

[DESCRIPTION]

[Invention Title]

AUTOMATIC TRANSFER APPARATUS OF OBJECT TO BE TRANSFERRED
AND AUTOMATIC TRANSFER METHOD

5 [Technical Field]

The present invention relates to an apparatus and method for automatically transferring an object to be transferred, and more particularly, to an apparatus and method for automatically transferring an object to be transferred, which automatically align the object to be transferred according to a size of a pallet and transfer the object to be transferred and, when the object to be transferred is transferred along a transfer line, detect whether a portion protruding from the object to be transferred is present.

[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 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 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 protective clothing, a gas mask, and the like and transfers and loads chemical
5 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
10 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
15 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
20 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
25 container is used, the safety of the operator is threatened.

In order to solve the above problem, Korean Patent Registration No. 10-1947450, which has been applied and published by the present applicant, has been disclosed.

According to an apparatus for automatically transferring a chemical container
5 disclosed in Korean Patent Registration No. 10-1947450, an alignment unit for aligning pallets to a central portion of a transfer line is provided. When the pallets are placed onto the transfer line, the alignment unit pushes both side surfaces of the pallets toward the central portion of the transfer line and aligns the pallets. In such a method, when pallets has a constant size, the pallets may be smoothly aligned, but
10 there is a problem in that, when pallets having different sizes are placed onto the transfer line, pallets having any one size are aligned but pallets having different sizes are not aligned.

Further, in an inspection unit, a protrusion detecting sensor for detecting whether a chemical container is placed at one side on the pallet or whether a
15 packaging material protrudes more than a frame due to the poor packaging of the chemical container is provided.

The protrusion detecting sensor is provided on each of front, rear, left, and right side surfaces of the frame constituting the inspection unit. In this case, the protrusion detecting sensor should detect each of the four side surfaces while the
20 chemical container is stationary, and the protrusion detecting sensor is composed of a light-emitting unit and a light-receiving unit, which are configured to cross in an X shape or cross in a cross (+) shape.

In the case of such a configuration, a blind spot in which a protruding portion cannot be detected may be present, and a large number of sensors are required to
25 detect all of the four side surfaces so that the blind spot is not present.

[Disclosure]

[Technical Problem]

The present invention is directed to solving the above-described problems and providing an apparatus and method for automatically transferring an object to be transferred, which automatically align the object to be transferred according to a size
5 of a pallet.

The present invention is also directed to providing an apparatus and method for automatically transferring an object to be transferred, in which the number of sensors for detecting whether a portion protruding from the object to be transferred is
10 present outside a set position is minimized and an undetected surface is minimized.

[Technical Solution]

One aspect of the present invention provides an apparatus for automatically transferring the object to be transferred, including: a pair of first sensors configured to detect whether any portion protruding from both side surfaces of the object to be
15 transferred, which is transferred along a transfer line, is present outside set positions while the object to be transferred is being transferred; and a pair of second sensors configured to detect whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary.

20 The object to be transferred may include a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical container.

The pair of first sensors and the pair of second sensors may be provided in an inspection unit provided on the transfer line in order to check information on a
25 chemical of the chemical container.

An inspection unit provided on the transfer line and an input unit for placing the chemical container onto the transfer line may be provided in order to check information on a chemical of the chemical container; the pair of first sensors may be provided in a state of being coupled to supports provided between the inspection unit
5 and the input unit; and the second sensors may be each located on front and rear surfaces of the inspection unit.

The apparatus may may be comprising: a control unit configured to receive the information on the chemical of the chemical container transferred along the transfer line and, when the information on the chemical matches information
10 required by the chemical supply device, supply the chemical container to the chemical supply device; an input unit into which the chemical container is introduced; and a discharge unit provided on a side of the input unit and configured to discharge the chemical container that is fully used in the chemical supply device, wherein the transfer line may include a first transfer line connected to the input unit
15 and a second transfer line disposed adjacent to the first transfer line to be parallel to the first transfer line and connected to the discharge unit.

In the inspection unit, when it is determined that the chemical container transferred from the input unit is incorrectly introduced, a connection unit that connects the first transfer line to the second transfer line in order to transfer the
20 chemical container to the second transfer line by changing a transfer direction of the chemical container by the inspection unit may be provided; and in the inspection unit, the chemical container transferred to the second transfer line through the connection unit may be discharged outward through the discharge unit.

The first sensors and the second sensors may be provided so that the object to
25 be transferred is first detected by the first sensors while the object to be transferred is

being transferred, and the object to be transferred is detected second by the second sensors while the object to be transferred stops at a predetermined position after the object to be transferred is transferred.

The first sensors and the second sensors may be provided so that the object to be transferred is first detected by the second sensors while the object to be transferred stops at a predetermined position after the object to be transferred is transferred, and the object to be transferred is detected second by the first sensors while the object to be transferred is being transferred.

The first sensor may include a light-emitting unit that emits light in an upward or downward direction and a light-receiving unit that receives the light generated by the light-emitting unit.

The light-emitting unit may be formed as a light source unit that generates a laser beam and the light-receiving unit may be formed as a reflecting plate that reflects the laser beam.

An inspection unit provided on the transfer line may be provided in order to check information on a chemical of the chemical container; and the second sensors may be each formed using a light curtain to detect an entire region of a front surface of the inspection unit and an entire region of a rear surface of the inspection unit.

The apparatus may be further comprising a third sensor configured to detect whether a portion protruding upward from an upper surface of the object to be transferred is present outside a set position.

The object to be transferred may include a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical container; an inspection unit provided on the transfer line may be provided in order to check information on the chemical of the chemical container; and the third sensor

may be provided on an upper frame provided on an upper side of the inspection unit and detects whether a portion protruding upward from the upper surface of the object to be transferred is present while the object to be transferred is stationary.

5 The third sensor detects whether a portion protruding upward from the upper surface of the object to be transferred may be present while the object to be transferred is being transferred.

Another aspect of the present invention provides an apparatus for automatically transferring the object to be transferred, including: a pair of first sensors configured to detect whether any portion protruding from both side surfaces
10 of the object to be transferred is present outside set positions while the object to be transferred is stationary; and a pair of second sensors configured to detect whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary, wherein the first sensors and the second sensors are each formed using a light curtain to detect
15 both of the side surfaces and entire regions of the front and rear surfaces.

A transfer line may be provided to transfer a chemical container, which is loaded on a pallet and introduced into an input unit, to a chemical supply device; and the chemical container and the pallet, which are transferred along the transfer line, are aligned with a central portion of the transfer line, wherein the apparatus may
20 include an alignment unit configured to align the chemical container and the pallet according to a size of the pallet.

An inspection unit may be provided in order to check information on a chemical of the chemical container transferred along the transfer line; and the alignment unit may be provided between the input unit and the inspection unit.

The alignment unit may include: a plurality of transfer members configured to transfer the chemical container and the pallet, which are transferred from the input unit, along the transfer line; a pair of alignment members configured to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing; and an alignment driving unit configured to reciprocate the pair of alignment members in opposite directions.

The alignment member has a length in a direction toward the transfer line and at least a portion thereof may be in surface contact with a side surface of the pallet.

The alignment unit may include a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and the control unit may control the alignment driving unit so that the recognized information on the pallet corresponds to an amount of movement of the alignment member.

The information on the pallet received by the pallet information recognition unit may include information about the size of the pallet, and the control unit may control the alignment driving unit to determine the amount of movement of the alignment member according to the size of the pallet.

The amount of movement of the alignment member corresponding to information on a plurality of pallets may be preset in the control unit.

The pallet information recognition unit may recognize a unique identifier formed at a barcode label or a radio-frequency identification (RFID) attached to the pallet.

The alignment unit may include a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and the pallet information recognition unit may include a pallet detection unit for detecting the size of the pallet, and an amount of movement of the alignment member may be determined according to the size of the pallet detected by the pallet detection unit.

The alignment unit may include a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and the pallet information recognition unit may include a distance measuring sensor for measuring a distance from the pallet, and an amount of movement of the alignment member may be determined according to the distance from the pallet measured by the distance measuring sensor.

The apparatus may include an in-place detection sensor configured to detect whether the pallet is placed at a correct position to be aligned by the alignment unit.

The in-place detection sensor may include: a first in-place detection sensor which is provided in a front of the alignment unit and detects whether a front of the pallet that has entered the alignment unit escapes from a set position; and a second in-place detection sensor which is provided at a rear of the pallet and detects whether the rear of the pallet that has entered the alignment unit reaches a set position.

An escape prevention stopper for preventing the pallet that has entered the alignment unit from escaping forward or rearward may be provided forward and rearward from the alignment unit.

5 The alignment unit may include a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and the alignment driving unit may be formed as a servomotor in order to control an amount of movement of the alignment member.

10 The apparatus may include a control unit configured to receive the information on a chemical of the chemical container transferred along the transfer line and, when the information on the chemical matches information required by the chemical supply device, supply the chemical container to the chemical supply device.

One aspect of the present invention provides a method of automatically
15 transferring an object to be transferred, the method comprising: operation a) of detecting, by a first sensor, whether any portion protruding from both side surfaces of the object to be transferred, which is transferred along a transfer line, is present outside set positions while the object to be transferred is being transferred; and
operation b) of detecting, by a second sensor, whether any portion protruding from
20 front and rear surfaces of the object to be transferred is present outside a set position while the object to be transferred is stationary.

Another aspect of the present invention provides a method of automatically transferring an object to be transferred, the method comprising: operation a) of detecting, by a second sensor, whether any portion protruding from front and rear

surfaces of the object to be transferred is present outside set positions while the object to be transferred, which is transferred along a transfer line, is stationary; and

operation b) of detecting, by a first sensor, whether any portion protruding from both side surfaces of the object to be transferred is present outside set positions
5 while the object to be transferred is being transferred.

When it is detected that the protruding portion is present by at least one of the first sensor and the second sensor, the object to be transferred may be discharged outward through a discharge unit.

The object to be transferred is discharged through the discharge unit provided
10 on a second transfer line disposed adjacent to a first transfer line connected to an input unit, into which the object to be transferred is introduced, to be parallel to the first transfer line.

The object to be transferred may include a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical
15 container; and the first sensor and the second sensor may be provided in an inspection unit provided on the transfer line in order to check information on a chemical of the chemical container, wherein, in the inspection unit, the object to be transferred is transferred to the second transfer line so that the object to be transferred may be discharged through the discharge unit.

20 The object to be transferred including a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical container is introduced into an input unit and then is transferred to the chemical supply device along the transfer line, and the control unit may control the chemical container and the pallet, which are transferred along the transfer line, to be aligned
25 with a central portion of the transfer line according to a size of a pallet.

The control unit receives information about the size of the pallet and may control an alignment driving unit for aligning the pallet according to the size of the pallet.

5 The control unit receives information about positions of both side surfaces of the pallet and may control an alignment driving unit for aligning the pallet according to the positions of both of the side surfaces of the pallet.

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

When it is detected that the pallet transferred along the transfer line is placed at a preset correct position, alignment of the pallet may be performed.

[Advantageous Effects]

According to the present invention, by allowing an alignment unit to align an
15 object to be transferred according to the size of a pallet, pallets having different sizes can be transferred along one transfer line, and thus an apparatus for automatically transferring a chemical container can be efficiently operated.

Further, by detecting whether any portion protruding from both side surfaces of the object to be transferred is present outside set positions while the object to be
20 transferred is being transferred and by detecting whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary, the number of sensors for detecting the protruding portion can be minimized and an undetected surface can be minimized.

[Description of Drawings]

FIG. 1 is a perspective view illustrating an automatic transfer apparatus according to an embodiment of the present invention.

FIG. 2 is a perspective view illustrating an inlet/outlet unit in the automatic transfer apparatus illustrated in FIG. 1.

5 FIG. 3 is a plan view illustrating the inlet/outlet unit illustrated in FIG. 2.

FIG. 4 is a perspective view illustrating sensors provided on a frame of a first inspection unit according to the present invention.

FIG. 5 is a side view illustrating the sensors provided on the frame of the first inspection unit according to the present invention.

10 FIG. 6 is a front view illustrating the sensors provided on the frame of the first inspection unit illustrated in FIG. 4.

FIG. 7 is a cross-sectional view taken along line A-A of FIG. 6 and illustrates a state in which an object to be transferred which is stationary in the first inspection unit.

15 FIG. 8 is a plan view illustrating a first sensor provided on a support according to another embodiment of the present invention.

FIG. 9 is a front view illustrating the first sensor, a chemical container, and a pallet according to the embodiment illustrated in FIG. 8.

FIG. 10 is a front view illustrating a state in which an object to be transferred
20 detected by a third sensor while the object to be transferred is being transferred according to another embodiment of the present invention.

FIG. 11 is a perspective view illustrating a state in which a third sensor provided at an upper side of a first inspection unit according to another embodiment of the present invention.

25 FIG. 12 is a perspective view illustrating an alignment unit in an input unit.

FIG. 13 is a front view of the alignment unit of FIG. 12.

FIG. 14 is a view illustrating a state in which a chemical container and a pallet which are loaded on the alignment unit of FIG. 12.

[Reference Numerals]

- 5 1: CHEMICAL AUTOMATIC TRANSFER APPARATUS
- 2: CHEMICAL CONTAINER
- 3: PALLET
- 10: INLET/OUTLET UNIT
- 10A: INPUT UNIT
- 10 10B: DISCHARGE UNIT
- 20: INSPECTION UNIT
- 20A: FIRST INSPECTION UNIT
- 20B: SECOND INSPECTION UNIT
- 21, 22: FIRST SENSOR
- 15 23, 24: SECOND SENSOR
- 25: FRAME
- 25A: UPPER FRAME
- 25B: LOWER FRAME
- 30: TRANSFER LINE
- 20 30-1: FIRST TRANSFER LINE
- 30-2: SECOND TRANSFER LINE
- 31-1: ROLLER
- 40: FIRST BUFFER UNIT
- 50: SECOND BUFFER UNIT
- 25 60: CONNECTION UNIT

- 70-1: FIRST ALIGNMENT UNIT
- 70-2: SECOND ALIGNMENT UNIT
- 71: TRANSFER MEMBER
- 72-1, 72-2: SIDE FRAME
- 5 73-1, 73-2: ALIGNMENT DRIVING UNIT
- 74-1, 74-2: ALIGNMENT MEMBER
- 75-1, 75-2: DRIVE SHAFT
- 77-1, 77-2: ESCAPE PREVENTION STOPPER
- 78-1, 78-2: PALLET INFORMATION RECOGNITION UNIT
- 10 79: LIFTING MEMBER
- 81, 82, 83, 84: SUPPORT
- 100-1, 100-2: CHEMICAL SUPPLY DEVICE
- 300: TRANSFER VEHICLE RAIL
- 400: TRANSFER VEHICLE

15 [Modes of the Invention]

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

An apparatus 1 for automatically transferring an object to be transferred will be described with reference to FIG. 1, and objects to be transferred in the present
 20 embodiment are chemical containers 2 and a pallet 3 which are vertically loaded and transferred along transfer lines 30. Hereinafter, for convenience of description, the object to be transferred is referred to as the chemical container 2, but when the description of the pallet 3 is required, the object to be transferred will be described as the pallet 3 together with the chemical container 2. Further, although the objects to
 25 be transferred are exemplified as the chemical container 2 and the pallet 3, other

objects that can be transferred along the transfer line 30 are applicable without being limited thereto.

The apparatus 1 for automatically transferring the object to be transferred includes at least one transfer line 30 for transferring the chemical container 2 (see FIG. 9) 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 2 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 100-2, controls the chemical container 2 to be supplied to the chemical supply devices 100-1 and 100-2.

The chemical container 2 is placed inside the chemical supply devices 100-1 and 100-2 in a state of being loaded on the pallet 3 (see FIG. 9). When the chemical container 2 and the pallet 3 are placed inside the chemical supply devices 100-1 and 100-2, the chemical supply devices 100-1 and 100-2 may automatically open a lid of the chemical container 2 and connect a coupler to the chemical container 2 so that the chemical accommodated in the chemical container 2 may be supplied to a chemical consuming device. In this case, the chemical accommodated in the chemical container 2 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 (20a and 20b), a first buffer unit 40, and a second buffer unit 50 are provided on the transfer lines 30. The transfer line 30 is defined as a path for transferring the pallet 3 on which the chemical

container 2 is loaded, and may include a transfer member from the beginning to the end of the transfer line 30 to transfer the chemical container 2 and the pallet 3.

The inlet/outlet unit 10 allows a forklift to place the chemical container 2 onto the transfer line 30 or transfer the chemical container 2 that is fully used in the
5 chemical supply devices 100-1 and 100-2 along the transfer line 30 and then discharge the chemical container 2 to the outside.

The inspection unit 20 (20a and 20b) 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 2.
10 The unique identifier attached to the chemical container 2 includes a chemical name and various pieces of necessary production information. Further, the inspection unit 20 may check a unique identifier formed at s 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.
15 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 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
20 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 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 that is fully used may be discharged from the chemical supply devices 100-1 and 100-2.

5 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 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
10 coordinates.

A transfer member such as a roller may be provided in the transfer vehicle 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
15 on the transfer vehicle 400.

The inlet/outlet unit 10 of the apparatus 1 for automatically transferring the object to be transferred of the present invention will be described with reference to FIGS. 2 and 3.

The inlet/outlet unit 10 includes an input unit 10a for introducing the
20 chemical container 2, and a discharge unit 10b for discharging the chemical container 2 that is fully used in the chemical supply devices 100-1 and 100-2 to the outside.

The transfer line 30 includes a first transfer line 30-1 connected to the input unit 10a and formed in a straight line, and a second transfer line 30-2 connected to the discharge unit 10b, formed in a straight line, and disposed adjacent to the first
25 transfer line 30-1 to be parallel to the first transfer line 30-1. The input unit 10a is

located at a position at which the first transfer line 30-1 starts, and the discharge unit 10b is located at a position at which the second transfer line 30-2 ends.

The transfer line 30 is defined as a path for transferring the pallet 3 on which the chemical container 2 is loaded, and a transfer member is provided in each of the
5 first transfer line 30-1 and the second transfer line 30-2.

The transfer member may include, for example, a plurality of rollers 31-1 in a longitudinal direction of the first transfer line 30-1, and a roller driving unit (not illustrated) for rotating the rollers 31-1. The pallet 3 on which the chemical container 2 is loaded is placed on the plurality of rollers 31-1, and the chemical
10 container 2 and the pallet 3 are transferred along the first transfer line 30-1 by rotation of the rollers 31-1. Further, the transfer member may be configured as a conveyor belt instead of the roller, and a hoist with wheels attached thereto may be configured as a chain block moved along both sides of a monorail installed on a ceiling by an electric motor. Such a transfer member may be provided to enable the
15 chemical container 2 and the pallet 3 to be driven in forward and reverse directions to be bidirectionally transferred.

A first inspection unit 20a for inspecting the information on the chemical of the chemical container 2 supplied from the input unit 10a may be provided on the first transfer line 30-1, and the control unit may be configured to receive the
20 information on the chemical from the first inspection unit 20a.

The discharge unit 10b and the second inspection unit 20b are provided on the second transfer line 30-2. The discharge unit 10b is provided to transfer the chemical container that is fully used in the chemical supply devices 100-1 and 100-2 along the second transfer line 30-2 and then discharge the chemical container to the

outside. The discharge unit 10b may be provided adjacent to a side of the input unit 10a.

The transfer member is provided as a plurality of transfer members in the discharge unit 10b and the second inspection unit 20b in a transfer direction to transfer the chemical container. In this case, the transfer members may be rotationally driven so that the chemical container may be bidirectionally transferred along the second transfer line 30-2.

A connection unit 60 for connecting the first transfer line 30-1 to the second transfer line 30-2 may be provided between the first transfer line 30-1 and the second transfer line 30-2. The connection unit 60 illustrated in FIGS. 2 and 3 is configured to connect the first inspection unit 20a to the second inspection unit 20b.

In the first inspection unit 20a, a plurality of first transfer members for transferring the chemical container in a transfer direction of the first transfer line 30-1, and a plurality of second transfer members for transferring the chemical container in a direction toward the second inspection unit 20a, which is a direction perpendicular to the transfer direction of the first transfer line 30-1, are separately provided. Further, in the second inspection unit 20b, a plurality of third transfer members for transferring the chemical container in a transfer direction of the second transfer line 30-2, and a plurality of fourth transfer members for transferring the chemical container between the first inspection unit 20a and the second inspection unit 20b in a direction perpendicular to the transfer direction of the second transfer line 30-2 are separately provided.

In order to transfer the chemical container of the first inspection unit 20a to the second inspection unit 20b, when the second transfer members and the fourth transfer members are driven, the chemical container that has been placed in the first

inspection unit 20a may be transferred to the second inspection unit 20b through the connection unit 60. That is, as a result of checking the information on the chemical of the chemical container transferred from the input unit 10a by the first inspection unit 20a, when the chemical is not a chemical required by the chemical supply devices 100-1 and 100-2 and it is determined that the chemical is input incorrectly, the chemical container may be transferred to the second inspection unit 20b by changing the transfer direction of the chemical container and then the chemical container may be discharged through the discharge unit 10b. Further, it is also possible to transfer the chemical container in a direction opposite thereto.

A first alignment unit 70-1 is provided between the input unit 10a and the first inspection unit 20a, and a second alignment unit 70-2 is provided between the discharge unit 10b and the second inspection unit 20b.

When the chemical container 2 is transferred in a state of being obliquely misaligned with respect to each of the first transfer line 30-1 and the second transfer line 30-2, the first alignment unit 70-1 and the second alignment unit 70-2 are provided to align the chemical container 2 in the misaligned state. In this case, the chemical container 2 may be aligned with a central portion of the first transfer line 30-1 or the second transfer line 30-2.

A configuration of sensors provided in the first inspection unit 20a will be described with reference to FIGS. 4 to 7.

A frame 25 for coupling components constituting the first inspection unit 20a is provided in the first inspection unit 20a. The frame 25 may include an upper frame 25a which is formed on an upper portion thereof and has a quadrangular shape, and a plurality of vertical frames 25b which are coupled to extend in a vertical

direction from corners of the upper frame 25a and disposed around the side of the chemical container 3.

The frame 25 may include a scanner (not illustrated) for checking the information on the chemical which is attached to the chemical container 2 and the
5 pallet 3.

The sensor includes a pair of first sensors 21 and 22 for detecting whether any portion protruding from both side surfaces of the object to be transferred (the chemical container or the pallet), which is transferred along the first transfer line 30-1, is present outside set positions while the object to be transferred is being
10 transferred, and a pair of second sensors 23 and 24 for detecting whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary.

Here, in referring to the terms “front surface” and “rear surface,” a portion in the front of the object to be transferred with respect to the transfer direction of the
15 first transfer line 30-1 is referred to as a front surface, and a portion at the rear of the object to be transferred with respect to the transfer direction is referred to as a rear surface. Conversely, a portion of the first inspection unit 20a that faces the front surface of the object to be transferred, which is a portion at the rear of the first inspection unit 20a with respect to the transfer direction of the first transfer line 30-1,
20 is referred to as a front surface, and a portion in the front of the first inspection unit 20a with respect to the transfer direction is referred to as a rear surface.

In order to detect whether a portion protruding from the object to be transferred is present while the object to be transferred is being transferred with respect to the transfer direction of the first transfer line 30-1, the pair of first sensors

21 and 22 are provided on the vertical frames 25b provided on both sides of a front surface of the first inspection unit 20a.

In this case, the first sensors 21 and 22 may include light-emitting units 21a and 22a for emitting light downward, and light-receiving units 21b and 22b for receiving light generated from the light-emitting units 21a and 22a, respectively. In the present embodiment, although the light-emitting units 21a and 22a are illustrated as being provided on the upper portion and the light-receiving units 21b and 22b are illustrated as being provided on the lower portion, the light-emitting units 21a and 22a may be provided on the lower portion and the light-receiving units 21b and 22b may be provided on the upper portion.

In this case, the first sensors 21 and 22 may be formed as laser sensors. That is, the light-emitting units 21a and 22a may be formed as light source units that generate a laser beam, and the light-receiving units 21b and 22b may be formed as reflecting plates that reflect the laser beam.

The light-emitting unit 21a constituting the first sensor 21 provided at one side is provided at one side of the upper portion of the vertical frame 25b provided on the front surface of the first inspection unit 20a, and the light-receiving unit 21b is provided at one side of the lower portion of the vertical frame 25b as a lower portion of the light-emitting unit 21a. Further, the light-emitting unit 22a constituting the first sensor 22 provided at the other side is provided at the other side of the upper portion of the vertical frame 25b provided on the front surface of the first inspection unit 20a, and the light-receiving unit 22b is provided at the other side of the lower portion of the vertical frame 25b as a lower portion of the light-emitting unit 22a.

The laser beams generated by the light-emitting units 21a and 22a are irradiated from the top to the bottom at set positions spaced apart from both side

surfaces of the object to be transferred. Therefore, in the case in which the object to be transferred is transferred along the first transfer line 30-1, when there is no portions protruding from both side surfaces of the object to be transferred, protrusion is not detected, and when a portion such as a packaging material protrudes to a position at which the laser beam passes from both side surfaces of the object to be transferred, protrusion is detected by the first sensors 21 and 22.

In this case, since the object to be transferred is being transferred and the first sensors 21 and 22 are located at fixed positions, it is possible to detect whether any portion protruding from both front side end portions of the object to be transferred to both rear side end portions of the object to be transferred is present until both entire side surfaces of the object to be transferred pass the laser beam. Therefore, when the first sensors 21 and 22 include only one light-emitting unit and one light-receiving unit, additional components are not required, and thus it is possible to detect whether any portion protruding from both side surfaces of the object to be transferred is present by using a simple configuration.

The pair of second sensors 23 and 24 are components for detecting whether a portion protruding from the front or rear surface of the object to be transferred is present with respect to the transfer direction of the first transfer line 30-1 while the object to be transferred is stationary, and include a second sensor 23 provided on the front surface of the first inspection unit 20a, and a second sensor 24 provided on the rear surface of the first inspection unit 20a.

The second sensor 23 provided on the front surface of the first inspection unit 20a is located at a position spaced apart from the first sensors 21 and 22 by a predetermined distance in the transfer direction, and is provided on the vertical frame 25b provided on the front surface of the first inspection unit 20a.

The second sensor 24 provided on the rear surface of the first inspection unit 20a is provided on the vertical frame 25b provided on the rear surface of the first inspection unit 20a.

5 The second sensor 23 and the second sensor 24 may each be formed using a light curtain. That is, a light-emitting unit 23a is provided on the vertical frame at one side and a light-receiving unit 23b is provided on the vertical frame at the other side, among the pair of vertical frames 25b provided on the front surface of the first inspection unit 20a. The light-emitting unit 23a and the light-receiving unit 23b are configured as light curtains having vertical lengths so that an entire region of the
10 front surface of the first inspection unit 20a may be detected. Further, a light-emitting unit 24a is provided on the vertical frame at one side and the light-receiving unit 24b is provided on the vertical frame at the other side, among the pair of vertical frames 25b provided on the rear surface of the first inspection unit 20a. The light-emitting unit 24a and the light-receiving unit 24b are configured as light curtains
15 having vertical lengths so that an entire region of the rear surface of the first inspection unit 20a may be detected.

As described above, by sequentially providing the first sensors 21 and 22, the second sensor 23 provided on the front surface of the first inspection unit 20a, and the second sensor 24 provided on the rear surface of the first inspection unit 20a,
20 whether a portion protruding from both side surfaces of the object to be transferred is present is first detected by the first sensors 21 and 22 while the object to be transferred is being transferred, and when the first inspection unit 20a is stationary after the object to be transferred is transferred, whether a portion protruding from the front and rear surfaces of the object to be transferred is present is detected by the
25 second sensors 23 and 24.

In the above, the case is described in which the first sensors 21 and 22 for detecting whether a portion protruding from the object to be transferred is present while the object to be transferred is being transferred are provided to detect the object to be transferred first and the second sensors 23 and 24 for detecting whether a portion protruding from the object to be transferred is present while the object to be transferred is stationary are provided to detect the object to be transferred later. Conversely, the second sensors 23 and 24 may be configured to first detect whether a portion protruding from the object to be transferred is present while the object to be transferred is stationary, and the first sensors 21 and 22 may be configured to later detect whether a portion protruding from the object to be transferred is present while the object to be transferred is being transferred.

A method of automatically transferring the object to be transferred performed by the apparatus for automatically transferring the object to be transferred described above will be described.

When the chemical container, which is the object to be transferred, is introduced through the input unit 10a, the transfer member of the first transfer line 30-1 is rotationally driven so that the object to be transferred is transferred along the first transfer line 30-1. The first sensors 21 and 22 detects whether any portion protruding from both side surfaces of the object to be transferred, which is transferred along the first transfer line 30-1, is present.

After the rear surface of the object to be transferred passes the first sensors 21 and 22, the object to be transferred enters the inside of the first inspection unit 20a and stops at a predetermined position inside the first inspection unit 20a.

In the object to be transferred which is stationary inside the first inspection unit 20a, whether a portion protruding from the front and rear surfaces of the object to be transferred is present is detected by the second sensors 23 and 24.

As a result of being detected by the first sensors 21 and 22 and the second
5 sensors 23 and 24, when it is detected that there is no protruding portion, the object to be transferred is continuously transferred along the first transfer line 30-1. When it is detected that there is a protruding portion, an alarm is generated, the transfer direction is changed to a direction toward the connection unit 60 and the second inspection unit 20b inside the first inspection unit 20a, and the object to be
10 transferred is transferred to the second inspection unit 20b.

The object to be transferred, which is transferred to the second inspection unit 20b, is discharged outward through the discharge unit 10b along the second transfer line 30-1.

Meanwhile, a method of automatically transferring an object to be transferred
15 in the case in which the second sensors 23 and 24 first detect whether a portion protruding from the object to be transferred is present and the first sensors 21 and 22 second detect whether a portion protruding from the object to be transferred is present will be described.

When the chemical container, which is an object to be transferred, is
20 introduced through the input unit 10a, the transfer member of the first transfer line 30-1 is rotationally driven so that the object to be transferred is transferred along the first transfer line 30-1 and stops at a predetermined position. Whether any portion protruding from the front and rear surfaces of the stopped object to be transferred is present is first detected by the second sensors 23 and 24. Thereafter, the object to
25 be transferred is continuously transferred along the first transfer line 30-1, and

whether any portion protruding from both side surfaces of the object to be transferred is present is detected by the first sensors 21 and 22 while the object to be transferred is being transferred. As a result of being detected, when it is detected that there is a protruding portion, an alarm is generated, and the object to be transferred is
5 discharged outward through the discharge unit 10b.

An embodiment in which first sensors are provided at different positions will be described with reference to FIGS. 8 and 9.

In the case of the present embodiment, first sensors 21 and 22 are provided in a state of being coupled to supports 81 provided between a first inspection unit 20a
10 and an input unit 10a, and second sensors 23 and 24 are respectively located on front and rear surfaces of the first inspection unit 20a.

A light-emitting unit 21a and a light-receiving unit 21b of the first sensor 21 are respectively provided on an upper portion and a lower portion of the support 81 at one side, and a light-emitting unit 22a and a light-receiving unit 22b of the first
15 sensor 22 are respectively provided on an upper portion and a lower portion of the support 82 at the other side.

According to the configuration as described above, whether any portion protruding from both side surfaces of the object to be transferred is present outside set positions may be detected while the object to be transferred is being transferred,
20 and whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions may be detected while the object to be transferred is stationary, and thus the number of sensors for detecting the protruding portion may be minimized.

Another embodiment of the present invention will be described with
25 reference to FIG. 10.

In the embodiment of FIG. 10, third sensors 26a and 26b for detecting whether a portion protruding upward from the chemical container 2 is present outside a set position while the chemical container 2 and the pallet 3, which are objects to be transferred, are being transferred are provided.

5 The third sensors 26a and 26b include a light-emitting unit 26a and a light-receiving unit 26b, and the light-emitting unit 26a and the light-receiving unit 26b are respectively provided on a pair of supports 83 and 84 provided on both sides of a first transfer line 30-1.

 Another embodiment of the present invention will be described with
10 reference to FIG. 11.

 In the embodiment of FIG. 11, third sensors 27a and 27b are provided on an upper frame 25a provided on an upper portion of a first inspection unit 20a. A light-emitting unit 27a and a light-receiving unit 27b are provided at one side and the other side of the upper frame 25a. When the object to be transferred stops at a set
15 position inside the first inspection unit 20a, the third sensors 27a and 27b detect whether a portion protruding from the top of the object to be transferred is present outside a set position. In this case, the third sensors 27a and 27b may be formed using light curtains to detect an entire upper region of a first inspection unit 20a.

 In the above, the case of detecting whether the protruding portion is present
20 while the object to be transferred is being transferred has been described. However, while the object to be transferred stops at a predetermined position, whether any portion protruding from both side surfaces of the object to be transferred is present may be detected by the first sensors, whether any portion protruding from the front and rear surfaces of the object to be transferred is present may be detected by the
25 second sensors, and whether a portion protruding upward from the upper side of the

object to be transferred is present may be detected by the third sensors. In this case, in order to minimize an undetected region, all of the first to third sensors may be formed using light curtains.

Configurations of alignment units 70-1 and 70-2 will be described with
5 reference to FIGS. 12 to 14. Since a first alignment unit 70-1 and a second alignment unit 70-2 have the same configuration, only the first alignment unit 70-1 will be described and a description of the second alignment unit 70-2 will be omitted.

The first alignment unit 70-1 includes a plurality of transfer members 71 for transferring the chemical container 2 and the pallet 3, which are transferred from the
10 input unit 10a, along the first transfer line 30-1, a pair of alignment members 74-1 and 74-2 for aligning both side surfaces of the pallet 3 to be parallel to the first transfer line 30-1 by pushing, and a pair of alignment driving units 73-1 and 73-2 for reciprocating the alignment members 74-1 and 74-2 in opposite directions. Due to the above configuration, the first alignment unit 70-1 is configured to align the
15 chemical container 2 and the pallet 3, which are transferred along the first transfer line 30-1, with a central portion of the first transfer line 30-1, and to align the chemical container 2 and the pallet 3 according to a size of the pallet 3.

Both ends of the transfer member 71 are supported by a pair of side frames 72-1 and 72-2 having a length in a direction toward the first transfer line 30-1, and
20 the transfer member 71 and the side frames 72-1 and 72-2 are supported by a lower frame unit 76.

The pair of alignment members 74-1 and 74-2 include a first alignment member 74-1 provided at one side of the first transfer line 30-1 and a second alignment member 74-2 provided at the other side of the first transfer line 30-1.
25 The first alignment member 74-1 and the second alignment member 74-2 may have a

plate shape having a length in the direction toward the first transfer line 30-1, and may be formed to have a length corresponding to a length of the pallet 3. Further, the first alignment member 74-1 and the second alignment member 74-2 may be configured so that at least a portion thereof is in surface contact with the side surface
5 of the pallet 3, and thus the alignment of the pallet 3 may be improved.

The pair of alignment driving units 73-1 and 73-2 include a first alignment driving unit 73-1 that provides a driving force for reciprocating the first alignment member 74-1, and a second alignment driving unit 73-2 that provides a driving force for reciprocating the second alignment member 74-2.

10 A first drive shaft 75-1 is provided between the first alignment member 74-1 and the first alignment driving unit 73-1 to transmit a driving force of the first alignment driving unit 73-1 to the first alignment member 74-1, and a second drive shaft 75-2 is provided between the second alignment member 74-2 and the second alignment driving unit 73-2 to transmit a driving force of the second alignment
15 driving unit 73-2 to the second alignment member 74-2.

Pallets 3 having different sizes may be introduced into the apparatus 1 for automatically transferring the object to be transferred of the present invention. That is, the sizes of the pallets 3 may vary for each type of chemical.

When an amount of movement of each of the first alignment member 74-1
20 and the second alignment member 74-2 by the driving of the first alignment driving unit 73-1 and the second alignment driving unit 73-2 is preset to one constant value, the pallets 3 having different sizes are not properly aligned. For example, in the case in which the amount of movement of each of the first alignment member 74-1 and the second alignment member 74-2 is set in order to align first pallets having a
25 first size, when second pallets having a second size smaller than the first size are

aligned, the amount of movement of each of the first alignment member 74-1 and the second alignment member 74-2 does not reach side surfaces of the second pallets so that the alignment is not performed properly.

In order to solve the above problem, the first alignment unit 70-1 of the present invention is provided to perform alignment according to the size of the pallet 3. The size of the pallet 3 is information on the pallet 3, and may be determined for each type of the chemical. In this case, the information on the pallet 3 may refer to information (type) on the chemical.

The first alignment unit 70-1 includes pallet information recognition units 78-1 and 78-2 for recognizing the information on the pallet 3.

The pallet information recognition units 78-1 and 78-2 include a first pallet information recognition unit 78-1 provided at a side where the first alignment member 74-1 is provided, and a second pallet information recognition unit 78-2 provided at a side where the second alignment member 74-2 is provided.

The first pallet information recognition unit 78-1 and the second pallet information recognition unit 78-2 may be respectively provided on the top of a first side frame 72-1 and a second side frame 72-2.

The pallet information recognition units 78-1 and 78-2 may be configured to recognize a unique identifier formed at a barcode label, an RFID, or the like, which is attached to the pallet 3. For example, the pallet information recognition units 78-1 and 78-2 may be formed as scanners that recognize the information (or the information on the chemical) on the pallet 3 by scanning the unique identifier attached to the surface of the pallet 3.

Further, the pallet information recognition units 78-1 and 78-2 may be formed as pallet detection units for measuring the size of the pallet 3. The

alignment members 74-1 and 74-2 may be configured so that the amount of movement thereof is determined according to the size of the pallet detected by the pallet detection units.

5 The pallet detection unit may be formed as a distance measuring sensor for measuring a distance from the side surface of the pallet 3. It is possible to measure the size of the pallet 3 using the distance from the side surface of the pallet 3, which is measured by the distance measuring sensor.

Further, the pallet detection unit may be configured to detect positions of both side surfaces of the pallet 3. The positions of both side surfaces of the pallet 3
10 currently being transferred may be detected, and the amount of movement of each of the alignment members 74-1 and 74-2 may be determined according to the detected positions of both side surfaces of the pallet 3.

As described above, the amount of movement of each of the first alignment member 74-1 and the second alignment member 74-2 may be determined so that the
15 appropriate alignment is performed according to the size of the pallet 3 using the information on the pallet 3 recognized from the pallet information recognition units 78-1 and 78-2.

In the control unit, the amount of movement of each of the alignment members 74-1 and 74-2 may be preset to correspond to information on the plurality
20 of pallets 3. The alignment driving units 73-1 and 73-2 are controlled to correspond to the amount of movement of each of the alignment members 74-1 and 74-2 according to the preset information on the pallet 3 using the information on the pallet 3 recognized by the pallet information recognition units 78-1 and 78-2.

Since the alignment driving units 73-1 and 73-2 should control the amount of movement of each of the alignment members 74-1 and 74-2, the alignment driving units 73-1 and 73-2 may be formed as servomotors.

5 The first alignment unit 70-1 may include an in-place detection sensor for detecting whether the pallet 3 is located at a correct position in order for alignment to be performed by the first alignment unit 70-1. The in-place detection sensor may include a first in-place detection sensor provided forward in the transfer direction to detect whether the front of the pallet 3 that has entered the first alignment unit 70-1 escapes from a set position, and a second in-place detection sensor provided rearward
10 in the transfer direction to detect whether the rear of the pallet 3 that has entered the first alignment unit 70-1 reaches a set position.

The pallet 3 transferred along the first transfer line 30-1 is transferred until a rear end of the pallet 3 is detected by the second in-place detection sensor. Further, when a front end of the pallet 3 is detected by the first in-place detection sensor, the
15 transfer of the pallet 3 stops.

In the front and rear of the first alignment unit 70-1, escape prevention stoppers 77-1 and 77-2 for preventing the pallet 3 that has entered the first alignment unit 70-1 from escaping forward or rearward are provided, respectively. The escape prevention stopper 77-1 located forward prevents the front end of the pallet 3 from
20 escaping forward, and the escape prevention stopper 77-2 located rearward prevents the rear end of the pallet 3 from escaping rearward. For the above operation, the escape prevention stoppers 77-1 and 77-2 may be configured to be moved up or down in a vertical direction so that the escape prevention stoppers 77-1 and 77-2 may be moved up to a higher position than the position of an upper end of the transfer
25 member 71, and thus the escape of the pallet 3 may be prevented.

When the transfer member 71 is formed as a roller, the transfer member 71 is transferred along the first transfer line 30-1 in a state in which a surface of the roller is in contact with a bottom surface of the pallet 3. In order to generate such a conveying force, a frictional force is required, and thus the surface of the roller may
5 be made of a synthetic resin or may be made of a polyethylene (PE) material among synthetic resins. However, when the alignment members 74-1 and 74-2 align both side surfaces of the pallet 3 by pushing, the bottom surface of the pallet 3 is in contact with the upper surface of the transfer member 71, and thus there is a problem in that when the alignment members 74-1 and 74-2 push the side surface of the pallet
10 3, the pallet 3 is not pushed due to the frictional force of the surface of the roller or a scratch is generated on the surface of the roller.

In order to prevent the above problem, when the alignment members 74-1 and 74-2 push the pallet 3 in a state in which the bottom surface of the pallet 3 is separated upward from the surface of the roller by lifting the chemical container 2
15 and the pallet 3 upward, the alignment may be performed without scratching the surface of the roller.

To this end, a lifting member 79 and a lift driving unit (not illustrated), which lift the pallet 3, may be provided. The lifting member 79 is a component for lifting the pallet 3 upward in a state in which the pallet 3 is placed on the upper portion of
20 the transfer member 71, and may be provided as a plurality of lifting members 79 in the transfer direction of the pallet 3. In this case, the lifting members 79 are provided between the adjacent transfer members 71 to be moved up and down without interfering with the transfer member 71.

The lift driving unit is a component for lifting the lifting member 79 in the vertical direction, and when there are a plurality of lifting members 79, the lift driving unit may integrally lift and lower the plurality of lifting members 79.

5 In the above, the alignment is exemplified as being performed in a state in which the pallet 3 is lifted using the lifting member 79 and the lift driving unit, but when the friction between the transfer member 71 and the pallet 3 is not large, the lifting member 79 and the lift driving unit are not provided so that the pallet 3 may be aligned without lifting.

10 A method of automatically transferring the chemical container performed by the apparatus for automatically transferring the chemical container configured as described above will be described.

First, in order to transfer a chemical container 2 loaded on a pallet 3 to chemical supply devices 100-1 and 100-2, the chemical container 2 is introduced into an input unit 10a.

15 The chemical container 2 and the pallet 3 that are introduced into the input unit 10a are transferred along a first transfer line 30-1.

Whether the pallet 3 transferred along the first transfer line 30-1 is located at a preset correct position is detected by an in-place detection sensor. When it is determined that the pallet 3 is located at the correct position, the driving of a transfer member provided in the first transfer line 30-1 stops so that the transfer of the pallet 3 stops.

20

Thereafter, a lifting member 79 is moved upward by driving a lift driving unit, and thus a bottom surface of the pallet 3 is spaced apart from the transfer member 71.

Then, at least one of a first pallet information recognition unit 78-1 and a second pallet information recognition unit 79-1 recognizes information on the pallet 3, and a control unit receives the recognized information on the pallet 3.

The information on the pallet 3 may be information about a size of the pallet 3 or information about a position of the pallet 3.

The amount of movement of each of a first alignment member 74-1 and a second alignment member 74-2 is determined according to the information on the pallet 3 received by the control unit. When the amount of movement of each of the alignment members 74-1 and 74-2 is determined, the control unit drives a first alignment driving unit 73-1 and a second alignment driving unit 73-2 so that the first alignment member 74-1 and the second alignment member 74-2 are moved in opposite directions toward the pallet 3 interposed therebetween.

By such an operation, the first alignment member 74-1 and the second alignment member 74-2 push both side surfaces of the pallet 3 so that the pallet 3 is aligned.

As described above, when the pallet 3 is aligned according to the information on the pallet 3 including the size of the pallet 3, the pallet 3 may be aligned at a predetermined position even when pallets 3 having different sizes are introduced, and thus the apparatus may be efficiently operated.

After the pallet 3 is aligned by the first alignment unit 70-1, the chemical container 2 and the pallet 3 are continuously transferred along the first transfer line 30-1 and are transferred to the first inspection unit 20a.

The first inspection unit 20a checks information on a chemical of the chemical container 2, and when the information on the chemical matches information required by the chemical supply devices 100-1 and 100-2, the control unit controls

the chemical container 2 to be supplied to the chemical supply devices 100-1 and 100-2.

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
5 the above-described embodiments. Various modifications may be made within the scope of the claims, the detailed description of the present invention, and the accompanying drawings, and also belong to the present invention.

[CLAIMS]

[Claim 1]

An apparatus for automatically transferring an object to be transferred, the apparatus comprising:

5 a pair of first sensors configured to detect whether any portion protruding from both side surfaces of the object to be transferred, which is transferred along a transfer line, is present outside set positions while the object to be transferred is being transferred; and

 a pair of second sensors configured to detect whether any portion protruding
10 from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary.

[Claim 2]

 The apparatus of claim 1, wherein the object to be transferred includes a chemical container that is supplied to a chemical supply device and a pallet that
15 supports a lower portion of the chemical container.

[Claim 3]

 The apparatus of claim 2, wherein the pair of first sensors and the pair of second sensors are provided in an inspection unit provided on the transfer line in order to check information on a chemical of the chemical container.

20 [Claim 4]

 The apparatus of claim 2, wherein:

 an inspection unit provided on the transfer line and an input unit for placing the chemical container onto the transfer line are provided in order to check information on a chemical of the chemical container;

the pair of first sensors are provided in a state of being coupled to supports provided between the inspection unit and the input unit; and

the second sensors are each located on front and rear surfaces of the inspection unit.

5 [Claim 5]

The apparatus of claim 3, comprising:

a control unit configured to receive the information on the chemical of the chemical container transferred along the transfer line and, when the information on the chemical matches information required by the chemical supply device, supply the
10 chemical container to the chemical supply device;

an input unit into which the chemical container is introduced; and

a discharge unit provided on a side of the input unit and configured to discharge the chemical container that is fully used in the chemical supply device,

wherein the transfer line includes a first transfer line connected to the input
15 unit and a second transfer line disposed adjacent to the first transfer line to be parallel to the first transfer line and connected to the discharge unit.

[Claim 6]

The apparatus of claim 5, wherein:

in the inspection unit, when it is determined that the chemical container
20 transferred from the input unit is incorrectly introduced, a connection unit that connects the first transfer line to the second transfer line in order to transfer the chemical container to the second transfer line by changing a transfer direction of the chemical container by the inspection unit is provided; and

in the inspection unit, the chemical container transferred to the second transfer line through the connection unit is discharged outward through the discharge unit.

[Claim 7]

- 5 The apparatus of claim 1, wherein the first sensors and the second sensors are provided so that the object to be transferred is first detected by the first sensors while the object to be transferred is being transferred, and the object to be transferred is detected second by the second sensors while the object to be transferred stops at a predetermined position after the object to be transferred is transferred.

10 [Claim 8]

The apparatus of claim 1, wherein the first sensors and the second sensors are provided so that the object to be transferred is first detected by the second sensors while the object to be transferred stops at a predetermined position after the object to be transferred is transferred, and the object to be transferred is detected second by the first sensors while the object to be transferred is being transferred.

15 [Claim 9]

The apparatus of claim 1, wherein the first sensor includes a light-emitting unit that emits light in an upward or downward direction and a light-receiving unit that receives the light generated by the light-emitting unit.

20 [Claim 10]

The apparatus of claim 9, wherein the light-emitting unit is formed as a light source unit that generates a laser beam and the light-receiving unit is formed as a reflecting plate that reflects the laser beam.

[Claim 11]

The apparatus of claim 2, wherein:

an inspection unit provided on the transfer line is provided in order to check information on a chemical of the chemical container; and

the second sensors are each formed using a light curtain to detect an entire
5 region of a front surface of the inspection unit and an entire region of a rear surface of the inspection unit.

[Claim 12]

The apparatus of claim 1, further comprising a third sensor configured to detect whether a portion protruding upward from an upper surface of the object to be
10 transferred is present outside a set position.

[Claim 13]

The apparatus of claim 12, wherein:

the object to be transferred includes a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical
15 container;

an inspection unit provided on the transfer line is provided in order to check information on the chemical of the chemical container; and

the third sensor is provided on an upper frame provided on an upper side of the inspection unit and detects whether a portion protruding upward from the upper
20 surface of the object to be transferred is present while the object to be transferred is stationary.

[Claim 14]

The apparatus of claim 12, wherein the third sensor detects whether a portion protruding upward from the upper surface of the object to be transferred is present
25 while the object to be transferred is being transferred.

[Claim 15]

An apparatus for automatically transferring an object to be transferred, the apparatus comprising:

5 a pair of first sensors configured to detect whether any portion protruding from both side surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary; and

a pair of second sensors configured to detect whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred is stationary,

10 wherein the first sensors and the second sensors are each formed using a light curtain to detect both of the side surfaces and entire regions of the front and rear surfaces.

[Claim 16]

The apparatus of claim 15, wherein:

15 a transfer line is provided to transfer a chemical container, which is loaded on a pallet and introduced into an input unit, to a chemical supply device; and

the chemical container and the pallet, which are transferred along the transfer line, are aligned with a central portion of the transfer line, wherein the apparatus includes an alignment unit configured to align the chemical container and the pallet
20 according to a size of the pallet.

[Claim 17]

The apparatus of claim 16, wherein:

an inspection unit is provided in order to check information on a chemical of the chemical container transferred along the transfer line; and

25 the alignment unit is provided between the input unit and the inspection unit.

[Claim 18]

The apparatus of claim 16, wherein the alignment unit includes:

a plurality of transfer members configured to transfer the chemical container and the pallet, which are transferred from the input unit, along the transfer line;

5 a pair of alignment members configured to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing; and

an alignment driving unit configured to reciprocate the pair of alignment members in opposite directions.

[Claim 19]

10 The apparatus of claim 18, wherein the alignment member has a length in a direction toward the transfer line and at least a portion thereof is in surface contact with a side surface of the pallet.

[Claim 20]

The apparatus of claim 16, wherein:

15 the alignment unit includes a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and

20 the control unit controls the alignment driving unit so that the recognized information on the pallet corresponds to an amount of movement of the alignment member.

[Claim 21]

The apparatus of claim 20, wherein the information on the pallet received by

25 the pallet information recognition unit includes information about the size of the

pallet, and the control unit controls the alignment driving unit to determine the amount of movement of the alignment member according to the size of the pallet.

[Claim 22]

5 The apparatus of claim 20, wherein the amount of movement of the alignment member corresponding to information on a plurality of pallets is preset in the control unit.

[Claim 23]

10 The apparatus of claim 20, wherein the pallet information recognition unit recognizes a unique identifier formed at a barcode label or a radio-frequency identification (RFID) attached to the pallet.

[Claim 24]

The apparatus of claim 16, wherein:

15 the alignment unit includes a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and

20 the pallet information recognition unit includes a pallet detection unit for detecting the size of the pallet, and an amount of movement of the alignment member is determined according to the size of the pallet detected by the pallet detection unit.

[Claim 25]

The apparatus of claim 16, wherein:

25 the alignment unit includes a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the

pallet with the transfer line to be parallel to the transfer line by pushing both of the side surfaces of the pallet; and

the pallet information recognition unit includes a distance measuring sensor for measuring a distance from the pallet, and an amount of movement of the alignment member is determined according to the distance from the pallet measured
5 by the distance measuring sensor.

[Claim 26]

The apparatus of claim 16, comprising an in-place detection sensor configured to detect whether the pallet is placed at a correct position to be aligned by
10 the alignment unit.

[Claim 27]

The apparatus of claim 26, wherein the in-place detection sensor includes:

a first in-place detection sensor which is provided in a front of the alignment unit and detects whether a front of the pallet that has entered the alignment unit
15 escapes from a set position; and

a second in-place detection sensor which is provided at a rear of the pallet and detects whether the rear of the pallet that has entered the alignment unit reaches a set position.

[Claim 28]

20 The apparatus of claim 16, wherein an escape prevention stopper for preventing the pallet that has entered the alignment unit from escaping forward or rearward is provided forward and rearward from the alignment unit.

[Claim 29]

The apparatus of claim 16, wherein:

the alignment unit includes a pallet information recognition unit for recognizing information on the pallet, and a pair of alignment members which are moved by the driving of the alignment driving unit to align both side surfaces of the pallet with the transfer line to be parallel to the transfer line by pushing both of the
5 side surfaces of the pallet; and

the alignment driving unit is formed as a servomotor in order to control an amount of movement of the alignment member.

[Claim 30]

The apparatus of claim 16, comprising a control unit configured to receive the
10 information on a chemical of the chemical container transferred along the transfer line and, when the information on the chemical matches information required by the chemical supply device, supply the chemical container to the chemical supply device.

[Claim 31]

A method of automatically transferring an object to be transferred, the
15 method comprising:

operation a) of detecting, by first sensors, whether any portion protruding from both side surfaces of the object to be transferred, which is transferred along a transfer line, is present outside set positions while the object to be transferred is being transferred; and

20 operation b) of detecting, by second sensors, whether any portion protruding from front and rear surfaces of the object to be transferred is present outside a set position while the object to be transferred is stationary.

[Claim 32]

A method of automatically transferring an object to be transferred, the
25 method comprising:

operation a) of detecting, by second sensors, whether any portion protruding from front and rear surfaces of the object to be transferred is present outside set positions while the object to be transferred, which is transferred along a transfer line, is stationary; and

5 operation b) of detecting, by first sensors, whether any portion protruding from both side surfaces of the object to be transferred is present outside set positions while the object to be transferred is being transferred.

[Claim 33]

The method of claim 31 or 32, wherein, when it is detected that the
10 protruding portion is present by at least one of the first sensors and the second sensors, the object to be transferred is discharged outward through a discharge unit.

[Claim 34]

The method of claim 33, wherein the object to be transferred is discharged through the discharge unit provided on a second transfer line disposed adjacent to a
15 first transfer line connected to an input unit, into which the object to be transferred is introduced, to be parallel to the first transfer line.

[Claim 35]

The method of claim 34, wherein:

the object to be transferred includes a chemical container that is supplied to a
20 chemical supply device and a pallet that supports a lower portion of the chemical container; and

the first sensors and the second sensors are provided in an inspection unit provided on the transfer line in order to check information on a chemical of the chemical container, wherein, in the inspection unit, the object to be transferred is

transferred to the second transfer line so that the object to be transferred is discharged through the discharge unit.

[Claim 36]

5 The method of claim 31 or 32, wherein the object to be transferred including a chemical container that is supplied to a chemical supply device and a pallet that supports a lower portion of the chemical container is introduced into an input unit and then is transferred to the chemical supply device along the transfer line, and the control unit controls the chemical container and the pallet, which are transferred along the transfer line, to be aligned with a central portion of the transfer line
10 according to a size of a pallet.

[Claim 37]

 The method of claim 36, wherein the control unit receives information about the size of the pallet and controls an alignment driving unit for aligning the pallet according to the size of the pallet.

15 [Claim 38]

 The method of claim 36, wherein the control unit receives information about positions of both side surfaces of the pallet and controls an alignment driving unit for aligning the pallet according to the positions of both of the side surfaces of the pallet.

[Claim 39]

20 The method of claim 36, wherein the control unit receives information on a chemical of the chemical container transferred along the transfer line, and when the information on the chemical matches information required by the chemical supply device, the control unit controls the chemical container to be supplied to the chemical supply device.

25 [Claim 40]

The method of claim 36, wherein, when it is detected that the pallet transferred along the transfer line is placed at a preset correct position, alignment of the pallet is performed.