[CLAIMS]

[Claim 1]

An apparatus for automatic transport of chemical containers, the apparatus comprising:

at least one transport line configured to transport a chemical container (2), which is input into an input unit (110), to a chemical supply device (5);

a controller configured to control the chemical container (2), which is transported through the transport line, to be supplied to the chemical supply device (5); and

a transport car (600) configured to linearly moves along a transport car rail (500) that is provided to be parallel to at least a portion of the transport line, wherein at an input position, the transport car (600) deliver the chemical container (2) from the transport line to the chemical supply device (5) or at a discharge position that is spaced apart from the input position along the transport car rail (500), the transport car (600) delivers the chemical container (2) from the chemical supply device (5) to the transport line; and

wherein, in a case in which the transport line at the discharge position malfunctions, the chemical container (2) is discharged from the chemical supply device (5) through the transport line at the input position.

[Claim 2]

The apparatus of claim 1, wherein an inspection unit (602) configured to check chemical information of the chemical container (2) is provided in the transport car (600), and when the chemical information checked by the inspection unit (602) matches chemical information required by the chemical supply device (5), the

controller controls the chemical container (2) to be supplied to the chemical supply device (5).

[Claim 3]

The apparatus of claim 1, wherein the transport car (600) is provided as a plurality of transport cars (600).

[Claim 4]

The apparatus of claim 3, wherein the plurality of transport cars (600) include:

a first transport car configured to input the chemical container (2) to the chemical supply device (5); and

a second transport car configured to discharge the chemical container (2) from the chemical supply device (5) to the transport line.

[Claim 5]

The apparatus of claim 3, wherein the plurality of transport cars (600) include:

a first transport car (600-1) configured to input and discharge a first chemical container, which accommodates a first chemical, to and from the chemical supply device (5); and

a second transport car (600-2) configured to input and discharge a second chemical container, which accommodates a second chemical, to and from the chemical supply device (5).

[Claim 6]

The apparatus of claim 3, wherein:

the chemical supply device (5) includes a first chemical supply device (5-1) and a second chemical supply device (5-2); and

the plurality of transport cars (600) include a first transport car (600-1) configured to input and discharge a first chemical container, which accommodates a first chemical, to and from the first chemical supply device and a second transport car (600-2) configured to input and discharge a second chemical container, which accommodates a second chemical, to and from the second chemical supply device.

[Claim 7]

The apparatus of claim 1, wherein:

the chemical supply device (5) is provided as a plurality of chemical supply devices (5);

the chemical container (2) is provided as a plurality of chemical containers (2) that accommodate a plurality of different chemicals; and

the transport car (600) inputs or discharges any one of the plurality of chemical containers to or from any one of the plurality of chemical supply devices.

[Claim 8]

The apparatus of claim 1, wherein:

the transport car (600) is provided between the transport line and the chemical supply device (5), and includes a transport member driven by the driving unit and, in a case in which the transport member provided on the transport line is driven and transports the chemical container (2) in a direction toward the chemical supply device (5), the driving unit is driven at the input position, which is disposed between the transport line and the chemical supply device (5), to deliver the chemical container (2) from the transport line to the chemical supply device (5).

[Claim 9]

The apparatus of claim 1, wherein a waiting place for the transport car (600) is provided at both sides of the transport car rail (500) while the chemical supply device (5) is disposed therebetween.

[Claim 10]

The apparatus of claim 2, wherein the inspection unit (602) includes a chemical container scanner configured to scan chemical information on a surface of the chemical container (2).

[Claim 11]

The apparatus of claim 2, wherein:

a pallet (3) configured to be transported along the transport line in a state in which the chemical container (2) is loaded thereon is provided; and

the inspection unit (602) includes a chemical container scanner configured to scan chemical information on a surface of the pallet (3).

[Claim 12]

The apparatus of claim 1, wherein the transport car (600) includes:

a transport member (601) configured to input the pallet (3), which has the chemical container (2) loaded thereon, to the chemical supply device (5); and

a chemical base (603) provided at a lower portion of the transport member (601) to accommodate the chemical falling from the chemical container (2).

[Claim 13]

The apparatus of claim 12, wherein the transport car (600) includes a drain valve (605) configured to drain the chemical accommodated in the chemical base (603).

[Claim 14]

The apparatus of claim 12, wherein the transport car (600) includes a chemical sensor configured to sense the chemical that falls into the chemical base (603).

[Claim 15]

The apparatus of claim 1, wherein:

a space in which the transport car (600) is stored and waits is formed at one side end portion of the transport car rail (500) configured to move the transport car (600); and

in a case in which the transport car (600) is stored and waits in the space, a safety bar including a safety sensor is provided at an inlet side, through which the transport car (600) enters, to prevent collision with another transport car.

[Claim 16]

The apparatus of claim 15, wherein a safety sensor configured to sense detachment of the safety bar from a support base is provided.

[Claim 17]

The apparatus of claim 1, wherein:

the transport car (600) includes:

a transport member (601) on which the pallet (3) having the chemical container (2) loaded thereon is loaded; and

a driving unit configured to drive the transport member (601) to transport the pallet (3) having the chemical container (2) loaded thereon to the chemical supply device (5) or to the transport line.

[Claim 18]

The apparatus of claim 1, wherein the transport car (600) includes an emergency stop switch (604) configured to stop the transport car (600) in case of emergency.

[Claim 19]

The apparatus of claim 18, wherein the emergency stop switch (604) is provided as a plurality of emergency stop switches (604) on a frame (610) provided on the transport car (600).

[Claim 20]

The apparatus of claim 1, wherein a stopper (501) configured to prevent deviation of the transport car (600) from the transport car rail (500) is provided at an end portion of the transport car rail (500).

[Claim 21]

The apparatus of claim 20, wherein the stopper (501) includes an impact absorbing unit to mitigate impact in a case in which collision of the transport car (600) occurs.

[Claim 22]

The apparatus of claim 8, wherein a sensor (502) configured to sense whether an object is present between both side end portions of the transport car rail (500) is provided at an end portion of the transport car rail (500).

[Claim 23]

The apparatus of claim 22, wherein, in a case in which an object is sensed by the sensor (502), the transport car (600) is stopped.

[Claim 24]

A method for automatic transport of chemical containers, the method comprising:

a) putting a chemical container (2) into an input unit (110);

b) transporting the chemical container (2) through at least one transport line;

c) in order to deliver the chemical container (2) from the transport line to a chemical supply device (5), placing a transport car (600), which linearly moves along a transport car rail (500) provided to be parallel to at least a portion of the transport line, at an input position;

d) putting the chemical container (2) placed on the transport line into the chemical supply device (5) via the transport car (600);

e) when the chemical container (2) transported to the chemical supply device (5) is mounted inside the chemical supply device (5) and the chemical accommodated in the chemical container (2) is used up, discharging the chemical container (2) to the outside of the chemical supply device (5) and loading the chemical container (2) on the transport car (600) placed at the input position;

f) in a state in which the chemical container (2) is loaded on the transport car (600), moving the transport car (600) along the transport car rail (500) to place the transport car (600) at a discharge position that is spaced apart from the input position; and

g) mounting the chemical container (2), which is on the transport car (600) placed at the discharge position, on the transport line and then transporting the chemical container (2) along the transport line to discharge the chemical container (2) to the outside;

wherein in the case in which the transport line at the discharge position malfunctions, the chemical container (2) is discharged from the chemical supply device (5) through the transport line disposed at the input position.

[Claim 25]

The method of claim 24, wherein:

the operation b) further includes checking chemical information of the chemical container (2) by an inspection unit provided on the transport line; and

the operation d) includes, when the chemical information checked by the inspection unit matches chemical information required by the chemical supply device (5), transporting the chemical container (2) placed on the transport line to the chemical supply device (5).

[Claim 26]

The method of claim 25, wherein:

the chemical supply device (5) includes a plurality of chemical supply devices (5) configured to supply a plurality of different kinds of chemicals; and

the inspection unit checks whether the chemical information checked from the chemical container (2) is one of pieces of chemical information on the plurality of different kinds of chemicals.

[Claim 27]

The method of claim 25, wherein the operation d) includes:

placing the chemical container (2), which is placed on the transport line, on the transport car (600) which is disposed between the transport line and the chemical supply device (5);

checking chemical information of the chemical container (2) using an inspection unit provided in the transport car (600); and

when the chemical information checked using the inspection unit matches chemical information required by the chemical supply device (5), the transport member provided on the transport line is driven and transporting the chemical container (2), to the direction for the chemical supply device (5), and by driving the transport member of the transport car (600), the chemical container (2) located on the transfer line is transferred to the chemical supply device (5).

[Claim 28]

The method of claim 27, wherein the checking of the chemical information of the chemical container (2) includes checking chemical information on a surface of a pallet that is transported along the transport line while the chemical container (2) is loaded thereon.

[Claim 29]

The method of claim 24, further comprising:

in the step e) discharging the chemical container (2) to the outside of the chemical supply device (5) and loading the chemical container (2) on the transport car (600) placed at the input position;

in the step f) moving the transport car (600) along the transport car rail (500) to place the transport car (600) at a discharge position from the input position; and

in the step g) mounting the chemical container (2), which is on the transport car (600) placed at the discharge position, on the transport line.

[Claim 30]

The method of claim 24, wherein:

the chemical supply device (5) includes a first chemical supply device (5-1) configured to supply a first chemical and a second chemical supply device (5-2) configured to supply a second chemical;

the transport car (600) includes a first transport car (600-1) configured to input a first chemical container, which accommodates the first chemical, to the first chemical supply device (5-1) and a second transport car (600-2) configured to input a second chemical container, which accommodates the second chemical, to the second chemical supply device (5-2),

the operation c) includes placing the first transport car (600-1) at an input position of the first chemical supply device (5-1) or placing the second transport car (600-2) at an input position of the second chemical supply device (5-2); and

the step d) includes transporting the first chemical container to the first chemical supply device (5-1) via the first transport car (600-1) or transporting the second chemical container to the second chemical supply device (5-2) via the second transport car (600-2).

[Claim 31]

The method of claim 24, wherein:

the chemical container is provided as a plurality of chemical containers that accommodate a plurality of different chemicals;

the chemical supply device (5) is provided as a plurality of chemical supply devices (5) to which the plurality of chemical containers are input; and

in a case in which the transport car (600) is provided as a plurality of transport cars (600), after one transport car inputs the plurality of chemical containers to the plurality of chemical supply devices, the plurality of chemical containers are discharged from the plurality of chemical supply devices.

[Claim 32]

The method of claim 24, wherein, in a case in which the transport car (600) is provided as a plurality of transport cars (600), the chemical container is input to the

chemical supply device (5) using at least one transport car, and the chemical container is discharged from the chemical supply device (5) using another transport car.

[Claim 33]

The method of claim 32, wherein:

the chemical supply device (5) includes a first chemical supply device (5-1) configured to supply a first chemical and a second chemical supply device (5-2) configured to supply a second chemical;

the transport car (600) includes a first transport car (600-1) and a second transport car (600-2);

the chemical container includes a first chemical container accommodating the first chemical and a second chemical container accommodating the second chemical;

the first transport car (600-1) inputs the first chemical container to the first chemical supply device (5-1) and inputs the second chemical container to the second chemical supply device (5-2); and

the second transport car (600-2) discharges the first chemical container from the first chemical supply device (5-1) and discharges the second chemical container from the second chemical supply device (5-2).