrogen may be sprayed to the outlet through the nitrogen supply line 354b to be dried. Thereafter, the chemicals may be charged in the container 10 by moving the sampling line L2.

[0221] Referring to [FIG. 31], the transport unit 20 may include a plurality of fixing jaws 23 for fixing the container 10, a contamination detection unit 22 for sensing chemicals, and a slider 21 moving along the rail 30. The contamination detection unit 22 is manufactured in a band shape and may include various sensors capable of detecting when the chemical SC is exposed on the outer surface of the container 10.

[0222] For example, when chemicals leak from the outer surface of the container 10 and come into contact with the contamination detection unit 22, the detection signal of the contamination detection unit 22 may be transmitted to the controller. In this case, the controller may stop the sampling process and transmit a warning signal to the outside.

[0223] [FIG. 32] is a view showing a state in which a container is rearranged on the lower portion of a lid detachable unit. [FIG. 33] is a view showing a state in which a lid is coupled to a container. [FIG. 34] is a view showing a state in which a container to which a lid is coupled is separated from a work area.

[0224] Referring to [FIG. 32], the transport unit 20 may transport the chemical-charged container 10 back to the lower portion of the lid detachable unit 200.

Referring to [FIG. 33], the gripping unit of the lid detachable unit 200 is lowered

in a state of gripping the lid 11 and then rotates (or rotates while being lowered) to fasten the lid 11 to the container 10 again. Thereafter, as shown in [FIG. 34], the transport unit 20 may transport the container 10 to an area adjacent to the discharge area P3.

5 **[0225]** [FIG. 35] is a view showing a discharge area according to an embodiment of the present invention. [FIG. 36] is a view showing a state in which a second pickup module rotates to pick up a container disposed in a work area according to an embodiment of the present invention. [FIG. 37] is a view showing a state in which a container is mounted on a pickup unit of a second
10 pickup module according to an embodiment of the present invention. [FIG. 38] is a view showing a state in which a second pickup module lifts a container to separate the container from a transport unit according to an embodiment of the present invention.

[0226] Referring to [FIG. 35], the discharge area P3 may include a second
15 accommodation unit 420 in which the plurality of containers 10 is accommodated, the second pickup module 410 that picks up the container 10 disposed in the work area P2 and transport it to the second accommodation unit 420, and the second opening and closing unit 430.

[0227] The second pickup module 410 may include substantially the same
20 structure as that of the first pickup module 110. The second pickup module 410 may include a body, a first driving unit that rotates the body, a pickup unit that picks up the container, and a second driving unit that moves the pickup unit, as shown in [FIG. 9].

[0228] The structure of the second accommodating unit 420 may be the same
25 as that of the first accommodating unit 120. The second accommodating unit

420 may include a transport member 422 on which the plurality of containers 10 is seated, a pair of side supports for supporting the side surface of the container 10, and an upper guide for supporting the upper surface of the container 10.

[0229] The structure of the second opening and closing unit 430 may be substantially the same as that of the first opening and closing unit 130. The second opening and closing unit 430 may include a second door 431 disposed on the second partition wall 44, a second blocking plate 432 coupled to the second door 431, and a door driving unit moving the second blocking plate 432. In this case, the second door 431 and the second blocking plate 432 may have inclined surfaces.

[0230] Referring to [FIG. 36] and [FIG. 37], the pickup unit 412 of the second pickup module 410 rotates toward the second door 431 and then extends to pass through the second door 431. The pickup unit 412 passing through the second door 431 may grip the container 10 disposed on the transport unit 20. Thereafter, the pickup unit 412 may be raised to separate the container 10 from the transport unit 20, and then transport the container 10 to the discharge area P3.

[0231] In this case, the controller may open the second door 431 only when there is no abnormality as a result of detecting fume in the work area P2 and the discharge area P3.

[0232] [FIG. 39] is a view showing a state in which a second pickup module rotates toward a second accommodation unit according to an embodiment of the present invention. [FIG. 40] is a view showing a state in which a second pickup module transports the container to the second accommodation unit according to an embodiment of the present invention. [FIG. 41] is a view showing a state in

which a second pickup module returns to its original location according to an embodiment of the present invention. [FIG. 42] is a view showing a state in which a container is accommodated in a second accommodation unit. [FIG. 43] is a view showing a state in which an upper guide is raised so that an operator
5 can collect a container.

[0233] Referring to [FIG. 39] and [FIG. 40], the second pickup module 410 rotates toward the second accommodation unit 420 and then extends the pickup unit 412 again to place the container 10 on the transport member 422 of the second accommodation unit 420. Referring to [FIG. 41], the pickup unit 412 may
10 be contracted and separated from the second accommodation unit 420.

[0234] Referring to [FIG. 42], the container 10 may be safely accommodated in the second accommodation unit 420 by the pair of side supports 423, 424 for supporting the side surface of the container 10 and the upper guide 425 for supporting the upper surface of the container 10.

[0235] Referring to [FIG. 43], before the operator collects the container 10, the upper guide 425 may be raised to facilitate the collection of the container 10. The operator may open the second window and take out the container 10 accommodated in the second accommodation unit 420.
15

[0236] In the above, the embodiment has been mainly described, but this is
20 only an example and does not limit the present invention, and those of ordinary skill in the art to which the present invention pertains will appreciate that various modifications and applications not illustrated above are possible without departing from the essential characteristics of the present embodiment. For example, each component specifically shown in the embodiment can be
25 implemented by modification. Further, differences related to such modifications

and applications should be construed as being included in the scope of the present invention defined in the appended claims.

CLAIMS:

[Claim 1]. A chemical sampling device, comprising:

a lid detachable unit that separates a lid of a container; and

a chemical charging unit that charges chemicals in the container,

5 wherein the chemical charging unit comprises:

a drain module from which residual chemicals remaining in a plurality of sampling lines is discharged; and

a plurality of sampling driving modules each independently moving the plurality of sampling lines,

10 wherein the plurality of sampling driving modules moves the plurality of sampling lines to an upper portion of the drain module or the container.

[Claim 2]. The chemical sampling device according to claim 1, wherein among the plurality of sampling driving modules, only the sampling driving
15 module coupled to the sampling line on which sampling is to be performed is selectively driven to move the sampling line from the drain module to the upper portion of the container, and the remaining sampling driving modules do not operate.

20 [Claim 3]. The chemical sampling device according to claim 1, wherein the plurality of sampling driving modules comprises a horizontal movement module that horizontally moves the sampling lines from the upper portion of the drain module to the upper portion of the container.

25 [Claim 4]. The chemical sampling device according to claim 1, wherein

the plurality of sampling driving modules comprises a vertical movement module that vertically moves the sampling lines.

[Claim 5]. The chemical sampling device according to claim 1, wherein
5 the drain module comprises a plurality of outlets respectively corresponding to the plurality of sampling lines.

[Claim 6]. The chemical sampling device according to claim 5, wherein
the plurality of outlets is each independently partitioned by a blocking wall
10 formed in the drain module.

[Claim 7]. The chemical sampling device according to claim 4, wherein
the drain module comprises a plurality of chemical discharge lines individually
connected to the plurality of outlets,
15 the chemicals each discharged to the plurality of outlets are individually
discharged to an outside through the plurality of chemical discharge lines.

[Claim 8]. The chemical sampling device according to claim 7, wherein
the drain module comprises a plurality of washing water supply lines and a
20 plurality of gas supply lines individually connected to the plurality of outlets,
the plurality of outlets or the sampling lines are each independently
washed and dried.

[Claim 9]. The chemical sampling device according to claim 1, wherein
25 the plurality of sampling lines is respectively connected to a pipe of a chemical

tank in which the chemicals to be sampled is stored,

a bypass line that discharges the chemicals by bypassing the drain module is formed between the pipe of the chemical tank and the sampling lines.

5 [Claim 10]. The chemical sampling device according to claim 9, wherein a diameter of the sampling lines is smaller than a diameter of the bypass line.

[Claim 11]. The chemical sampling device according to claim 1, wherein the chemical charging unit comprises:

10 a transport unit that moves the container; and
 a rail on which the transport unit slides,
 wherein the transport unit stops at a lower portion of the sampling line on which sampling is to be performed among the plurality of sampling lines,
 an upper end of the container disposed on the lower portion of the
15 sampling line on which the sampling is to be performed has a height corresponding to a height of an upper end of the drain.

[Claim 12]. A chemical sampling device, comprising:

 a lid detachable unit that separates a lid of a container; and
20 a chemical charging unit that charges chemicals in the container,
 wherein the chemical charging unit comprises:
 a drain module through which residual chemicals remaining in a sampling
line are discharged; and
 a sampling driving module that moves the sampling line,
25 wherein the sampling driving module moves the sampling line to an upper

portion of the drain module or the container.