

[DESCRIPTION]

[Invention Title]

DEVICE AND METHOD FOR AUTOMATICALLY TRANSFERRING CHEMICAL CONTAINER

5 [Technical Field]

The present invention relates to an apparatus and method for automatically transferring a chemical container, and more particularly, to an apparatus and method for automatically transferring a chemical container, using which a time taken for introducing the chemical container into a chemical supply device is reduced.

10 [Background Art]

Generally, various types of chemicals are used in companies that manufacture semiconductors, semiconductor devices, liquid crystal devices (LCDs), and organic light-emitting diodes (OLEDs) and all companies that use hazardous chemicals, such as pharmaceutical companies, paint companies, etc., and methods of safely supplying
15 such chemicals are also being diversified.

Such chemicals are often supplied in large quantities by tank lorry vehicles and are also contained in small quantities in various containers of 20 to 1,000 ℓ and supplied depending on chemicals, usage, and process characteristics.

The chemical containers are generally shipped from the chemical
20 manufacturing factory in a state of being packaged in a bundle on a pallet that can be moved by a forklift, a hand lift, or the like. When the chemical containers are unloaded with a forklift at an entrance of the factory that uses chemicals, an operator uses a hand lift to bring the chemical containers into the building.

Thereafter, the operator wears protective equipment such as chemical
25 protective clothing, a gas mask, and the like and transfers and loads chemical

containers, of which the number is acceptable in a cart, that can be placed on the cart that can be mounted on a chemical supply device.

Thereafter, a door of the chemical supply device is opened and the cart with the chemical containers is mounted on the chemical supply device. In this case, only the chemical containers may be placed by providing rollers on an upper part of the cart and on a bottom of the inside of the chemical supply device, or the chemical containers may be mounted on the outside of the chemical supply device instead of the inside thereof.

Thereafter, a coupler with a nozzle is connected to a chemical inlet/outlet of the chemical container inside the chemical supply device. When the connection of the coupler is completed, a chemical transfer pump is driven to transfer a chemical in the chemical container to a chemical consuming device. In this case, nitrogen gas may be injected into the chemical container to transfer the chemical to the chemical consuming device at a set pressure. The chemical container, which is empty by fully using the chemical through the above process, is unloaded in the reverse order of the above.

In such a conventional method of transferring the chemical container, the operator manually transfers the container containing the chemical to the chemical supply device by hand using a hand lift, a cart, or the like. Therefore, there is a problem in that, when such a conventional method of transferring the chemical container is used, the safety of the operator is threatened.

As the related art for solving the above problems, Korean Patent Registration No. 10-1947450 has been disclosed.

According to the apparatus for automatically transferring the chemical container according to the related art, there is a problem in that a time taken for

discharging an empty chemical container fully used by a chemical supply device and introducing a new chemical container stored in an arbitrary storage place into the chemical supply device is increased.

[Disclosure]

5 [Technical Problem]

The present invention is directed to solving the above-described problems and providing an apparatus and method for automatically transferring a chemical container, using which a time taken for replacing an empty chemical container of a chemical supply device with a new chemical container is reduced.

10 The present invention is also directed to providing an apparatus and method for automatically transferring a chemical container, using which an area occupied by the apparatus for automatically transferring the chemical container is minimized.

[Technical Solution]

One aspect of the present invention provides an apparatus for automatically
15 transferring a chemical container, comprising: a chemical supply device in which a first chemical container is accommodated; a standby unit configured such that a second chemical container temporarily stands by; a shelter configured such that the first chemical container is discharged from the chemical supply device and sheltered; an entrance unit configured to serve as a path along which the first chemical
20 container is discharged and as a path along which the second chemical container is introduced; and a control unit configured to control transfer of the first chemical container and the second chemical container at each of the standby unit, the shelter, and the entrance unit.

The apparatus may be comprising at least one transfer line configured to
25 transfer the second chemical container to the chemical supply device,

wherein the standby unit is provided between the transfer line and the chemical supply device, the shelter is connected to one side of the entrance unit, and the standby unit is connected to another side of the entrance unit.

5 The standby unit may be provided between the transfer line and the chemical supply device.

The chemical supply device, the entrance unit, and the shelter may be provided on a straight path; and the standby unit is connected to the entrance unit and provided perpendicular to the shelter with respect to the entrance unit.

10 The entrance unit may include a first transfer member for transferring the chemical container from the entrance unit toward the shelter, and a second transfer member for transferring the chemical container from the standby unit toward the entrance unit; and a transfer direction of the first transfer member and a transfer direction of the second transfer member are perpendicular to each other.

15 The apparatus may be further comprising: a transfer vehicle rail provided parallel to at least a portion of the transfer line; and a transfer vehicle which is linearly moved along the transfer vehicle rail and transfers the chemical container from the transfer line to the chemical supply device at an input position adjacent to the standby unit or transfers the chemical container from the chemical supply device to the transfer line at a discharge position spaced apart from the input position along
20 the transfer vehicle rail.

The control unit may receive information on a chemical of the chemical container transferred along the transfer line and, when the received information on the chemical matches information required by the chemical supply device, controls the chemical container to be supplied to the chemical supply device.

The chemical supply device may be provided as a pair of chemical supply devices of which entrances face each other; the entrance unit is provided as a pair of entrance units near the entrances of the pair of chemical supply devices; the standby unit is provided as a pair of standby units to each be adjacent to a corresponding one of the pair of entrance units; and each of the pair of entrance units functions as a shelter in which the first chemical container discharged from the chemical supply device on the other side is sheltered.

The standby unit may be provided at a position on a line perpendicular to a straight path formed by connecting the entrance of the chemical supply device and the entrance unit.

The standby unit may serve as a path along which the first chemical container is discharged.

The standby unit and the shelter may be provided at both sides of the entrance unit.

A first transfer vehicle, which is linearly moved along a first transfer vehicle rail provided at an opposite side of the entrance unit with respect to the standby unit, may be provided; a second transfer vehicle, which is linearly moved along a second transfer vehicle rail provided at the opposite side of the entrance unit with respect to the shelter, may be provided; the second chemical container loaded on the first transfer vehicle may pass the standby unit and is introduced into the chemical supply device through the entrance unit; and the first chemical container placed inside the chemical supply device may pass the entrance unit and the shelter, is transferred to the second transfer vehicle, and then is discharged outward through the transfer line.

One aspect of the present invention provides a method of automatically transferring a chemical container, the method comprising: operation a) of discharging

a first chemical container fully used by a chemical supply device to an entrance unit located near an entrance of the chemical supply device; operation b) of transferring the first chemical container of the entrance unit to a shelter; and operation c) of passing a second chemical container, which is a new chemical container and stands
5 by in a standby unit, through the entrance unit and introducing the second chemical container into the chemical supply device.

The shelter may be connected to one side of the entrance unit; and in operation c), the second chemical container is transferred along at least one transfer line and then stands by in the standby unit connected to another side of the entrance
10 unit.

The method may further comprising operation d) of transferring the first chemical container sheltered in the shelter to the transfer line.

In the operation d), the first chemical container may sequentially pass the shelter, the entrance unit, and the standby unit and then is transferred to the transfer
15 line.

The first chemical container may be loaded on a transfer vehicle linearly moved along a transfer vehicle rail provided parallel to at least a portion of the transfer line, and then is discharged outward along the transfer line.

[Advantageous Effects]

20 According to the present invention, by providing a standby unit for standing by a new chemical container to be introduced into a chemical supply device and providing a shelter for temporarily sheltering an empty chemical container discharged after a chemical is fully used by the chemical supply device, a time taken for replacing the empty chemical container of the chemical supply device with the
25 new chemical container can be minimized.

Further, the standby unit and the shelter are provided at positions perpendicular to each other with respect to an entrance unit which is provided near the entrance of the chemical supply device and serves as a transfer path of the chemical container, and thus an area occupied by an apparatus for automatically transferring a chemical container can be minimized.

[Description of Drawings]

FIG. 1 is a perspective view illustrating an apparatus for automatically transferring a chemical container according to an embodiment of the present invention.

FIG. 2 is a perspective view illustrating a standby unit and a shelter which are provided in a chemical supply device according to an embodiment of the present invention.

FIG. 3 is a plan view of FIG. 2.

FIGS. 4 to 12 are views illustrating a process of replacing a chemical container.

FIG. 13 is a view illustrating an apparatus for automatically transferring a chemical container according to another embodiment of the present invention.

[Reference Numerals]

1: APPARATUS FOR AUTOMATICALLY TRANSFERRING CHEMICAL CONTAINER

10: INLET/OUTLET UNIT

20: INSPECTION UNIT

30: TRANSFER LINE

40: FIRST BUFFER UNIT

50: SECOND BUFFER UNIT

100-1: FIRST CHEMICAL SUPPLY DEVICE

100-2: SECOND CHEMICAL SUPPLY DEVICE

110-1: DOOR

210: FIRST TRANSFER UNIT

5 220: SECOND TRANSFER UNIT

230: THIRD TRANSFER UNIT

240: FOURTH TRANSFER UNIT

300: TRANSFER VEHICLE RAIL

400: TRANSFER VEHICLE

10 [Modes of the Invention]

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

Referring to FIG. 1, an apparatus 1 for automatically transferring a chemical container of the present invention includes at least one transfer line 30 for
15 transferring a chemical container (not illustrated), which is introduced into an inlet/outlet unit 10, to chemical supply devices 100-1 and 100-2, and a control unit (not illustrated) which receives information on a chemical of the chemical container transferred along the transfer line 30 and, when the received information on the chemical matches information required by the chemical supply devices 100-1 and
20 100-2, controls the chemical container to be supplied to the chemical supply devices 100-1 and 100-2.

The chemical container is placed inside the chemical supply devices 100-1 and 100-2 in a state of being loaded on a pallet (not illustrated). When the chemical container and the pallet are placed inside the chemical supply devices 100-1 and 100-
25 2, the chemical supply devices 100-1 and 100-2 may automatically open a lid of the

chemical container and connect a coupler to the chemical container so that the chemical contained in the chemical container may be supplied to a chemical consuming device. In this case, the chemical contained in the chemical container may be transferred to the chemical consuming device by a transfer pump or a pressure of nitrogen gas. A pump unit including the transfer pump may be provided at one side of each of the chemical supply devices 100-1 and 100-2.

The inlet/outlet unit 10, an inspection unit 20, a first buffer unit 40, and a second buffer unit 50 are provided on the transfer line 30. The transfer line 30 is defined as a path for transferring the pallet on which the chemical container is loaded, and may include a transfer member from the beginning to the end of the transfer line 30 to transfer the chemical container and the pallet.

The transfer member may include, for example, a plurality of rollers provided in a longitudinal direction of the transfer line 30 and a roller driving unit for rotating the rollers. The pallet on which the chemical container is loaded is placed on the plurality of rollers, and the chemical container and the pallet are transferred along the transfer line 30 by rotation of the rollers. Such a transfer member may be provided to enable the chemical container and the pallet to be driven in forward and reverse directions to be bidirectionally transferred, and may be provided to enable the chemical container and the pallet to all of the transfer lines 30 to be bidirectionally transferred.

Further, objects to be transferred that are transferred along the transfer line 30 are the chemical container and the pallet which are vertically loaded. However, hereinafter, for convenience of description, the object to be transferred is referred to as a chemical container, and when a description of the pallet is necessary, the object to be transferred is referred to as a pallet in addition to the chemical container.

The inlet/outlet unit 10 allows a forklift to introduce the chemical container into the transfer line 30 or transfer the chemical container fully used by the chemical supply devices 100-1 and 100-2 along the transfer line 30 and then discharge the chemical container outward.

5 The inspection unit 20 may check the information on the chemical using a unique identifier formed at a barcode label, a radio-frequency identification (RFID), or the like, which is attached to the chemical container. The unique identifier attached to the chemical container includes a chemical name and various pieces of necessary production information. Further, the inspection unit 20 may check a
10 unique identifier formed at a barcode label, an RFID, or the like, which is attached to the pallet. The unique identifier attached to the pallet also includes a chemical name and various pieces of necessary production information. The inspection unit 20 may check the unique identifier, and the control unit may check whether the checked information on the chemical of the chemical container and the pallet
15 matches information on a chemical required by the chemical supply devices 100-1 and 100-2.

 The first buffer unit 40 and the second buffer unit 50 may allow the chemical container that has passed the inspection unit 20 to temporarily standby before being supplied to the chemical supply devices 100-1 and 100-2. The first buffer unit 40 is
20 provided on a first layer, the second buffer unit 50 is provided on a second layer, and a lifting/lowering device may be provided between the first buffer unit 40 and the second buffer unit 50 to move the chemical container up or down.

 Using an unmanned transfer vehicle 400, the chemical container may be introduced into the chemical supply devices 100-1 and 100-2 or the empty chemical

container fully used may be discharged from the chemical supply devices 100-1 and 100-2.

To this end, a transfer vehicle rail 300 may be provided between the chemical supply devices 100-1 and 100-2 and the transfer line 30 such that the transfer vehicle
5 400 reciprocates. In the present embodiment, although the transfer vehicle rail 300 is exemplified as being provided, the transfer vehicle 400 may be configured to travel along a line drawn on the floor or to travel according to predetermined coordinates.

A transfer member such as a roller may be provided in the transfer vehicle
10 400 such that the chemical container may be introduced into the chemical supply devices 100-1 and 100-2 or discharged to the transfer line 30 from the chemical supply devices 100-1 and 100-2 in a state in which the chemical container is placed on the transfer vehicle 400.

Two or more transfer vehicles 400 may be provided on the transfer vehicle
15 rail 300 in preparation for failure. As described above, when two or more transfer vehicles 300 are provided, a space in which, when one transfer vehicle 300 has failed, the failed transfer vehicle 300 may be stored and repaired, may be provided.

Referring to FIGS. 2 and 3, the apparatus 1 for automatically transferring the chemical container of the present invention includes a first chemical supply device
20 100-1, a second chemical supply device 100-2, a transfer vehicle rail 300, a transfer vehicle 400, and first to fourth transfer units 210, 220, 230, and 240.

Each of the first chemical supply device 100-1 and the second chemical supply device 100-2 includes a door opened or closed in order for introducing or discharging a chemical container. Although only a door 110-1 provided in the first
25 chemical supply device 100-1 is illustrated in FIG. 2, a door (not illustrated) is also

provided in the second chemical supply device 100-2 at a position facing the door 110-1. The position where the door is provided is defined as a position of an entrance of the first chemical supply device 100-1 or the second chemical supply device 100-2.

5 The chemical container introduced into the first chemical supply device 100-1 or the second chemical supply device 100-2 is referred to as a first chemical container, and the chemical container that stands by in the third transfer unit 230 or the fourth transfer unit 240 to be introduced into the first chemical supply device 100-1 or the second chemical supply device 100-2 is referred to as a second chemical
10 container. The first chemical container refers to a chemical container in which a chemical is being supplied or to an empty chemical container in which the chemical is fully supplied, and the second chemical container refers to a new chemical container introduced into the first and second chemical supply devices 100-1 and 100-2.

15 The first transfer unit 210 is provided at an entrance side of the first chemical supply device 100-1, and the second transfer unit 220 is provided at an entrance side of the second chemical supply device 100-2. Further, the third transfer unit 230 is provided at a position closer to the transfer vehicle rail 300 than the first transfer unit 210, and the fourth transfer unit 240 is provided at a position closer to the transfer
20 vehicle rail 300 than the second transfer unit 220.

Each of the third transfer unit 230 and the fourth transfer unit 240 is provided at a position on a line perpendicular to a straight path formed by connecting the entrance of the first chemical supply device 100-1, the first and second transfer units 210 and 220, and the second chemical supply device 100-2.

That is, the third transfer unit 230 is provided at a position on a line perpendicular to the second transfer unit 220 with respect to the first transfer unit 210, and the fourth transfer unit 240 is provided at a position on a line perpendicular to the first transfer unit 210 with respect to the second transfer unit 220.

5 In other words, the second transfer unit 220 is connected to one side of the first transfer unit 210, and the third transfer unit 230 is connected to another side of the first transfer unit 210. Conversely, the third transfer unit 230 may be defined as being connected to one side of the first transfer unit 210, and the second transfer unit 220 may be defined as being connected to another side of the first transfer unit 210.

10 A transfer member such as a roller is provided in each of the first transfer unit 210 and the second transfer unit 220 to transfer the chemical container loaded thereon.

 In the first transfer unit 210, a first transfer member is provided to transfer the chemical container in a Y direction, which is a longitudinal direction connecting the
15 first transfer unit 210 and the second transfer unit 220. Further, in the first transfer unit 210, a second transfer member is provided to transfer the chemical container in an X direction, which is a longitudinal direction connecting the first transfer unit 210 and the third transfer unit 230. That is, a transfer direction of the chemical container by driving of the first transfer member and a transfer direction of the
20 chemical container by driving of the second transfer member are perpendicular to each other.

 In the second transfer unit 220, a first transfer member is provided to transfer the chemical container in the Y direction, which is the longitudinal direction connecting the first transfer unit 210 and the second transfer unit 220. Further, in
25 the second transfer unit 220, a second transfer member is provided to transfer the

chemical container in the X direction, which is a longitudinal direction connecting the second transfer unit 220 and the fourth transfer unit 240. That is, a transfer direction of the chemical container by driving of the first transfer member and a transfer direction of the chemical container by driving of the second transfer member are perpendicular to each other.

Further, in the first transfer unit 210 and the second transfer unit 220, the first transfer member is provided to be bidirectionally transferred in the Y direction, and the second transfer member is provided to be bidirectionally transferred in the X direction.

In each of the third transfer unit 230 and the fourth transfer unit 240, a transfer member is provided to be transferred in the X direction.

The first transfer unit 210 serves as a path along which the first chemical container placed inside the first chemical supply device 100-1 is discharged, and serves as a path along which the second chemical container that stands by in the third transfer unit 230 is introduced into the first chemical supply device 100-1, and thus the first transfer unit 210 is referred to as an “entrance unit (first entrance unit).”

The second transfer unit 220 serves as a path along which the first chemical container placed inside the second chemical supply device 100-2 is discharged, and serves as a path along which the second chemical container that stands by in the fourth transfer unit 240 is introduced into the second chemical supply device 100-1, and thus the second transfer unit 220 is referred to as an “entrance unit (second entrance unit).”

The third transfer unit 230 is provided such that the second chemical container for being introduced into the first chemical supply device 100-1 is temporarily on standby, and is referred to as a “standby unit (first standby unit).” In

this case, the third transfer unit 230 also serves as a path along which the first chemical container placed inside the first chemical supply device 100-1 is discharged.

The fourth transfer unit 240 is provided such that the second chemical container for being introduced into the second chemical supply device 100-2 is temporarily on standby, and is referred to as a “standby unit (second standby unit).” In this case, the fourth transfer unit 240 also serves as a path along which the second chemical container placed inside the second chemical supply device 100-2 is discharged.

Meanwhile, when the first chemical container placed inside the first chemical supply device 100-1 is discharged and the second chemical container that stands by in the third transfer unit 230 is introduced into the first chemical supply device 100-1, the second transfer unit 220 functions to temporarily shelter the first chemical container, and thus the second transfer unit 220 is referred to as an “shelter (first shelter).”

Further, when the first chemical container placed inside the second chemical supply device 100-2 is discharged and the second chemical container that stands by in the fourth transfer unit 240 is introduced into the second chemical supply device 100-2, the first transfer unit 210 functions to temporarily shelter the first chemical container, and thus the first transfer unit 210 is referred to as an “shelter (second shelter).”

Therefore, as described above, when the entrances of the chemical supply devices 100-1 and 100-2 are formed as a pair of entrances to face each other, the second entrance unit functions as a shelter for the first chemical supply device 100-1, and the first entrance unit functions as a shelter for the second chemical supply device 100-2.

According to the above-described configuration, by providing the standby unit for standing by a new chemical container and providing the shelter for temporarily sheltering an empty chemical container discharged after the chemical is fully used, a time taken for replacing the empty chemical container of the chemical supply device with the new chemical container can be minimized. Further, the standby unit and the shelter are provided at positions perpendicular to each other with respect to the entrance units provided near the entrances of the chemical supply devices 100-1 and 100-2, wherein the standby unit is located close to the transfer vehicle rail 300, and thus an area occupied by the apparatus for automatically transferring the chemical container can be minimized.

In the above embodiment, the case in which the chemical supply device 100-1 is provided as a pair of chemical supply devices is exemplified, but when only the first chemical supply device 100-1 is provided and the second chemical supply device 100-2 is not provided, the fourth transfer unit 240 may not be provided.

Hereinafter, a method of automatically transferring a chemical container according to the present invention will be described with reference to FIGS. 4 to 12.

Referring to FIG. 4, a first chemical container 510 is introduced into a first chemical supply device 100-1, and a chemical contained in the first chemical container 510 is supplied to a chemical consuming device.

When the first chemical container 510 is fully used, a plurality of second chemical containers 520 to be introduced into the first chemical supply device 100-1 are standing by in a first standby unit 230.

The state is illustrated in which a first chemical container 530 is introduced into a second chemical supply device 100-2 and a chemical contained in the first chemical container 530 is being supplied to the chemical consuming device.

A transfer vehicle 400 moved along a transfer vehicle rail 300 is located at a side of a fourth transfer unit 240, and a second chemical container 540 to be introduced into the second chemical supply device 100-2 is loaded on the transfer vehicle 400.

5 The first chemical container 510 placed inside the first chemical supply device 100-1 is provided as a plurality of first chemical containers 510, and the plurality of first chemical containers 510 are supported by a pallet 511. The first chemical container 530 placed inside the second chemical supply device 100-2 and the second chemical containers 520 and 540 that are placed inside the second transfer
10 unit 220 and the transfer vehicle 400 are also supported by pallets.

Referring to FIG. 5, the second chemical container 540 placed inside the transfer vehicle 400 in the state of FIG. 4 is transferred to the fourth transfer unit 240. A transfer member provided on an upper portion of the transfer vehicle 400 is driven by a driving unit and a transfer member provided in the fourth transfer unit 240 is
15 driven by a driving unit, and thus the second chemical container 540 is transferred in an X direction to be located on the fourth transfer unit 240.

Referring to FIG. 6, the first chemical container 510, which becomes an empty container after the chemical of the first chemical container 510 placed inside the first chemical supply device 100-1 is fully used, is discharged from the first
20 chemical supply device 100-1 and loaded on the first transfer unit 210.

Referring to FIG. 7, the first chemical container 510 loaded on the first transfer unit 210 in the state of FIG. 6 is transferred to the second transfer unit 220, which is a first shelter. As a result, a second chemical container 520 placed on a third transfer unit 230 enters a state which allows the second chemical container to
25 be introduced into the first chemical supply device 100-1.

Referring to FIG. 8, the second chemical container 520 loaded on the third transfer unit 230 in the state of FIG. 7 is transferred to the first transfer unit 210. Thereafter, as illustrated in FIG. 9, the second chemical container 520 placed on the first transfer unit 210 is introduced into and located in the first chemical supply device 100-1 to supply the chemical to the chemical consuming device.

Thereafter, the first chemical container 510 sheltered in the second transfer unit 220, which is the first shelter, is transferred to the first transfer unit 210 as illustrated in FIG. 10, and is transferred from the first transfer unit 210 to the third transfer unit 230 as illustrated in FIG. 11.

The first chemical container 510 transferred to the third transfer unit 230 is transferred to the upper portion of the transfer vehicle 400 located at a side of the third transfer unit 230 as illustrated in FIG. 12. The transfer vehicle 400 on which the first chemical container 510 is loaded is moved along the transfer vehicle rail 300 and then allows the first chemical container 510 to be loaded on a transfer line 30. The first chemical container 510 transferred on the transfer line 30 is transferred along the transfer line 30 and then discharged outward.

Another embodiment of the present invention will be described with reference to FIG. 13.

An apparatus for automatically transferring a chemical container illustrated in FIG. 13 includes a chemical supply device 100-3, a first transfer unit 210-2 provided near an entrance of the chemical supply device 100-3, and a second transfer unit 220-2 and a third transfer unit 230-2 which are provided on both sides of the first transfer unit 210-2 in an X direction.

Further, the apparatus for automatically transferring the chemical container may further include a first transfer vehicle rail 300-1 provided at an opposite side of

the first transfer unit 210-2 with respect to the third transfer unit 230-2, and a second transfer vehicle rail 300-2 provided at an opposite side of the first transfer unit 210-2 with respect to the second transfer unit 220-2. In other words, the third transfer unit 230-2 and the first transfer vehicle rail 300-1 are sequentially provided at one side of
5 the first transfer unit 210-2, and the second transfer unit 220-2 and the second transfer vehicle rail 300-2 are sequentially provided at another side of the first transfer unit 210-2.

The first transfer unit 210-2 serves as an entrance unit, the second transfer unit 220-2 serves as a shelter, and the third transfer unit 230-2 serves as a standby
10 unit.

A first chemical container 510 placed inside the chemical supply device 100-3 is discharged from the chemical supply device 100-3 to the first transfer unit 210-2. The first chemical container 510 discharged to the first transfer unit 210-2 is transferred to the second transfer unit 220-2, and the first chemical container 510 of
15 the second transfer unit 220-2 is transferred using a transfer vehicle (not illustrated) of the first transfer vehicle rail 300-1 and then discharged outward along a transfer line.

In this case, when the first chemical container 510 is transferred from the first transfer unit 210-2 to the second transfer unit 220-2, a second chemical container 520
20 that stands by in the third transfer unit 230-2 is transferred to the first transfer unit 210-2 and then introduced into the chemical supply device 100-2.

In the above-described embodiments, the chemical container is transferred to the transfer line using the transfer vehicle, but the chemical container may be directly transferred from the third transfer unit 230/fourth transfer unit 240/second transfer
25 unit 220-2/third transfer unit 230-2 to the transfer line without the transfer vehicle.

As described above, the present invention has been described in detail with reference to the exemplary embodiments, but the present invention is not limited to the above-described embodiments. Various modifications may be made within the scope of the claims, the detailed description of the present invention, and the
5 accompanying drawings, and also belong to the present invention.

[CLAIMS]

[Claim 1]

An apparatus for automatically transferring a chemical container, the apparatus comprising:

a shelter configured such that a first chemical container is discharged from a chemical supply device and sheltered in the shelter;

a standby unit configured such that a second chemical container temporarily stands by;

an entrance unit configured to serve as a path along which the first chemical container is discharged and as a path along which the second chemical container is introduced into the chemical supply device;

a control unit configured to control transfer of:

the first chemical container at each of the shelter and the entrance unit; and

the second chemical container at each of the standby unit and the entrance unit; and

at least one transfer line configured to transfer the second chemical container to the chemical supply device,

wherein the standby unit is provided between the transfer line and the chemical supply device, the shelter is connected to one side of the entrance unit, and the standby unit is connected to another side of the entrance unit.

[Claim 2]

The apparatus of claim 1, wherein:

the chemical supply device, the entrance unit, and the shelter are provided on a straight path; and

the standby unit is connected to the entrance unit and provided perpendicular to the shelter with respect to the entrance unit.

[Claim 3]

The apparatus of claim 1, wherein:

the entrance unit includes a first transfer member for transferring the chemical container from the entrance unit toward the shelter, and a second transfer member for transferring the chemical container from the standby unit toward the entrance unit; and

a transfer direction of the first transfer member and a transfer direction of the second transfer member are perpendicular to each other.

[Claim 4]

The apparatus of claim 1, further comprising:

a transfer vehicle rail provided parallel to at least a portion of the transfer line; and

a transfer vehicle which is linearly moved along the transfer vehicle rail and transfers the chemical container from the transfer line to the chemical supply device at an input position adjacent to the standby unit or transfers the chemical container

from the chemical supply device to the transfer line at a discharge position spaced apart from the input position along the transfer vehicle rail.

[Claim 5]

The apparatus of claim 1, wherein the control unit receives information on a chemical of the chemical container transferred along the transfer line and, when the received information on the chemical matches information required by the chemical supply device, controls the chemical container to be supplied to the chemical supply device.

[Claim 6]

The apparatus of claim 1, wherein:

the chemical supply device is provided as a pair of chemical supply devices of which entrances face each other;

the entrance unit is provided as a pair of entrance units near the entrances of the pair of chemical supply devices;

the standby unit is provided as a pair of standby units to each be adjacent to a corresponding one of the pair of entrance units; and

each of the pair of entrance units functions as a shelter in which the first chemical container discharged from the chemical supply device on the other side is sheltered.

[Claim 7]

The apparatus of claim 6, wherein the standby unit is provided at a position on a line perpendicular to a straight path formed by connecting the entrance of the chemical supply device and the entrance unit.

[Claim 8]

The apparatus of claim 1, wherein the standby unit serves as a path along which the first chemical container is discharged.

[Claim 9]

The apparatus of claim 1, wherein the standby unit and the shelter are provided at both sides of the entrance unit.

[Claim 10]

The apparatus of claim 9, wherein:

a first transfer vehicle, which is linearly moved along a first transfer vehicle rail provided at an opposite side of the entrance unit with respect to the standby unit, is provided;

a second transfer vehicle, which is linearly moved along a second transfer vehicle rail provided at the opposite side of the entrance unit with respect to the shelter, is provided;

the second chemical container loaded on the first transfer vehicle passes the standby unit and is introduced into the chemical supply device through the entrance unit; and

the first chemical container placed inside the chemical supply device passes the entrance unit and the shelter, is transferred to the second transfer vehicle, and then is discharged outward through the transfer line.

[Claim 11]

A method of automatically transferring a chemical container, the method comprising:

operation a) of discharging a first chemical container fully used by a chemical supply device to an entrance unit located near an entrance of the chemical supply device;

operation b) of transferring the first chemical container of the entrance unit to a shelter; and

operation c) of passing a second chemical container, which is a new chemical container and stands by in a standby unit, through the entrance unit and introducing the second chemical container into the chemical supply device;

wherein:

the shelter is connected to one side of the entrance unit; and

in operation c), the second chemical container is transferred along at least one transfer line and then stands by in the standby unit connected to another side of the entrance unit.

[Claim 12]

The method of claim 11, further comprising operation d) of transferring the first chemical container sheltered in the shelter to the transfer line.

[Claim 13]

The method of claim 12, wherein, in operation d), the first chemical container sequentially passes the shelter, the entrance unit, and the standby unit and then is transferred to the transfer line.

[Claim 14]

The method of claim 12, wherein the first chemical container is loaded on a transfer vehicle linearly moved along a transfer vehicle rail provided parallel to at least a portion of the transfer line, and then is discharged outward along the transfer line.