

[DESCRIPTION]

[Invention Title]

LOCKING DEVICE FOR SUPPLYING CHEMICAL, AND AUTOMATIC
CHEMICAL SUPPLY APPARATUS INCLUDING SAME

5 [Technical Field]

The present invention relates to a locking device for supplying a chemical and an automatic chemical supply apparatus including the same and, more particularly, to a locking device for supplying a chemical, which may prevent a chemical from leaking and allows automatic locking and manual locking to be
10 implemented simultaneously; and an automatic chemical supply apparatus including the same.

[Background Art]

In general, in all companies using hazardous chemicals, such as companies that manufacture semiconductors, semiconductor devices, liquid crystal displays
15 (LCDs), and organic light emitting diodes (OLEDs), pharmaceutical companies, and paint companies, various types of chemicals are used, and methods of safely supplying these chemicals are also diversified. These chemicals are transferred from a chemical tank of a tank lorry stopped outside a building to a chemical storage tank installed inside the building and are then transferred from the chemical storage
20 tank to a chamber in which a unit process is performed. A method of manually connecting a chemical supply hose to a connector by an operator has been used as the conventional method of transferring chemicals from the tank lorry to the chemical storage tank, and the method will be described in detail below.

A chemical hose for supplying chemicals and a nitrogen hose for supplying
25 nitrogen are connected to the tank lorry, a chemical male connector and a nitrogen

male connector are respectively coupled to ends of the chemical hose and the nitrogen hose, and each of the male connectors is covered with a cap for sealing an open end. Further, a chemical female connector and a nitrogen female connector to be respectively inserted into the male connector of the chemical hose and the male
5 connector of the nitrogen hose are provided on the chemical storage tank. Each of the chemical female connector and the nitrogen female connector is also covered with a cap for sealing an open end thereof. The operator pulls out the chemical hose and the nitrogen hose from the tank lorry, separates the caps, which are coupled to the chemical male connector and the nitrogen male connector, from the chemical
10 male connector and the nitrogen male connector, and separates the caps, which are coupled to the chemical female connector and the nitrogen female connector, from the chemical female connector and the nitrogen female connector. Thereafter, the chemical male connector is coupled to the chemical female connector, and the nitrogen male connector is coupled to the nitrogen female connector.

15 In this way, in a state in which the male connector and the female connector are coupled, when nitrogen at a certain pressure is supplied to the tank lorry through the nitrogen hose from a nitrogen storage tank provided inside the building, the chemical inside the tank lorry is transferred to the chemical storage tank through the nitrogen hose due to the pressure of nitrogen. However, according to such a
20 conventional method, as the operator manually couples or separates the chemical connectors and the nitrogen connectors to or from each other and supplies nitrogen at a certain pressure, the chemical may leak to the outside, and in this case, the operator may be exposed to the chemical.

Korean Patent No. 10-1572537 has been disclosed as the conventional
25 technology for solving this problem. In Korean Patent No. 10-1572537, a chemical

relay unit called an automatic clean quick coupler (ACQC) unit is provided between the tank lorry and the chemical storage tank. Here, the chemical storage tank is generally provided inside the building, and the ACQC unit serves as a relay between the chemical tank of the tank lorry located outside the building and the chemical storage tank located inside the building.

According to the conventional ACQC unit, after the chemical hose and the nitrogen hose are seated in a mounting part, the chemical hose and the nitrogen hose are linearly moved by a first transfer part and a second transfer part, and thus the male connectors, the chemical hose, and the nitrogen hose are connected to the chemical female connector and the nitrogen female connector provided in the ACQC unit. In this way, in a state in which the chemical male connector and the chemical female connector are connected and the nitrogen male connector and the nitrogen female connector are connected, nitrogen at a certain pressure is supplied to the chemical tank of the tank lorry through the ACQC unit and the chemical is discharged and stored in the chemical storage tank due to the pressure of the supplied nitrogen through the chemical hose.

In this case, a locking unit is provided to maintain a state in which the chemical male connector and the nitrogen male connector are respectively coupled to the chemical female connector and the nitrogen female connector. The locking unit is provided with eccentric cams to grip the male connector. The pair of eccentric cams are provided on one side and the other side of one female connector. Since two cylinders are provided to drive the pair of eccentric cams, a large space for installing the cylinders is required.

In Korean Patent No. 10-1779493, a fixing unit is provided to maintain a state in which the chemical male connector and the chemical female connector are

coupled. The fixing unit includes a first locking member, a first locking member drive unit, a second locking member, and a second locking member drive unit operating in a horizontal direction and a vertical direction. In this case, the second locking member is located below the chemical male connector, and when the remaining chemical falls on a joint portion between the male connector and the female connector due to undrying or leakage, the second locking member and the second locking member drive unit are damaged due to corrosion. Further, the first locking member is separated from the first locking member drive unit which is a fixed one side and the second locking member is separated from the second locking member drive unit that is a fixed one side. Thus, when a situation occurs in which a chemical male connector or a chemical female connector cap is pushed rearward, an excessive force is applied to the first locking member and the second locking member, and thus the first locking member and the second locking member may be damaged during long-term use. Further, when the locking unit malfunctions, the operator needs to manually operate the eccentric cams to grip the male connector. In this case, when a malfunction occurs in a state in which the first locking member and the second locking member are in a locked position, it is difficult to move the first locking member and the second locking member to an unlocked position, and thus it is difficult to manually supply the chemical. In preparation for such a case, a locking unit that may be manually operated by the operator is required. However, when the manual locking unit is additionally provided, the device is very complicated, and a lot of time and costs are required for maintenance.

Further, Korean Utility Model No, 20-0201657 discloses a manual locking unit. When the manual locking unit is provided in addition to the automatic locking unit, the manual locking unit uses a plurality of fixing pins for fixing the position of a

lever or the like for preventing accidents that may occur because the locking unit deviates from a correct position at each of a locked position and an unlocked position. In this case, since the operator should manually operate the fixing pins, work becomes cumbersome.

5 [Disclosure]

[Technical Problem]

The present invention is conceived for solving the above-described problems, and the present invention is directed to providing a locking device for supplying a chemical capable of selecting an automatic mode in which locking is
10 performed by driving of a drive unit or a manual mode in which an operator manually performs the locking.

The present invention is also directed to providing a locking device for supplying a chemical of which a structure can be simplified as two locking parts are simultaneously locked or unlocked.

15 The present invention is also directed to provide a locking device for supplying a chemical capable of preventing damage to the drive unit because the drive unit is not affected even when a chemical falls at a connection portion between a male connector and a female connector.

The present invention is also directed to provide a locking device for
20 supplying a chemical that may be easily and manually operated by an operator when the drive unit malfunctions.

[Technical Solution]

One aspect of the present invention provides a locking device for supplying a chemical, the locking device including: a drive unit that provides a driving force; a
25 first locking part (330) and a second locking part (340) of which positions are

changed between a locked position in which a position of a locked object is fixed and an unlocked position in which movement of the locked object is allowed; and at least one link member configured to transfer the driving force of the drive unit (310) to the first locking part (330) and the second locking part (340).

5 The first locking part (330) and the second locking part (340) may be provided to face each other in a vertical direction and are locked by coming into contact with both sides of the locked object.

 The first locking part (330) may include a first locking member (331) coming into contact with one side of the locked object to be in a locked state and a first
10 connection rod (332) hinge-connected to the other end of the second link member (322), and the second locking part (340) may include a second locking member (341) coming into contact with the other side of the locked object to be in a locked state and a second connection rod (342) hinge-connected to the other end of the third link member (323).

15 A second link pin (334) that includes a first hinge shaft (334c) hinge-connected to the second link member (322) and a first insertion groove (334b) formed in a direction perpendicular to the first hinge shaft 334c, the first connection rod (332) being inserted into the first insertion groove (334b); a first coupling member (335) that prevents the first connection rod (332) from being separated from
20 the first insertion groove (334b) by covering an upper portion of the first insertion groove (334b) into which the first connection rod (332) is inserted; a third link pin (344) that includes a second hinge shaft hinge-connected to the third link member (323) and a second insertion groove formed in a direction perpendicular to the second hinge shaft, the second connection rod (342) being inserted into the second
25 insertion groove; and a second coupling member (345) that prevents the second

connection rod (342) from being separated from the second insertion groove by covering an upper portion of the second insertion groove into which the second connection rod (342) is inserted.

A first link pin coupling part (333) having a diameter that is larger than a diameter of the first connection rod (332) is integrally formed at an end of the first connection rod (332); a second link pin coupling part (343) having a diameter that is larger than a diameter of the second connection rod (342) is integrally formed at an end of the second connection rod (342); the first link pin coupling part (333) is caught by the first coupling member (335) and is thus prevented from being removed through the first insertion groove (334b); and the second link pin coupling part (343) is caught by the second coupling member (335) and thus can be prevented from falling out of the second insertion groove.

Further comprising a first link pin (324) that is linearly moved by the drive unit, wherein the at least one link member may include a second link member (322) and a third link member (323) that are rotated by the linear movement of the first link pin (324).

Each of the first locking part (330) and the second locking part (340) has, as a rotation center, a fixed position of one end in contact with the locked object, and the first locking part (330) and the second locking part (340) rotate about the fixed position by the rotational movements of the second link member (322) and the third link member (323) and thus can be changed between the locked position and the unlocked position.

Further comprising a first link member (321) that is linearly moved in a horizontal direction by the drive unit, wherein the linear movement of the first link pin (324) in a vertical direction is performed by the linear movement of the first link

member (321), and the rotational movements of the second link member (322) and the third link member (323) can be performed by the linear movement of the first link pin (324).

5 A slot (321a) having a length in an inclined direction with respect to a horizontal direction is formed in the first link member (321), and the first link pin (324) is moved between one side and the other side in the slot (321a).

A linear part is formed at an upper end of the slot (321a) in a direction parallel to a horizontal direction, and when the first locking part (330) and the second locking part (340) are in the locked positions, the first link pin (324) is located in the
10 linear part (321b).

The first link member (322) and the third link member (323) rotate symmetrically with respect to a vertical direction.

One ends of the first link member (322) and the third link member (323) are hinge-connected by the first link pin (324), and when a position is changed between
15 the locked position and the unlocked position, the second link member (322) and the third link member (323) rotate symmetrically about the first link pin (324).

The linear movement of the first link pin (324) can be guided by a guide part (350) having a vertical length.

The drive unit is a rotating cylinder; a first link member (321-3) rotating
20 about a drive hinge shaft by driving of the drive unit is provided; the first link pin (324) is coupled to the other end of the first link member (321-3); and the first link pin (324) is linearly moved along a guide part (350-3) in a vertical direction by the rotation of the first link member (321-3).

The first link pin (324) is coupled to guide connection members (351-1, 351-
25 2), and when the drive unit is driven, the guide connection members (351-1, 351-2)

are vertically moved while being guided by cylinder guides (312-1, 312-2) having a vertical length.

The drive unit is a cylinder that allows the linear movement using a pressure of a fluid; the drive unit operates in any one of an automatic mode in which the first link pin (324) is linearly moved by driving of the cylinder and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and in the manual mode, a locking member (319-2) can be provided to manually change the positions of the first locking part (330) and the second locking part (340) by discharging the fluid inside the cylinder to an outside.

The locking member (319-2) includes a lock nut; when the lock nut is loosened, the fluid inside the cylinder is discharged to the outside, and thus the manual mode is performed; and when the lock nut is locked, the fluid inside the cylinder is not discharged, and thus the first link pin 324 does not descend and is maintained in a stationary state at a certain position.

The drive unit operates in any one of an automatic mode in which the first link pin (324) is linearly moved by the driving force and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and the guide connection members (351-1, 351-2) are provided with handles to linearly move the first link pin (324) to operate in the manual mode.

The drive unit operates in any one of an automatic mode in which the first link pin (324) is linearly moved by the driving force and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and the at least one link member can be provided with a handle to linearly move the first link pin (324) to operate in the manual mode.

Further comprising: locking detection sensors (361, 362) that detect whether

at least one of the first locking part (330) and the second locking part (340) is in the locked position; and unlocking detection sensors (363, 364) that detect whether the at least one of the first locking part (330) and the second locking part (340) is in the unlocked position.

5 The locked object is a chemical male connector inserted into a chemical female connector, and when the locking detection sensors (361, 362) detect that the at least one of the first locking part (330) and the second locking part (340) is in the locked position, a controller may control a chemical to flow through the chemical male connector and the chemical female connector.

10 When the unlocking detection sensors (361, 362) detect that the at least one of the first locking part (330) and the second locking part (340) is in the unlocked position, the controller may control the locked object to move.

 The drive unit operates in an automatic mode in which positions of the first locking part (330) and the second locking part (34) are changed by the driving force
15 or in a manual mode in which when the driving force is not applied, the positions of the first locking part (330) and the second locking part (340) are manually changed.

 The drive unit may include a cylinder which changes the positions of the first locking part (330) and the second locking part (340) using a pressure of a fluid.

 The drive unit comprises: a drive connection member that is linearly moved
20 by driving of the drive unit; a first fluid supply part (313) that supplies the fluid so that the drive connection member linearly moves in one direction; a second fluid supply part (314) that supplies the fluid so that the drive connection member linearly moves in the other direction; and a neutral part (312) that implements the manual mode as the fluid is discharged even when the drive connection member linearly
25 moves in either the one direction or the other direction.

The first fluid supply part (313) and the second fluid supply part (314) are integrally provided on both sides of the neutral part (312) interposed therebetween; and a pair of springs (315a, 315b) can be provided at side portions of the first fluid supply part (313) and the second fluid supply part (314) so that elastic forces are
5 applied in opposite directions.

By applying electricity, the neutral part (312), the first fluid supply part (313), and the second fluid supply part (314) are integrally moved, and thus any one of the first fluid supply part (313) and the second fluid supply part (314) is connected to a first connection opening (316) and a second connection opening (317), through
10 which the fluid is introduced and discharged, to move the drive connection member (311) in the one direction or the other direction.

An automatic chemical supply apparatus of present invention has the locking device for supplying a chemical of any one of claims 1 to 27.

In addition, the locking device for supplying a chemical of the present
15 invention includes at least one driving unit that provides a driving force; and at least one locking unit that is changed between a locking position in which the position of the object to be locked is fixed and a position to release the lock to enable the movement of the object to be locked, wherein it operates in an automatic mode in which the position of the locking unit is changed by the driving force or in a manual
20 mode in which the position of the locking part is changed manually when the driving force is not applied. In this case, a mode selection unit may be provided to enable selection of the automatic mode and the manual mode.

[Advantageous Effects]

According to the present invention, an automatic mode in which locking is
25 performed by driving of a drive unit and a manual mode in which the locking is

manually performed by an operator can be selected, and thus a chemical can be supplied even when the drive unit malfunctions.

Further, two locking parts are simultaneously locked or unlocked using the one drive unit, and thus a structure thereof can be simplified.

5 Further, even when the chemical falls at a connection portion between a male connector and a female connector, the drive unit is not affected, and thus damage to the drive unit can be prevented.

Further, when the drive unit malfunctions, the operator can easily and manually perform an operation, and thus work efficiency can be improved.

10 [Description of Drawings]

FIG. 1 is a cross-sectional view illustrating an automatic chemical supply apparatus equipped with a locking device for supplying a chemical according to the present invention.

FIG. 2 is a view illustrating a state in which a chemical female connector cap
15 is inserted into an insertion groove of a chemical female connector.

FIG. 3 is a view illustrating a state in which the chemical female connector cap is separated from the insertion groove of the chemical female connector.

FIG. 4 is a perspective view illustrating a locking device for supplying a chemical according to a first embodiment of the present invention.

20 FIG. 5 is a perspective view illustrating a guide part, second and third link members, and first and second locking units in the locking device for supplying a chemical according to the first embodiment of the present invention.

FIG. 6 is a perspective view illustrating a state in which the second link member and a partial configuration of the first locking part are disassembled in the
25 locking device for supplying a chemical according to the first embodiment of the

present invention when viewed in an opposite direction to FIG. 5.

FIG. 7 is a front view illustrating a case in which the locking device for supplying a chemical according to the first embodiment of the present invention is in a locked position.

5 FIG. 8 is a front view illustrating a case in which the locking device for supplying a chemical according to the first embodiment of the present invention is in an unlocked position.

FIG. 9 is a view illustrating a configuration and an operation state of a drive unit in the locking device for supplying a chemical according to the first embodiment
10 of the present invention.

FIG. 10 is a perspective view illustrating a locking device for supplying a chemical according to a second embodiment of the present invention.

FIG. 11 is a front view illustrating a case in which the locking device for supplying a chemical according to the second embodiment of the present invention is
15 in an unlocked position.

FIG. 12 is a front view illustrating a case in which the locking device for supplying a chemical according to the second embodiment of the present invention is in a locked position.

FIG. 13 is a perspective view illustrating a locking device for supplying a
20 chemical according to a third embodiment of the present invention.

FIG. 14 is a front view illustrating a case in which the locking device for supplying a chemical according to the third embodiment of the present invention is in an unlocked position.

FIG. 15 is a front view illustrating a case in which the locking device for
25 supplying a chemical according to the third embodiment of the present invention is in

a locked position.

FIG. 16 is a perspective view illustrating a locking device for supplying a chemical according to a fourth embodiment of the present invention.

FIG. 17 is a front view illustrating a case in which the locking device for supplying a chemical according to the fourth embodiment of the present invention is in an unlocked position.

FIG. 18 is a front view illustrating a case in which the locking device for supplying a chemical according to the fourth embodiment of the present invention is in a locked position.

[DESCRIPTION OF REFERENCE NUMERALS]

	100: automatic chemical supply apparatus	105: transfer unit housing
	150: holder	160: transfer unit
	190: female connector cap detachment and attachment unit	
	191: chemical cap fixing unit	
15	192: chemical front-rear guide	193: chemical front-rear drive unit
	194: chemical up-down guide	195: chemical up-down drive unit
	200: housing body	210: chemical female connector
	211: chemical female connector cap	
	300,300-1,300-2,300-3,300-4: locking device	
20	310,310-1,310-2,310-3: drive unit	
	311,311-1,311-2: drive connection member	
	312,312-1,312-2: cylinder guide	319-2: locking member
	321: first link member	321a: slot
	321b: linear part	321c,351-1a: handle
25	322: second link member	323: third link member

	324: first link pin	330: first locking part
	331: first locking member	331a,341a: contact part
	331b,341b: non-contact part	332: first connection rod
	333: first link pin coupling part	334: second link pin
5	335: first coupling member	340: second locking part
	341: second locking member	342: second connection rod
	343: second link pin coupling part	344: third link pin
	345: second coupling member	350: guide part
	351,351-1,351-2,351-3: guide connection member	
10	352: guide rail	
	361: first locking detection sensor	
	362: second locking detection sensor	
	363: first unlocking detection sensor	
	364: second unlocking detection sensor	
15	400,400-1,400-2: nitrogen locking device	500: chemical hose
	510: chemical male connector	600: nitrogen hose
	700: connector guide part	710: upper housing
	711: upper housing coupling boss	720: lower housing
	721: lower housing coupling boss	730: upper guide roller
20	740: upper bracket	750: lower guide roller
	760: lower bracket	

[Modes of the Invention]

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

25 Referring to FIG. 1, an automatic chemical supply apparatus 100 to which

locking devices 300 and 400 for supplying a chemical are applied according to the present invention is an apparatus for automatically connecting, to a chemical female connector 210 and a nitrogen female connector (not illustrated) provided in a housing body 200, a chemical male connector 510 and a nitrogen male connector (not illustrated) coupled to ends of a chemical hose 500 and a nitrogen hose 600 connected to a chemical tank (not illustrated) of a tank lorry.

Hereinafter, when a direction is indicated, a direction in which the chemical male connector 510 is located is referred to as a rearward direction, and a direction in which the chemical female connector 210 is located is referred to as a frontward direction.

The automatic chemical supply apparatus 100 includes a transfer housing 105, holders 150, transfer units 160, a female connector cap detachment and attachment unit 190, and the locking devices 300 and 400.

The chemical female connector 210 and the nitrogen female connector (not illustrated) are installed on one side surface of the housing body 200 facing the transfer unit housing 105.

Components that distribute a chemical supplied through the chemical hose 500 to a chemical storage tank (not illustrated) or clean the chemical female connector 210 and the nitrogen female connector are provided inside the housing body 200.

The pair of holders 150 may be formed to hold each of the chemical hose 500 and the nitrogen hose 600.

The transfer unit 160 is provided inside the transfer unit housing 105 and is controlled so that the chemical hose 500 and the nitrogen hose 600 are transferred toward the chemical female connector 210 and the nitrogen female connector while

seated on the holders 150. The pair of transfer units 160 may be formed to transfer each of the chemical hose 500 and the nitrogen hose 600.

The transfer units 160 each include a stage 161 on which the holder 150 is loaded and a drive unit that transfers the holder 150 on the stage 161 in a front-rear
5 direction to transfer the chemical hose 500 and the nitrogen hose 600 toward the chemical female connector 210 and the nitrogen female connector. Driving of the drive unit is controlled by a controller.

As the transfer units 160 transfer the chemical hose 500 and the nitrogen hose 600 forward, the chemical male connector 510 is inserted into and coupled to the
10 chemical female connector 210 and the nitrogen male connector is inserted into and coupled to the nitrogen female connector. In this state, the chemical is transferred between the chemical tank and the chemical storage tank.

The female connector cap detachment and attachment unit 190 will be described with reference to FIGS. 2 and 3.

15 The female connector cap detachment and attachment unit 190 is a component for coupling or separating a nitrogen female connector cap (not illustrated) to or from a chemical female connector cap 211 to seal open ends of the chemical female connector 210 and the nitrogen female connector provided in the chemical storage tank.

20 The female connector cap detachment and attachment unit 190 may include a chemical female connector cap detachable unit for attaching or detaching the chemical female connector cap 211 and a nitrogen female connector cap detachable unit for attaching or detaching the nitrogen female connector cap.

Hereinafter, only the chemical female connector cap detachable unit will be
25 described, and since the nitrogen female connector cap detachable unit has the same

configuration as the chemical female connector cap detachable unit, a detailed description thereof will be omitted.

The chemical female connector cap detachment and attachment unit 190 includes a chemical cap fixing unit 191, a chemical front-rear guide 192, a chemical front-rear drive unit 193, a chemical up-down guide 194, and a chemical up-down drive unit 195.

The chemical cap fixing unit 191 is for fixing the chemical female connector cap 211 to the chemical female connector cap detachment and attachment unit 190. One end of the chemical female connector cap 211 is integrally coupled with the chemical cap fixing unit 191.

The chemical front-rear guide 192 has a front-rear length and guides the chemical cap fixing unit 191 so that the chemical cap fixing unit 191 is transferred on the chemical front-rear guide 192 in a front-rear direction.

The chemical front-rear drive unit 193 may be formed of an air cylinder, a motor, or the like and provides a driving force so that the chemical cap fixing unit 191 is transferred on the chemical front-rear guide 192 in the front-rear direction.

The chemical up-down guide 194 may have a length in an up-down direction to serve as a guide and the chemical up-down drive unit 195 may be formed of an air cylinder, a motor, or the like.

The chemical cap fixing unit 191, the chemical front-rear guide 192, and the chemical front-rear drive unit 193 are integrally transferred on the chemical up-down guide 194 by the chemical up-down drive unit 195.

An insertion groove 210a is formed in the chemical female connector 210 in the front-rear direction, and as illustrated in FIG. 2, while the chemical is not transferred between the chemical tank and the chemical storage tank, the chemical

female connector cap 211 is inserted into the insertion groove 210a.

Further, when the chemical front-rear drive unit 193 is driven, the chemical cap fixing unit 191 is transferred to the rear side, and as illustrated in FIG. 3, the chemical female connector cap 211 inserted in the insertion groove 210a is separated
5 from the insertion groove 210a.

Further, in a state of FIG. 3, when the chemical up-down drive unit 195 is driven, the chemical cap fixing unit 191 and the chemical female connector cap 211 are moved upward along the chemical up-down guide 194, and thus the chemical male connector 510 is in a state capable of being coupled to the chemical female
10 connector 210.

The locking device 300 for supplying a chemical according to a first embodiment of the present invention will be described with reference to FIGS. 4 to 6. The locking device 300 may be provided to fix the chemical male connector 510 and the chemical female connector cap 211, and the locking device 400 for fixing the
15 nitrogen male connector and the nitrogen female connector cap may be additionally provided.

The locking device 300 includes a drive unit 310 that provides a driving force, a first locking part 330 and a second locking part 340 that are changed between a locked position in which the position of a locked object is fixed by the
20 driving force of the drive unit 310 and an unlocked position in which the locked object may move, and at least one link member for transferring the driving force to of the drive unit 310 to the first locking part 330 and the second locking part 340. The locking device 300 may include a first link pin 324 that is linearly moved by the drive unit 310 and a second link member 322 and a third link member 323 that
25 perform rotational movement by the linear movement of the first link pin 324.

In this case, the locking device may further include a first link member 321 that is linearly moved by the drive unit 310 in a first direction that is a horizontal direction, and the second link member 322 and the third link member 323 may perform the rotational movement by the linear movement of the first link member 321. A handle 321c is formed in the first link member 321 so that an operator may move the first link member 321 while gripping the first link member 321 with his/her hands.

The drive unit 310 may be formed as a motor or a cylinder so that the first link member 321 performs the linear movement in the first direction. The cylinder may be a pneumatic cylinder or a hydraulic cylinder which generates a driving force due to the pressure of fluid.

In FIG. 4, a pneumatic cylinder is illustrated as an example of the drive unit 310.

The drive unit 310 includes a drive connection member to which the first link member 321 is coupled and a cylinder guide 312 which guides the drive connection member 311 so that the drive connection member 311 linearly moves in the horizontal direction that is the first direction. The cylinder guide 312 is formed long in the horizontal direction that is the first direction. The drive connection member 311 has one side coupled to the first link member 321 and the other side that may linearly move along the cylinder guide 312. When the drive unit 310 is driven, the drive connection member 311 may linearly move on the cylinder guide 312 in the first direction,

The first link member 321 is formed of a plate, an upper portion of which is coupled to the drive connection member 311 using a fastening member (not illustrated). The first link member 321 has a slot 321a obtained by cutting a portion

of the plate. The slot 321a is formed to have a length in an inclined direction with respect to the first direction. The first link pin 324 moves between one side and the other side inside the slot 321a.

A linear part 321b formed in a direction parallel to the first direction is formed at an upper end of the slot 321a. When the locking parts 330 and 340 are in the locked position, the first link pin 324 is located in the linear part 321b, and thus the first link pin 324 does not move downward. When the locking parts 330 and 340 are in the unlocked position, the first link pin 324 is located at a lower end of the slot 321a.

The second link member 322 and the third link member 323 are hinge-connected to one end of the first link pin 324, and the other end of the first link pin 324 is connected to a guide part 350 so that a linear movement in the second direction that is a vertical direction is guided on the guide part 350.

The second link member 322 and the third link member 323 are provided to be symmetrical with respect to the lengthwise direction of the guide part 350 that is the second direction. Further, the second link member 322 and the third link member 323 are links having a predetermined length, and both ends thereof are hinge-connected to each other. Upper ends of the second link member 322 and the third link member 323 are hinge-connected together by the first link pin 324, lower ends thereof are hinge-connected to a second link pin 334 and a third link pin 344, and a gap between the second link member 322 and the third link member 323 is inclined to be gradually increased in a direction toward the rear side from the first link pin 324.

The second link member 322 and the first locking part 330 are hinge-connected by the second link pin 334, and the third link member 323 and the second

locking part 340 are hinge-connected by the third link pin 344. The first locking part 330 and the second locking part 340 will be described with reference to FIGS. 4 to 6. The first locking part 330 and the second locking part 340 are provided to face each other with respect to the lengthwise direction of the guide part 350 that is the second direction and are locked by coming into contact with one side and the other side of the chemical male connector 510 or the chemical female connector cap 211 that are the locked objects. The first locking part 330 includes a first locking member 331 and a first connection rod 332, and the second locking part 340 includes a second locking member 341 and a second connection rod 342.

10 The first locking member 331 and the second locking member 341 may be installed to be symmetrical and have the same shape, and the first connection rod 332 and the second connection rod 342 may be installed to be symmetrical and have the same shape. The first locking member 331 and the second locking member 341 have a cam shape and include contact parts 331a and 341a, an outer peripheral surface of which has a circular shape, and non-contact parts 331b and 341b formed in a flat shape by cutting a part of the cylinder.

 The first locking member 331 and the second locking member 341 are rotatably fixed to a rear end surface 210b of the chemical female connector 210 using a fixing member (not illustrated).

20 When the first locking member 331 and the second locking member 341 are in the locked position, the contact part 331a of the first locking member 331 and the contact part 341a of the second locking member 341 are in contact with positions facing one side and the other side of the locked object, and thus the locked object is in a state of not moving and being fixed. Further, the first locking member 331 and the second locking member 341 rotate about rotation centers thereof to release the

25

contact between a contact part 331a and the locked object, and when the non-contact part 331b is in a position facing the locked object, the non-contact part 331b is spaced apart from the locked object, and thus an unlocking state is achieved in which the locked object may move.

5 The first locking member 331 and the second locking member 341 are coupled to the chemical female connector 210 and are fixed in position so that front end surfaces 331c and 341c of the first locking member 331 and the second locking member 341 are in close contact with the one side of the rear end surface of the chemical female connector 210. Further, the first locking member 331 and the
10 second locking member 341 rotate about the rotation centers thereof. The rotation centers of the first locking member 331 and the second locking member 341 may be the centers of the contact parts 331a and 341a, the outer peripheral surfaces of which have a circular shape. In this configuration, since a separation distance between the rotation center of each of the first locking member 331 and the second locking
15 member 341 and a portion of each of the first locking member 331 and the second locking member 341, with which the locked object is in contact, is short, even when a situation occurs in which the chemical male connector 510 or the chemical female connector cap 211 is pushed rearward, an excessive force is not applied to the first locking member 331 and the second locking member 341, and thus the possibility of
20 breakage is reduced even when used for a long time.

 The first connection rod 332 and the second connection rod 342 has a rod shape having a circular cross section, one ends thereof are coupled to the first locking member 331 and the second locking member 341, and the other ends thereof are hinge-connected to the second link member 322 and the third link member 323.

25 The rotation center of the first locking member 331 is a rotation center of the

entire first locking part 330 including the first connection rod 332 and the rotation center of the first locking member 331 is in a fixed position. Further, the rotation center of the second locking member 341 is a rotation center of the entire second locking part 340 including the second connection rod 342 and the rotation center of the second locking member 341 is in a fixed position.

A first link pin coupling part 333 having a larger diameter than the first connection rod 332 is formed at an end of the first connection rod 332, and a second link pin coupling part 343 having a larger diameter than the second connection rod 342 is formed at an end of the second connection rod 342.

FIG. 6 illustrates a state in which the first locking part 330 and the second link member 322 are disassembled. The first locking part 330 may further include the second link pin 334 and a first coupling member 335. The first link pin coupling part 333 may be formed at the end of the first connection rod 332. A second link pin insertion hole 323a into which the second link pin 334 is inserted is formed at one end of the second link member 322.

The second link pin 334 includes a first hinge shaft 334c inserted into and hinge-connected to the second link pin insertion hole 323a and a second link pin body 334a which has the first hinge shaft 334c integrally formed at one end thereof and a first insertion groove 334b formed therein.

The first hinge shaft 334c has a cylindrical shape protruding from the second link pin body 334a, and when the first hinge shaft 334c is inserted into the second link pin insertion hole 323a, the first hinge shaft 334c may rotate inside the second link pin insertion hole 323a, and thus the second link pin 334 functions as a hinge. The first insertion groove 334b has a groove shape having an open top in a direction parallel to the lengthwise direction of the second link member 322 and the first

connection rod 332, and thus the first connection rod 332 is inserted into and seated in the first insertion groove 334b. A central axis of the first insertion groove 334b in the lengthwise direction is formed to be perpendicular to the first hinge shaft 334c.

A pair of fastening holes 334d are formed in both upper surfaces at an upper
5 end of the second link pin body 334a with the first insertion groove 334b interposed therebetween.

The first coupling member 335 is formed of a substantially quadrangular plate and has a pair of fastening holes 335a formed therein. When upper portions of the first connection rod 332 and the first insertion groove 334b are covered in a state
10 in which the first connection rod 332 is inserted into the first insertion groove 334b, and when a fastening member (not illustrated) is inserted into and fastened to the fastening holes 335a of the first coupling member 335 and the fastening holes 334d of the second link pin 334, the first connection rod 332 and the second link pin 334 may be coupled to each other to prevent separation from the first insertion groove
15 334b. In this case, in a state in which the first connection rod 332 is inserted into the first insertion groove 334b, the first link pin coupling part 333 is caught by the first coupling member 335 and the second link pin body 334a, and thus separation in the lengthwise direction of the first connection rod 332 can be reliably prevented.

A configuration in which the second locking part 340 and the third link
20 member 323 are connected to each other is the same as a configuration in which the first locking part 330 and the second link member 322 are connected to each other. That is, the second locking part 340 may further include the third link pin 344 having the same configuration as the second link pin 334 and a second coupling member 345 having the same configuration as the first coupling member 335. Further, the
25 second link pin coupling part 343 having the same configuration as the first link pin

coupling part 333 may be formed at an end of the second connection rod 342. Further, a second hinge shaft, a third link pin body, and a second insertion groove which have the same configurations as the first hinge shaft 334c, the second link pin body 334a, and the first insertion groove 334b, respectively, are formed in the third
5 link pin 344.

The second hinge shaft of the third link pin 344 is inserted into a third link pin insertion hole formed at one end of the third link member 323 to hinge-connect the third link member 323 and the third link pin 344. When upper portions of the second connection rod 342 and the second insertion groove are covered in a state in
10 which the second connection rod 342 is inserted into the second insertion groove, and when the second coupling member 345 and the third link pin 344 are coupled using a fastening member, the second connection rod 342 can be prevented from being separated from the second insertion groove 344b.

The guide part 350 may include a guide rail 352 having a predetermined
15 length in the vertical direction that is the second direction and a guide connection member 351 that is vertically moved while being guided by the guide rail 352 in a state of being coupled to the guide rail 352.

The first link pin 324 is integrally coupled with the guide connection member 351, and thus the first link pin 324 is also moved when the guide connection member
20 351 moves in the second direction. The guide part 350 is fixedly coupled to a frame 110.

A plurality of sensors 361, 362, 363, and 364 may be provided to detect whether the first locking part and the second locking part 340 are in the locked position or the unlocked position.

25 The plurality of sensors 361, 362, 363 and 364 may include locking detection

sensors 361 and 362 that detect whether the first locking part 330 and the second locking part 340 in the locked position and unlocking detection sensors 363 and 364 that detect whether the first locking part 330 and the second locking part 340 are in the unlocked position. The locking detection sensors 361 and 362 may include a
5 first locking detection sensor 361 and a second locking detection sensor 362 provided on both sides of the guide part 350 above the locked object.

The unlocking detection sensors 363 and 364 may include a first unlocking detection sensor 363 and a second unlocking detection sensor 364 provided at positions adjacent to the locked object in the lateral direction. When the first
10 locking part 330 and the second locking part 340 are in the locked positions, the first locking detection sensor 361 and the second locking detection sensor 362 may be provided at positions at which the first link pin coupling part 333 and the second link pin coupling part 343 may be detected, respectively.

When the first locking part 330 and the second locking part 340 are in the
15 unlocked positions, the first unlocking detection sensor 363 and the second unlocking detection sensor 364 may be provided at positions at which the first connection rod 332 and the second connection rod 342 may be detected, respectively.

The locking detection sensors 361 and 362 and the unlocking detection sensors 363 and 364 may be provided at different positions in addition to the above
20 positions to detect other parts of the first locking part 330 and the second locking part 340.

When the locking detection sensors 361 and 362 detect that the first locking part 330 and the second locking part 340 are in the locked positions, the controller may control the chemical to flow through the locked object. That is, when the
25 locked object is the chemical male connector 510, and when the locking detection

sensors 361 and 362 detect that the first locking part 330 and the second locking part 340 are in the locked positions in a state in which the chemical male connector 510 is inserted into the chemical female connector 210, the chemical is controlled to be supplied through the chemical male connector 510 and the chemical female connector 210. When the locked object is the chemical female connector cap 211, and when the locking detection sensors 361 and 362 detect that the first locking part 330 and the second locking part 340 are in the locked positions in a state in which the chemical female connector cap 211 is inserted into the chemical female connector 210, it is determined that the chemical female connector cap 211 is normally inserted into the chemical female connector 210, and thus a subsequent operation may be performed.

Further, when the unlocking detection sensors 363 and 364 detect that the first locking part 330 and the second locking part 340 are in the unlocked positions, the controller may control the locked object to be moved. That is, when the locked object is the chemical male connector 510 or the chemical female connector cap 211, the chemical male connector 510 or the chemical female connector cap 211 become movable. Thus, the chemical male connector 510 and the chemical female connector 210 may be fastened and separated and the chemical female connector cap 211 and the chemical female connector 210 may be fastened and separated. According to the above configuration, a structure can be simplified by locking or unlocking the two locking parts 330 and 340 using one drive unit 310 at the same time. Further, since the drive unit 310 constituting the locking device 300 is not provided below a connection portion between the chemical male connector 510 and the chemical female connector 210, the drive unit is not affected even when the chemical falls, and thus damage to the drive unit can be prevented. Further, when

the drive unit 310 malfunctions, the operator may easily and manually perform an operation, thereby improving work efficiency.

An operation of the locking device 300 for supplying a chemical according to the first embodiment of the present invention will be described with reference to
5 FIGS. 7 and 8. FIG. 7 illustrates a case in which the locking device 300 is in the locked position. It is expressed in FIGS. 4 and 7 that the drive connection member 311 is separated from the first link member 321. However, since the drive connection member 311 and the first link member 321 are integrally coupled, it is expressed that the drive connection member 311 is moved leftward in the locked
10 position of FIGS. 4 and 7. However, for clear expression of the configuration, it is illustrated that the drive connection member 311 and the first link member 321 are separated from each other. The drive connection member 311 is located on the left side on the cylinder guide 312, and the first link member 321 is moved integrally with the drive connection member 311 and is thus located on the left side. In this
15 case, the first link pin 324 is located in the linear part 321b that is the uppermost side of the slot 321a. The first link pin 324 is caught by a lower end of the linear part 321b and thus does not descend downward along the slot 321a.

The first link pin 324 is moved upward on the guide rail 352. The first link pin 324 is hinge-connected to the upper ends of the second link member 322 and the
20 third link member 323, and thus the second link member 322 and the third link member 323 are provided to be symmetrical about the guide rail 352 at a narrow angle.

In this case, the non-contact part 331b of the first locking member 331 and the non-contact part 341b of the second locking member 341 are located toward the
25 lower side, the contact part 331a of the first locking member 331 and the contact part

341a of the second locking member 341 are in contact with one side and the other side of the locked object, and thus the locked object may be maintained in a fixed state without moving.

The first connection rod 332 of the first locking part 330 and the second
5 connection rod 342 of the second locking part 340 are located to extend long in the vertical direction. Further, the first link pin coupling part 333 is located below the first locking detection sensor 361 and the second link pin coupling part 343 is located below the second locking detection sensor 362. The first locking detection sensor 361 detects the first link pin coupling part 333, the second locking detection sensor
10 362 detects the second link pin coupling part 343, and thus the controller determines that the first locking part 330 and the second locking part 340 are in the locked positions.

FIG. 8 illustrates a case in which the locking device 300 is in the unlocked position.

15 When the drive unit 310 is driven in the locked position of FIG. 7, the unlocked position of FIG. 8 is obtained. The drive connection member 311 is located on the right side on the cylinder guide 312, and the first link member 321 is also moved integrally with the drive connection member 311 and is thus located on the right side. In this case, the first link pin 324 is separated from the linear part
20 321b and located on the lowermost side of the slot 321a along the inclined slot 321a. At the same time, the first link pin 324 is moved downward on the guide rail 352. Further, the first locking member 331, the first connection rod 332, and the second link pin 334 rotate in a clockwise direction about a fixed center of the first locking member 331, and the second locking member 341, the second connection rod 342,
25 and the third link pin 344 rotate in a counterclockwise direction about a fixed center

of the second locking member 341. Thus, since the second link member 322 and the third link member 323 rotate about the first link pin 324 in a direction away from each other, the second link member 322 and the third link member 323 are located to be symmetrical about the guide rail 352 at a wide angle. In this case, since the non-
5 contact part 331b of the first locking member 331 and the non-contact part 341b of the second locking member 341 are positioned by being rotated to face the locked object, the non-contact parts 331b and 341b are spaced apart from the locked object. Further, the contact part 331a of the first locking member 331 and the contact part 341a of the second locking member 341 are rotated so as not to be in contact with the
10 one side and the other side of the locked object. Thus, the locked object becomes a movable state.

The first connection rod 332 of the first locking part 330 rotates about the first locking member 331 and is thus positioned above the first unlocking detection sensor 363, and the second connection rod 342 of the second locking part 340 rotates
15 about the second locking member 341 and is thus positioned above the second unlocking detection sensor 364. The first unlocking detection sensor 363 detects the first connection rod 332, the second unlocking detection sensor 364 detects the second connection rod 342, and thus the controller determines that the first locking part 330 and the second locking part 340 are in the unlocked positions.

20 The drive unit 310 according to the first embodiment of the present invention will be described with reference to FIG. 9.

The drive unit 310 may operate in either an automatic mode in which the first link pin 324 is linearly moved in the vertical direction by the driving force of the drive unit 310 or a manual mode in which when the driving force of the drive unit
25 310 is not applied, the first link pin 324 may be manually moved. The manual

mode is required in a case in which the drive unit 310 malfunctions. When the manual mode is not provided and the drive unit 310 malfunctions, the chemical may not be supplied. Thus, even when the drive unit 310 cannot provide the driving force due to a malfunction, the operator may manually position the first locking part 5 330 and the second locking part 340 in the locked positions and the unlocked positions.

The drive unit 310 may include a first fluid supply part 313 that supplies a fluid (in the case of a pneumatic cylinder, air) so that the drive connection member 311 linearly moves in one direction, a second fluid supply part 314 that supplies the 10 fluid so that the drive connection member 311 linearly moves in the other direction, and a neutral part 312 that implements the manual mode as the fluid is discharged even when the drive connection member 311 linearly moves in either the one direction or the other direction. The first fluid supply part 313 and the second fluid supply part 314 may be integrally provided on both sides of the neutral part 312 15 interposed therebetween.

A pair of springs 315a and 315b are provided at side portions of the first fluid supply part 313 and the second fluid supply part 314 so that elastic forces are applied in opposite directions. The first fluid supply part 313 is provided with an inlet 313a through which the fluid flows into the first fluid supply part 313 and an outlet 313b 20 through which the fluid is discharged to the outside of the first fluid supply part 313. The second fluid supply part 314 is provided with an inlet 314a through which the fluid flows into the second fluid supply part 314 and an outlet 314b through which the fluid is discharged to the outside of the second fluid supply part 314. The neutral part 312 is provided with a pair of outlets 312a and 312b through which the 25 fluid is discharged to the outside of the neutral part 312.

A first connection opening 316 and a second connection opening 317 are provided for inflow and outflow of the fluid for linearly moving the drive connection member 311. The first connection opening 316 communicates with a space 318a in which the pressure of the fluid is applied to one side of the drive connection member 311, and the second connection opening 317 communicates with a space 318b in which the pressure of the fluid is applied to the other side of the drive connection member 311.

By application of electricity, the neutral part 312, the first fluid supply part 313, and the second fluid supply part 314 are integrally moved, and thus one of the first fluid supply part 313 and the second fluid supply part 314 is connected to the first connection opening 316 and the second connection opening 317. In this case, when the first fluid supply part 313 is connected and the second fluid supply part 314 is connected, the direction of the pressure of the fluid applied to the drive connection member 311 is opposite, and thus the movement direction of the drive connection member 311 is opposite.

FIG. 9A illustrates a state in which electricity is not applied. In this case, the pair of springs 315a and 315b maintain a force equilibrium state. The first connection opening 316 communicates with the outlet 312a, and the second connection opening 317 communicates with the other outlet 312b. Thus, when the operator applies a force to the left side of the drive connection member 311, while the fluid is discharged through the first connection opening 316 and the outlet 312a, the drive connection member 311 is moved to the left side. In contrast, when the operator applies a force to the right side of the drive connection member 311, while the fluid is discharged through the second connection opening 317 and the outlet 312b, the drive connection member 311 is moved to the right side. Thus, when the

operator manually moves the first link member 321 while holding the handle 321c, the first locking part 330 and the second locking part 340 may be moved to one of the locked position and the unlocked position.

FIG. 9B illustrates a state in which by applying electricity, the neutral part 312, the first fluid supply part 313, and the second fluid supply part 314 are moved to the right side. In this case, the first connection opening 316 communicates with the inlet 313a of the first fluid supply part 313, and the second connection opening 317 communicates with the outlet 313b of the first fluid supply part 313. The spring 315a connected to the first fluid supply part 313 is tensioned, and the spring 315b connected to the second fluid supply part 314 is compressed. In this state, when the pressure of the fluid is applied to one side of the drive connection member 311 by supplying the fluid through the inlet 313a, the drive connection member 311 is moved to the right side, and the fluid in the other side space 318b of the drive connection member 311 is discharged to the outside through the second connection opening 317 and the outlet 313b.

In contrast to FIG. 9B, FIG. 9C illustrates a state in which by applying electricity, the neutral part 312, the first fluid supply part 313, and the second fluid supply part 314 are moved to the left side. In this case, the first connection opening 316 communicates with the outlet 314b of the second fluid supply part 314, and the second connection opening 317 communicates with the inlet 314a of the second fluid supply part 314. The spring 315a connected to the first fluid supply part 313 is compressed, and the spring 315b connected to the second fluid supply part 314 is tensioned. In this state, when the pressure of the fluid is applied to one side of the drive connection member 311 by supplying the fluid through the inlet 314a, the drive connection member 311 is moved to the left side, and the fluid in the other side space

318a of the drive connection member 311 is discharged to the outside through the first connection opening 316 and the outlet 314b.

Thus, as illustrated in FIGS. 9B and 9C, by the driving force of the drive unit 310, the first locking part 330 and the second locking part 340 are automatically
5 moved to one of the locked position and the unlocked position. The operator may select either the automatic mode or the manual mode by operating a mode selection unit provided in the automatic chemical supply device. The mode selection unit may be a switch.

A locking device 300-1 according to a second embodiment of the present
10 invention will be described with reference to FIGS. 10 to 12. Like the locking device 300 of the first embodiment, the locking device 300-1 of the second embodiment equally includes the first link pin 324, the second link member 322 and the third link member 323, the first locking part 330 including the first locking member 331 and the first connection rod 332, the second locking part 340 including
15 the second locking member 341 and the first connection rod 342, the second link pin 334 and the third link pin 344, the first locking detection sensor 361, the second locking detection sensor 362, the first unlocking detection sensor 363, and the second unlocking detection sensor 364. Further, a third embodiment and a fourth embodiment, which will be described below, have the same configuration.

20 FIG. 11 illustrates a case in which the locking device 300-1 is in the unlocked position, and FIG. 12 illustrates a case in which the locking device 300-1 is in the locked position. Further, the chemical locking device 300-1 and a nitrogen locking device 400-1 may be provided. The locking device 300-1 includes a drive unit 310-1 that provides a driving force. By driving the drive unit 310-1, the first link pin
25 324 is guided to linearly move in the vertical direction. The first link pin 324 is

coupled to a guide connection member 351-1, the guide connection member 351-1 is integrally coupled to a drive connection member 311-1, and the drive connection member 311-1 may linearly move in the vertical direction while being guided on a cylinder guide 312-1 formed with a vertical length.

5 The guide connection member 351-1 has a handle 351-1a so that, in the manual mode, the operator may grip and move the handle 351-1a with his/her hands.

 In the case of the second embodiment, the cylinder guide 312-1 has the vertical length and linearly moves in the vertical direction. Further, the neutral part 312 described in FIG. 9 is provided in the drive unit 310-1, and thus the locking
10 device 300-1 may operate in the manual mode. In this configuration, a configuration of the drive unit 310-1 is simplified.

 However, in the case of the second embodiment, when the locking device 300-1 operates in the manual mode in the locked position as in FIG. 12, a load by the weight of the guide connection member 351-1, the drive connection member 311-1,
15 and the first link pin 324 is applied to the fluid inside the drive unit 310-1. Accordingly, since the fluid is discharged to the outside through the outlets 312a and 312b, the guide connection member 351-1, the drive connection member 311-1, and the first link pin 324 are moved downward, and thus the first locking part 330 and the second locking part 340 may not maintain a locked state. Thus, the drive unit 310-1
20 of the second embodiment may not be provided with the neutral part 312 having the outlets 312a and 312b communicating with the outside and may operate only in the automatic mode.

 A locking device 300-2 according to a third embodiment of the present invention will be described with reference to FIGS. 13 to 15. FIG. 14 illustrates a
25 case in which the locking device 300-2 is in the unlocked position, and FIG. 15

illustrates a case in which the locking device 300-2 is in the locked position. Further, the chemical locking device 300-2 and a nitrogen locking device 400-2 may be provided. The locking device 300-2 includes a drive unit 310-2 that provides a driving force. Like the second embodiment, by driving the drive unit 310-2, the first link pin 324 is guided to linearly move in the vertical direction.

The first link pin 324 is coupled to a guide connection member 351-2, the guide connection member 351-2 is integrally coupled to a drive connection member 311-2, and the drive connection member 311-2 may linearly move in the vertical direction while being guided by a cylinder guide 312-2 formed with a vertical length. The guide connection member 351-2 has a handle 351-2a so that, in the manual mode, the operator may grip and move the handle 351-1a with his/her hands. In the drive unit 310-2 of the third embodiment, like the second embodiment, the cylinder guide 312-2 has the vertical length and linearly moves in the vertical direction. In the case of the third embodiment, a locking member 319-2 is provided to enable both the automatic mode and the manual mode to operate. The locking member 319-2 may be, for example, a lock nut.

When the operator loosens the lock nut 319-2, the fluid inside the cylinder may be discharged to the outside, and thus the locking device 300-2 may operate in the manual mode. Further, when the operator locks the lock nut 319-2, the fluid inside the cylinder is sealed so as not to be discharged to the outside, the guide connection member 351-2 is not lowered by its own weight and is maintained in a stationary state at a certain position, and thus the locking device 300-2 may operate in the automatic mode. That is, when the operator loosens the lock nut 319-2 and moves the guide connection member 351-2 upward while gripping the handle 351-2a in the unlocked position of the FIG. 14, the locked position of FIG. 15 is obtained.

In this state, by locking the lock nut 319-2, the fluid for operating the cylinder is not discharged to the outside, and thus the locked position may be maintained without descending due to its own weight.

The neutral part 312 described in FIG. 9 is provided in the drive unit 310-2 of
5 the third embodiment. However, the third embodiment differs from the first embodiment in that the neutral part 312 is configured so that the fluid is not discharged to the outside. That is, in the case of the third embodiment, a solenoid valve (not illustrated) is in a closed state so that the fluid is not discharged through the pair of outlets 312a and 312b, and the manual mode may be implemented by the
10 operator operating the lock nut 319-2. Thus, in the third embodiment, the automatic mode and the manual mode may selectively operate.

A locking device 300-3 according to a fourth embodiment of the present invention will be described with reference to FIGS. 16 to 18. FIG. 17 illustrates a case in which the locking device 300-3 is in the unlocked position, and FIG. 18
15 illustrates a case in which the locking device 300-3 is in the locked position. The locking device 300-3 according to the fourth embodiment includes a drive unit 310-3, a first link member 321-3, a guide part 350-3, a guide connection member 351-3, and a drive hinge shaft 370-3.

The drive unit 310-3 is a rotary cylinder. The first link member 321-3 that
20 rotates about the drive hinge shaft 370-3 is connected to the drive unit 310-3. The first link pin 324 is coupled to the other end of the first link member 321-3. The first link pin 324 is integrally coupled to the guide connection member 351-3, and the guide connection member 351-3 linearly moves along the guide part 350-3 in the vertical direction.

25 In the unlocked state of FIG. 17, when the drive unit 310-3 is driven, the first

link member 321-3 rotates about the drive hinge shaft 370-3 in a clockwise direction. Further, the first link pin 324 and the guide connection member 351-3 move upward in the lengthwise direction of the guide part 350-3. Further, the first locking part 330 rotates about the first locking member 331, the second locking part 340 rotates about the second locking member 341, and thus the locked position of FIG. 19 is obtained. In this configuration, the locking device 300-3 may be implemented using a simple configuration.

In the first to fourth embodiments, the locked positions and the unlocked positions of the two locking parts 330 and 340 are controlled using the one drive unit 310, 310-1, 310-2, and 310-3. However, the locked positions and the unlocked positions of the first locking part 330 and the second locking part 340 may be controlled using two drive units. In this case, as the first fluid supply part 313, the second fluid supply part 314, and the neutral part 312 are provided in one drive unit, the first locking part 330 may operate in the automatic mode or the manual mode. Further, as the first fluid supply part 313, the second fluid supply part 314, and the neutral part 312 are provided in another drive unit, the second locking part 340 may operate in the automatic mode or the manual mode.

As described above, exemplary embodiments of the present invention have been described in detail. However, the present invention is not limited to the above-described embodiments, and various modifications may be implemented without departing from the appended claims, the detailed description of the invention, and the accompanying drawings, and also belong to the present invention.

[CLAIMS]

[Claim 1]

A locking device for supplying a chemical, the locking device comprising:
a drive unit that provides a driving force;
5 a first locking part (330) and a second locking part (340) of which positions are changed between a locked position in which a position of a locked object is fixed and an unlocked position in which movement of the locked object is allowed; and
at least one link member configured to transfer the driving force of the drive unit (310) to the first locking part (330) and the second locking part (340).

10 [Claim 2]

The locking device of claim 1, wherein the first locking part (330) and the second locking part (340) are provided to face each other in a vertical direction and are locked by coming into contact with both sides of the locked object.

[Claim 3]

15 The locking device of claim 2, wherein the first locking part (330) includes a first locking member (331) coming into contact with one side of the locked object to be in a locked state and a first connection rod (332) hinge-connected to the other end of the second link member (322), and

the second locking part (340) includes a second locking member (341)
20 coming into contact with the other side of the locked object to be in a locked state and a second connection rod (342) hinge-connected to the other end of the third link member (323).

[Claim 4]

The locking device of claim 3, further comprising:
25 a second link pin (334) that includes a first hinge shaft (334c) hinge-

connected to the second link member (322) and a first insertion groove (334b) formed in a direction perpendicular to the first hinge shaft 334c, the first connection rod (332) being inserted into the first insertion groove (334b);

5 a first coupling member (335) that prevents the first connection rod (332) from being separated from the first insertion groove (334b) by covering an upper portion of the first insertion groove (334b) into which the first connection rod (332) is inserted;

10 a third link pin (344) that includes a second hinge shaft hinge-connected to the third link member (323) and a second insertion groove formed in a direction perpendicular to the second hinge shaft, the second connection rod (342) being inserted into the second insertion groove; and

15 a second coupling member (345) that prevents the second connection rod (342) from being separated from the second insertion groove by covering an upper portion of the second insertion groove into which the second connection rod (342) is inserted.

[Claim 5]

The locking device of claim 4, wherein:

20 a first link pin coupling part (333) having a diameter that is larger than a diameter of the first connection rod (332) is integrally formed at an end of the first connection rod (332);

a second link pin coupling part (343) having a diameter that is larger than a diameter of the second connection rod (342) is integrally formed at an end of the second connection rod (342);

25 the first link pin coupling part (333) is caught by the first coupling member (335) and is thus prevented from being removed through the first insertion groove

(334b); and

the second link pin coupling part (343) is caught by the second coupling member (335) and is thus prevented from falling out of the second insertion groove.

[Claim 6]

5 The locking device of claim 1, further comprising a first link pin (324) that is linearly moved by the drive unit,

wherein the at least one link member includes a second link member (322) and a third link member (323) that are rotated by the linear movement of the first link pin (324).

10 [Claim 7]

The locking device of claim 6, wherein each of the first locking part (330) and the second locking part (340) has, as a rotation center, a fixed position of one end in contact with the locked object, and

the first locking part (330) and the second locking part (340) rotate about the
15 fixed position by the rotational movements of the second link member (322) and the third link member (323) and thus are changed between the locked position and the unlocked position.

[Claim 8]

The locking device of claim 6, further comprising a first link member (321)
20 that is linearly moved in a horizontal direction by the drive unit,

wherein the linear movement of the first link pin (324) in a vertical direction is performed by the linear movement of the first link member (321), and the rotational movements of the second link member (322) and the third link member (323) are performed by the linear movement of the first link pin (324).

25 [Claim 9]

The locking device of claim 8, wherein a slot (321a) having a length in an inclined direction with respect to a horizontal direction is formed in the first link member (321), and

the first link pin (324) is moved between one side and the other side in the
5 slot (321a).

[Claim 10]

The locking device of claim 9, wherein a linear part is formed at an upper end of the slot (321a) in a direction parallel to a horizontal direction, and

when the first locking part (330) and the second locking part (340) are in the
10 locked positions, the first link pin (324) is located in the linear part (321b).

[Claim 11]

The locking device of claim 6, wherein the first link member (322) and the third link member (323) rotate symmetrically with respect to a vertical direction.

[Claim 12]

15 The locking device of claim 11, wherein one ends of the first link member (322) and the third link member (323) are hinge-connected by the first link pin (324), and

when a position is changed between the locked position and the unlocked position, the second link member (322) and the third link member (323) rotate
20 symmetrically about the first link pin (324).

[Claim 13]

The locking device of claim 6, wherein the linear movement of the first link pin (324) is guided by a guide part (350) having a vertical length.

[Claim 14]

The locking device of claim 6, wherein:

the drive unit is a rotating cylinder;

a first link member (321-3) rotating about a drive hinge shaft by driving of the drive unit is provided;

5 the first link pin (324) is coupled to the other end of the first link member (321-3); and

the first link pin (324) is linearly moved along a guide part (350-3) in a vertical direction by the rotation of the first link member (321-3).

[Claim 15]

10 The locking device of claim 6, wherein the first link pin (324) is coupled to guide connection members (351-1, 351-2), and

when the drive unit is driven, the guide connection members (351-1, 351-2) are vertically moved while being guided by cylinder guides (312-1, 312-2) having a vertical length.

15 [Claim 16]

The locking device of claim 15, wherein:

the drive unit is a cylinder that allows the linear movement using a pressure of a fluid;

the drive unit operates in any one of an automatic mode in which the first link
20 pin (324) is linearly moved by driving of the cylinder and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and

in the manual mode, a locking member (319-2) is provided to manually change the positions of the first locking part (330) and the second locking part (340) by discharging the fluid inside the cylinder to an outside.

25 [Claim 17]

The locking device of claim 16, wherein:

the locking member (319-2) includes a lock nut;

when the lock nut is loosened, the fluid inside the cylinder is discharged to the outside, and thus the manual mode is performed; and

5 when the lock nut is locked, the fluid inside the cylinder is not discharged, and thus the first link pin 324 does not descend and is maintained in a stationary state at a certain position.

[Claim 18]

The locking device of claim 15, wherein:

10 the drive unit operates in any one of an automatic mode in which the first link pin (324) is linearly moved by the driving force and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and

the guide connection members (351-1, 351-2) are provided with handles to linearly move the first link pin (324) to operate in the manual mode.

15 [Claim 19]

The locking device of claim 6, wherein:

the drive unit operates in any one of an automatic mode in which the first link pin (324) is linearly moved by the driving force and a manual mode in which when the driving force is not applied, the first link pin (324) is manually moved; and

20 the at least one link member is provided with a handle to linearly move the first link pin (324) to operate in the manual mode.

[Claim 20]

The locking device of claim 1, further comprising:

locking detection sensors (361, 362) that detect whether at least one of the
25 first locking part (330) and the second locking part (340) is in the locked position;

and

unlocking detection sensors (363, 364) that detect whether the at least one of the first locking part (330) and the second locking part (340) is in the unlocked position.

5 [Claim 21]

The locking device of claim 20, wherein the locked object is a chemical male connector inserted into a chemical female connector, and

when the locking detection sensors (361, 362) detect that the at least one of the first locking part (330) and the second locking part (340) is in the locked
10 position, a controller controls a chemical to flow through the chemical male connector and the chemical female connector.

[Claim 22]

The locking device of claim 20, wherein, when the unlocking detection sensors (361, 362) detect that the at least one of the first locking part (330) and the
15 second locking part (340) is in the unlocked position, the controller controls the locked object to move.

[Claim 23]

The locking device of claim 1, wherein the drive unit operates in an automatic mode in which positions of the first locking part (330) and the second
20 locking part (34) are changed by the driving force or in a manual mode in which when the driving force is not applied, the positions of the first locking part (330) and the second locking part (340) are manually changed.

[Claim 24]

The locking device of claim 23, wherein the drive unit includes a cylinder
25 which changes the positions of the first locking part (330) and the second locking

part (340) using a pressure of a fluid.

[Claim 25]

The locking device of claim 24, wherein the drive unit comprises:

a drive connection member that is linearly moved by driving of the drive unit;

5 a first fluid supply part (313) that supplies the fluid so that the drive connection member linearly moves in one direction;

a second fluid supply part (314) that supplies the fluid so that the drive connection member linearly moves in the other direction; and

a neutral part (312) that implements the manual mode as the fluid is
10 discharged even when the drive connection member linearly moves in either the one direction or the other direction.

[Claim 26]

The locking device of claim 25, wherein:

the first fluid supply part (313) and the second fluid supply part (314) are
15 integrally provided on both sides of the neutral part (312) interposed therebetween; and

a pair of springs (315a, 315b) are provided at side portions of the first fluid supply part (313) and the second fluid supply part (314) so that elastic forces are applied in opposite directions.

20 [Claim 27]

The locking device of claim 25, wherein, by applying electricity, the neutral part (312), the first fluid supply part (313), and the second fluid supply part (314) are integrally moved, and thus any one of the first fluid supply part (313) and the second fluid supply part (314) is connected to a first connection opening (316) and a second
25 connection opening (317), through which the fluid is introduced and discharged, to

move the drive connection member (311) in the one direction or the other direction.

[Claim 28]

An automatic chemical supply apparatus having the locking device for supplying a chemical of any one of claims 1 to 27.