

A MOBILE DISHWASHER

[0001] The present application relates to a mobile dishwasher for collecting and cleaning eating utensils in food centres and the like. The eating utensils may simply
5 be known as utensils, which include bowls, plates, cups, saucers and cutleries. The application also relates to methods of using, maintaining, upgrading and servicing the mobile dishwasher.

[0002] The present application claims the priority date of the earlier Singapore patent
10 application "Automatic Dishwasher for Eateries", which has the serial number of 10201406555X and filing date of 13 October 2014. All content and/or subject matter of this priority application is hereby incorporated entirely.

[0003] Most food centres (e.g. coffee shops or hawker centres), hotels, restaurants
15 and other eateries serve food and drinks without using disposable utensils. Instead, porcelain, metal and glass utensils are commonly deployed, which are repeatedly washed and used. Often, the food centres and restaurants employ dedicated groups of workers to gather and wash soiled utensils. After being cleansed, the cleaned utensils are sorted and distributed back to respective stalls in the food centres and
20 restaurants. The process from collecting dirty utensils to redistributing clean utensils is continuously repeated throughout operation hours of the food centres and restaurants. Even though industrial dishwashers with high washing capacities are available, this process of washing utensils inevitably requires complex systems of transportation, inventory control and manpower management. Besides, the collection,
25 cleaning and distributing of utensils are labour intensive, tedious and time-consuming, which inevitably add to the operation costs of the food centres and restaurants, which in turn increases the cost of dining to customers.

[0004] The present invention aims to provide a new and useful mobile dishwasher.
30 The application also intends to provide new and useful methods for using, maintaining, upgrading and servicing the mobile dishwasher. Essential features of the invention are provided by one or more independent claims, whilst advantageous features are presented by their dependent claims respectively.

[0005] It may be a further objective of the present application to provide a mobile dishwasher that comprises a cart and a washer that can be separated or coupled together. In use, a cleaner pushes the cart around a restaurant and collect soiled
5 utensils into baskets of the cart. The cart is subsequently coupled to the washer for cleaning the soiled utensils inside the mobile dishwasher. The baskets may be detachably mounted onto the cart, and one or more of the baskets has one or more jigs for fastening the soiled utensils in place. The jigs may be detachable from the baskets. The cart additionally may have a bin for accumulating disposed food waste.
10 The mobile dishwasher is compact such that the mobile dishwasher can be easily installed in a food centre or restaurant without occupying much space.

[0006] According to a first aspect of the application, the present application provides a mobile dishwasher that comprises a washer having one or more nozzles for
15 discharging a cleaning fluid (e.g. clean water, recycled water and detergent) into the washer, and a first cart. The first cart is configured or adapted to be detachably coupled to the washer for providing an enclosure with the washer in order to wash soiled utensils. In other words, the first cart is able to be detachably coupled or joined to the washer. The first cart comprises two or more side-openings for receiving soiled
20 utensils into the first cart or the enclosure before the first cart being coupled to the washer in forming the enclosure.

[0007] The multiple side openings allows an operator of the mobile dishwasher or the first cart to load soiled eating utensils onto the cart easily because an interior of the
25 first cart is exposed for easy access. In fact, when opposite sides of the first cart are opened (e.g. lateral opposite sides), the operator can conveniently and fully fill the first carts with the soiled utensils so that the loading of the utensils become fast, efficient and convenient. For example, if a width of the first cart is less than two meters, the operator can reach and placed a soiled dish/plate at a centre of the first
30 cart without requiring additional tools. In contrast, a length of the first cart may be from 0.5 meters to 2 meters or more, without causing difficulty in loading soiled utensils onto any part of the first cart. The first cart is desired to be lower than a normal height of the operator (e.g. 1.7 meters), but higher than 0.5 meters so that the

operator does not have to stretch or bend his body excessively for handling the first cart.

[0008] In fact, the mobile dishwasher provides an open cart concept which may drastically increases loading efficiency of the utensils without having to pull out racks or baskets for loading. The mobile dishwasher may have one or more standard racks or baskets for loading of smaller or larger plates and bowl found in eateries. The mobile dishwasher is wide (e.g. larger than 50 centimetres) for holding bigger plates and bowls. The side-openings or doors of the cart facilitate efficient washing. The mobile dishwasher may use water, detergent (e.g. electrolysis of water for providing acid & alkaline), steam or other cleaning agents for removing stubborn stains, depending on nature the soiled utensils, such as by oil/butter or sauces. The mobile dishwasher may also adopt different washing programmes (e.g. detergent usage or steam temperature) for cleaning diverse types of soiled utensils.

[0009] The mobile dishwasher can further comprise a guiding mechanism for directing the first cart to the washer for coupling. The guiding mechanism can include wedges, rails, tracks, magnets or other cooperating parts on the first cart and the washer so that the first cart is easily guided into the washer or mobile dishwasher for easy coupling. For example, the guiding mechanism can comprise two sleeves on the first cart, and two rods on the washer. The two rods are inserted into the two sleeves respectively when coupling the first cart and the washer together such that the first cart and washer can be easily joined together for washing the soiled utensils. The guiding mechanism can provide assistance for aligning the two separated parts (i.e. the first cart and the washer) possibly before their physical contact and/or after their physical contact. Hence, the guiding mechanism allows the ease of joining the first cart and the washer together, avoiding collision or hard landing. Soft-close/positive-close mechanism and/or locking mechanism can be additionally incorporated. The soft-close mechanism enables the first cart and the washer to be coupled quietly, or which are coupled fully after being joined only partially. The locking mechanism can either manually or automatically (e.g. connected to a computer) operated so that the first cart is prevented from being decoupled when the washer is in washing operation.

[0010] The mobile dishwasher may comprise a strainer for preventing solid particles or slurry from blocking an internal or external drainage system connected to the mobile dishwasher. The strainer allows rinsed or used water to pass through so that
5 the rinsed or used water can be recycled to nozzles for flushing soiled utensils again. Clean water consumption by the mobile dishwasher is drastically reduced.

[0011] The strainer can comprise a cyclone filter that is adapted to automatically
10 purge out the solid particles, slurry or food debris from recycled water. The cyclone reduces or avoid usage of filtering screen or net so that the mobile dishwasher is less dependent on the supply of consumables, such as filtering screens.

[0012] The strainer further may comprise a waste collector for storing the solid
15 particles or the slurry. The waste collector may be periodically cleaned so that food waste may be collected for recycling. Additionally, the solid particles or the slurry may be removed from waste water discharge from the mobile dishwasher so that a sewage system or drainage system of a food court or restaurant will be blocked. The strainer may comprise a fluid trap for draining sewage water from the mobile
20 dishwasher to the drainage system without spillage (e.g. dirtying floor of the food court).

[0013] The mobile dishwasher can further comprise one or more fluid seals that are configured to withstand heat, acid, alkali, pressure or a combination of any of these for hermetically sealing the mobile dishwasher during operation. The one or more
25 fluid seals (also known as mechanical seal) helps join parts or mechanisms together by preventing leakage (e.g. in a plumbing system), containing pressure, or excluding contamination. The effectiveness of the fluid seal is dependent on adhesion in the case of sealants and compression in the case of gaskets. Examples of the fluid seals include O-ring and hermetic seal.

30 [0014] The mobile dishwasher may further comprise a monitoring system that is configured to observe operation of the mobile dishwasher. The monitoring system may include cameras, computers, sensors and glass windows for observing

operation status of the first mobile dishwasher (also known as mobile dishwasher). The cameras may include a thermographic camera (infrared camera or thermal imaging camera), a camcorder, a digital camera and X-ray camera.

- 5 [0015] The monitoring system can comprise a safety mechanism that is adapted to suspend the operation of the mobile dishwasher when detecting system fault (e.g. improper coupling between the washer and the first cart). The safety mechanism can detect gas leakage, water spillage, hazardous electric current discharge or any other safety issues so that the mobile dishwasher cannot start washing process without
10 resolving these safety issues. For example, the safety mechanism cuts off electricity supply to a pump of the mobile dishwasher if the first cart and the washer are coupled or locked to each other securely.

- [0016] The monitoring system may further comprises one or more indicators for
15 showing operation status of the mobile dishwasher. The indicators may give audio or visual signals to operators so that the operators may observe status of the mobile dishwasher.

- [0017] The one or more indicators can comprise a display screen, a warning light, an
20 audio alarm, a loud speaker, a touchscreen, a transparent window on the mobile dishwasher or a combination of any of these. These indicators can give access or interfaces for regulating or observing the mobile dishwasher.

- [0018] The monitoring system may further comprise one or more cameras for taking
25 images (e.g. photos or movies) of the operation. The monitoring system may further comprise one or more audio or video recorders for recording operation of the mobile dishwasher.

- [0019] The monitoring system can be configured to cause the mobile dishwasher to
30 perform self-clean operation according to predetermined programmes. The mobile dishwasher has sensors that detects cleanness of the mobile dishwasher so that the self-clean operation is performed according to predetermined time intervals or programmes. For example, when using hard water, the mobile dishwasher can

discharge acidic fluid within its fluid circulation system for removing calcium and magnesium carbonates.

5 [0020] The first cart may comprise one or more racks for holding one or more baskets on each of the racks. The racks are fixtures of the first cart for receiving containers. The one or more racks may be resistive to corrosion and/or mechanical shocks so that the first cart becomes durable for long-term operation.

10 [0021] The one or more racks may comprise a first rack and a second rack for holding the utensils of different heights. The utensils may have diverse shapes, sizes and/or heights. Two or more racks of the first cart with different heights provides suitable space for receiving the utensils into the baskets without wasting space/height between loaded utensils and their upper rack. More utensils may be packed into the first cart such that an interior space or room in the first cart may be effectively utilised.

15 Instead of having racks with same sizes, a rack or basket with a short distance from a base of the rack to a bottom of its upper rack (known as the height of the rack or basket) accepts utensils with suitable sizes, wasting less loading capacity of the first cart. For example, a top rack of the first cart having a small height (e.g. 15 centimetres) can hold mugs well; a middle rack of the first cart having a medium

20 height (e.g. 25 centimetres) can receive bowls and plates; and a bottom rack of the first cart having a large height (e.g. 50 centimetres) can accommodate trays.

[0022] The one or more racks can be configured to detachably hold the one or more baskets. Baskets of diverse sizes are suitable for holding a variety of eating utensils

25 so that the same mobile dishwasher is suitable for food catering of different preferences, culture or duty of usage.

[0023] The one or more racks may comprise a height adjustment mechanism for holding the baskets of different heights. The height adjustment may be discrete or

30 continuous so that the baskets or utensil of diverse sizes may be contained by the first cart for washing. The height adjustment mechanism may be electrically or mechanically regulated so that the height adjustment may be achieved with simplify, accuracy or reliability.

[0024] The mobile dishwasher can further comprise a fluid circulation mechanism for reusing the cleaning fluid. The fluid circulation mechanism can circulate clean water, used water, detergent, steam or hot air of different temperatures depending on washing schemes of the mobile dishwasher.

[0025] The mobile dishwasher may further comprise a dryer that may utilise UV (ultraviolet), infrared, hot air/gas, super-heated steam for drying washed eating utensils. The dryer may include one or more blowers, lamps or orifices at diverse locations of the mobile dishwasher so that parts of whole of the mobile dishwasher may be dried with different or same capacity.

[0026] The washer, the first cart or both the washer and the first cart can comprise one or more ground propulsion (e.g. wheel or track) for moving the first cart, the washer or both on a floor. The ground propulsion can be manually or electrically powered. Other means (e.g. internal combustion engine) can also be suitable as replacement, compliments or backup. The one or more ground propulsion (e.g. wheel or track) can further comprise one or more locks for bolting the ground propulsion so that the first cart or both the washer and the first cart can be parked at designated places for operation. The washer, the first cart or both the washer and the first cart can additionally comprise one or more legs, hooks or other anchors for fastening, locating or locking the first cart or both the washer and the first cart at the designated places. The one or more ground propulsion can be detachable, replaceable or height adjustable.

[0027] The mobile dishwasher may further comprise a storage tank for keeping detergent, sanitizing agent or other cleaning agents. The storage tank may be incorporated or detachable for easy handling. The storage tank may also have housing and connectors of standard shapes or sizes for receiving cartridges or containers of the detergent, sanitizing agent or other cleaning agents.

[0028] The mobile dishwasher can further comprise a metre for showing remaining volume of the detergent, sanitizing agent or other cleaning agents for refilling. The

meter is a measuring gauge that indicates or communicates remaining volumes of relevant consumables, such as the detergent.

5 [0029] The mobile dishwasher may further comprise a communication host for transmitting operation information of the mobile dishwasher remotely. The communication host uses Information and communications technology (ICT) for providing automatic data transmission of the mobile dishwasher so that the mobile dishwasher may be locally or remotely monitored or operated.

10 [0030] The mobile dishwasher can further comprise an instant steam generator (not boiler or without boiler) for providing saturated, super-heated steam, pressurised steam or a combination of any of these. The mobile dishwasher can additionally include a boiler and/or heater connected for supplying steam of different temperatures.

15 [0031] The mobile dishwasher may further comprise a washing gun that is connected to the mobile dishwasher via a flexible or rigid hose for spraying the cleaning agent. The washing gun, also known as spray gun, provides an additional tool to the operator for cleaning a specific item or corner including washing the washer itself as
20 well as surrounding flooring. In fact, the first cart, the second cart or both are optionally washable by the washer so that the first cart or the second cart can be automatically cleaned when necessary or depending on operator settings. For example, the first cart, the second cart or the washer are automatically washed by the washer if sensors of the mobile washer detects excessive contaminations on
25 them.

[0032] The mobile dishwasher can further comprise a hub connector for receiving electrical power supply, fluid supply or both from an external source. Accordingly, the hub connector provides a single connector instead of multiple couplings. The hub
30 connector includes an electric hub connector for electric (power or signal) cables, a fluid hub connector for fluids and a common hub connector for both fluid and cables.

[0033] The first cart may comprise a rubbish bin. The rubbish bin facilitates the operator for collecting food debris when collecting soiled utensils. Accordingly, large food particles are removed before loading to the first cart (also known as cart).

5 [0034] The rubbish bin can be rotatable, detachable or both rotatable and detachable for emptying rubbish. The operator can easily flip the rotatable rubbish bin for emptying. If a full rubbish bin is removed, an empty rubbish bin is conveniently attached to the first cart for resuming collection of soiled utensils. The rubbish bin can comprise two containers, which enclose each other. An inner container has
10 perforations for draining sewage water and collecting solid food debris, whilst an outer container has an enclosed bottom for keeping the sewage water dripped from the solid food debris or slurry. The rubbish bin can additionally comprise a side rubbish bin for collecting sewage water from rubbish in the rubbish bin. The side rubbish bin can be attached to a perforated bottom of the rubbish bin so that sewage
15 water can be dripped and collected at the side rubbish bin.

[0035] The first cart or the washer may further comprises of an auxiliary bin for holding cleaning tools. The cleaning tools help the operator to clean dining tables when collecting the soiled utensils.

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[0036] The mobile dishwasher can further comprise a second cart or more carts. The second cart can be configured to couple with the washer from a same side, a different side or an opposite side of the first cart. In fact, the mobile dishwasher can receive multiple carts from several sides, thus having higher efficiency for washing.

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[0037] The mobile dishwasher may further comprise an electrolyser (i.e. electrolyzer) for generating acidic cleaning agent, alkaline washing agent or both. For example, proton exchange membrane electrolyzers may be used in industrial and laboratory applications. Hence, the mobile dishwasher may avoid using market available
30 chemical detergent (e.g. anionic detergents, cationic detergents, and non-ionic and zwitterionic detergents) for cost reduction. Known chemical detergent is a mixture of surfactants with "cleaning properties in dilute solutions." These substances are usually alkylbenzenesulfonates, a family of compounds that are similar to soap but

are more soluble in hard water, because the polar sulfonate (of detergents) is less likely than the polar carboxyl (of soap) to bind to calcium and other ions found in hard water. In most household contexts, the term detergent by itself refers specifically to laundry detergent or dish detergent, as opposed to hand soap or other types of cleaning agents. Besides, users of the mobile dishwasher are no longer required to purchase or refill the chemical detergent. The mobile dishwasher may further mix used acidic water and alkaline water together for neutralisation before discharging to external sewage system, which is environment friendly. The electrolyser, also known as electrolysis detergent generator, thus provide better sanitizing and green washing.

[0038] The mobile dishwasher can further comprise a washing mechanism that comprises one or more spray arms. The at least one spray arm has orifices for ejecting the cleaning fluid. The one or more spray can discharge water from several angles around the soiled utensils with or without high pressure so that the soiled utensils are speedily washed. More sprayer arms for different racks, baskets or layers reduce the number of row thus reduces loading quantities. Height in each row is also reduced which is unable to cater to larger plates and/or bowls. Also water usage and powerful pump is required.

[0039] The one or more spray arms may be rotatable, which may be driven by fluid pressure or electric motor directly or indirectly. Rotary movement of the spray arms ejects swirling fluids for effective scrubbing on the soiled utensils.

[0040] The first cart may further comprise one or more jigs for spreading the utensils apart from each other. The one or more jigs may further hold the utensils at desired positions so that cleaning fluid is not accumulated at the utensils during washing process. Suitable space between neighbouring utensils further permit the cleaning fluid (e.g. clean water) to reach exposed utensils from diverse directions.

[0041] The mobile dishwasher can further comprise a hand washing and sterilizing compartment that has a basin, tap water, steam, spray head, scrubber, sanitizer, washing cloth, detergent, drying towel or other cleaning accessories. The operator can easily access these cleaning tools for cleaning the dining table or his hands.

[0042] The mobile dishwasher may allow baskets or drawer be pulled out or pushed into the cart. The racks or baskets of the cart may have double staggered sides. The cart may have a front frame support, back frame support or side frame support. The mobile dishwasher may use reusable energy (e.g. hot spring, solar). The mobile dishwasher may comprise service compartment that has a basin, a water tap, a spray head, a scrubber or other cleaning tools. The mobile dishwasher may additionally has a camera or a sensor for observing status of washing operation.

[0043] The mobile dishwasher can further comprise one multiple entrances, exits, or several entrances together with exits for receiving washing soiled utensils on several carts concurrently, sequentially or both. Thus, the mobile dishwasher can also be known as mobile dishwashing station because washing capacity of the mobile dishwashing station is greater than washing by using a single cart. The mobile dishwasher or the mobile dishwashing station may be installed in a stall for providing commercial services. The mobile dishwasher or mobile dishwashing station can adopt computers to control and monitor dishwashing process, providing regulation to resources (e.g. water, gas, electricity) cost and billings. For example, utensil items carry electronic identification (e.g. RFID embedded or tagged) so that the computers of the washer, the first cart or the mobile dishwasher can gather the usage and tabulate bills for users (e.g. each stall owner) on a use-as-you-pay scheme.

[0044] The mobile dishwasher may have one or more washing modes for operation. These modes may be manually determined, configured or modified. These modes may also be automatically selected depending machine setting, such as based on sensor detection on uncleanness, time periodical control or detergent application status. For example, the mobile dishwasher has an eco-wash mode for washing lightly-soiled utensils at 45 seconds (i.e. short wash); a standard/normal wash mode at 90 seconds (i.e. medium wash); and a strong/soil wash mode at 120 seconds (i.e. long wash) for heavily contaminated/oily/greasy utensils. Detergenless (washing mode without using chemical detergent) washing mode may be executed by electrolysis water, whilst extreme washing mode may be performed by using super-heated steam (e.g. spraying utensils with super-heated or dry steam at 125°C).

[0045] According to a second aspect of the application, the present application provides a method for using a mobile dishwasher or any of the mobile dishwasher as illustrated before. The method comprises a first step of moving a first cart of the mobile dishwasher for collecting soiled utensils of a food court; a second step of loading the soiled utensils onto the first cart from a first side-opening, a second side-opening, a top side-opening or any of the side-openings; a third step of coupling the first cart with a washer of the mobile dishwasher together; and fourth step of washing the soiled utensils by the washer; a fifth step of detaching the first cart from the washer; and a sixth step of unloading washed utensils from the first cart. These steps can be repeated or change in sequence when required. Hence, the mobile dishwasher can effectively and efficiently clean soiled utensils of a food court locally at low cost. The method may further comprises a step of distributing the washed utensils in the food court. The method avoid the restriction of loading the soiled utensils only from one side (e.g. front side). Once interior of the first cart is allowed to be accessed from lateral or multiple sides (e.g. two opposite lateral sides across width of the first cart), an operator does not have to stretch his arm to a deep interior of the first cart. Handling of the first cart becomes much easier.

[0046] According to a third aspect, the application provides a method for operating a mobile dishwasher or any of the mobile dishwasher as illustrated before. The method comprises a first step of monitoring operation status of the mobile dishwasher; and a second step of replenishing consumables when detecting low storage level of consumables. The step of monitoring can further comprise a step of collecting information of the mobile dishwasher via a remote electronic device connected to the mobile dishwasher. Therefore, the mobile dishwasher is examined during its operation, which offers reliability and durability for long term operation. The method can further comprise a step of suspending operation of the mobile dishwasher when detecting safety issues so that safety of operators or consumers is not compromised.

[0047] According to a fourth aspect, the application provides a method for servicing a mobile dishwasher or any of the mobile dishwasher as illustrated before, which comprises a first step of connecting to the mobile dishwasher via an electronic

communication device; a second step of diagnosing the mobile dishwasher with a computer programme on the electronic communication device; and a third step of configuring the mobile dishwasher by the electronic communication device. Some of these steps may be repeated or changed in sequence.

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[0048] According to a fifth aspect of the application, the application provides a method of repairing a mobile dishwasher or any of the mobile dishwasher as illustrated before that comprises a first step of receiving an electronic signal on a faulty part of the mobile dishwasher; and a second step of replacing the faulty part.

10 Users of the mobile dishwasher have peace in mind because the mobile dishwasher is maintained in good condition throughout its lifespan.

[0049] According to a sixth aspect, the present application provides a parking lot for accommodating a mobile dishwasher or any of the mobile dishwasher as illustrated before. The parking lot, which may also be known as a stall, comprises a tap for providing water to the mobile dishwasher; an electrical socket for offering electricity to the mobile dishwasher; a drainage system for draining waste water from the mobile dishwasher; and a passageway for allowing access of a cart, a washer or both of the mobile dishwasher. The parking lot can be easily constructed, which further provides protection to parts of the mobile dishwasher. The mobile dishwasher can be locked or shielded by the parking lot when not in use.

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[0050] The method of repairing a mobile dishwasher or the mobile dishwasher as illustrated before may further comprise step of providing a software patch to the mobile dishwasher. The software patch include firmware update package, software update package, diagnostic software package, driver software package for hardware components, additional software packages for new functions or new components, and any software configurations. The method thus facilitates repairing or upgrading the mobile dishwasher locally onsite, or remotely offsite, depending on situations.

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[0051] The accompanying figures (Figs.) illustrate embodiments and serve to explain principles of the disclosed embodiments. It is to be understood, however, that these

figures are presented for purposes of illustration only, and not for defining limits of relevant applications.

[0052] Figs. 1 to 9 illustrates various views of a first mobile dishwasher according to a first embodiment of the present application;

[0053] Fig. 10 to 13 illustrates how a first cart is used with the first mobile dishwasher in accordance with the first embodiment of the present application.

[0054] Fig. 14 illustrate a second mobile dishwasher according to a second embodiment of the present application.

[0055] Figs. 15 & 16 illustrates various designs of carts;

[0056] Figs. 17 to 21 illustrate various cleaning mechanisms performing various cleaning operations according to embodiments of the present application;

[0057] Figs. 22 to 27 illustrates loading and unloading of the cart to and from the compartment of the mobile dishwasher according to different embodiments of the present application; and

[0058] Figs. 28 to 36 illustrates installation of mobile dishwashers in food centres according to different embodiments of the present application.

[0059] Exemplary, non-limiting embodiments of the present application will now be described with references to the above-mentioned figures. Embodiments of the application comprise parts or method steps that are similar or identical to each other. These parts or method steps are thus denoted with similar or identical names or reference numerals. Description of these relevant parts of method steps is hereby incorporated by reference, wherever relevant or appropriate.

[0060] Figs. 1 to 13 illustrates a first embodiment of the application, which provides a first mobile dishwasher 50 for washing soiled eating utensils 52. The first mobile

dishwasher 50 is alternatively known as mobile dishwasher 50 in short, whilst the soiled eating utensils 52 may also simply be known as utensils 52. The mobile dishwasher 50 comprises a washer 54 and a first cart 56 that are coupled together. The washer 54 has some nozzles 58 for discharging water 60 inside a compartment 62 of the washer 54. The first cart 56 and the washer 54 are detachably coupled together in forming a compartment 62 for receiving the water 60. The first cart 56 comprises baskets 64 or trays for holding the dirty utensils 52, whilst each of the baskets 64 are movably mounted onto a rack 66 fixed to the first cart 56.

10 [0061] The coupling of the first cart 56 with the washer 54 is performed linearly. The linear movement is achieved by a guiding mechanism 68 that comprises two parallel rails (not shown) on the washer 54, which cooperate with two tracks (not shown) on the first cart 56. The tracks fit with the rails when the first cart 56 is pushed into the washer 54 so that the first cart 56 is aligned with the washer 54 throughout a coupling process of the two parts 54, 56.

[0062] Figs. 1 to 9 illustrates various views of the mobile dishwasher 50. Particularly, Fig. 1 shows a perspective view of the mobile dishwasher 50. Fig. 2 shows the mobile dishwasher 50 whose first cart 56 is being pushed into the washer 54 for coupling. The first cart 56 has three lateral side openings 70, 72, 74, which consists of a first side-opening 70, a second side-opening 72 and a front side-opening 74. In contrast, a bottom side 76 and a back side 78 of the first cart 56 are provided by plates 76, 78 that closes off sides of the first cart 56. The back side 78 is located at an opposite end of the front side-opening 70. The first cart 56 additionally has a top side-opening 76. The side-openings 70, 72, 74, 76 of the first cart 56 expose the baskets 64 such that the soiled utensils 52 can be easily loaded into the baskets 64 for washing or removed from the baskets 64 after the washing. The mobile dishwasher 50 comprises a fluid seal 77 that prevents leakage of gas, water or steam from the mobile dishwasher 50 after secure coupling of the first cart 56 with the washer 54. The fluid seal 77 comprises multiple gasket, rubber seals and O rings (not shown) on connection interfaces of the first cart 56 with the washer 54. The mobile dishwasher 50 comprises multiple safety mechanism 79 that prevents operation of

the mobile dishwasher 50 if there is leakage of water, steam, electricity, gas or waste water.

[0063] The mobile dishwasher 50 has a control unit 410 that regulates operation of the mobile dishwasher 50 and communicates with external electronic devices (not shown). For example, the control unit 410 transmits operation data to a remote computer sever for data analysis and operation monitoring. The control unit 410 comprises indicators 412, a display screen 414, warning lights 416, an audio alarm 418, a loud speaker 420, a touchscreen 422, a transparent window 424, a camera 426, a dryer 428, a meter 430, a storage tank 432, a communication host 434 (e.g. computer) and a hub connector 436. The indicators 412 are LED light bulbs that have several colours for representing status of the mobile dishwasher 50. A red LED light 412 indicates faulty states, a yellow LED light 412 indicates shortage of supply (e.g. detergent) and a green LED light 412 indicates stable operation of the mobile dishwasher 50. Both the red LED light 412 and the yellow LED light 41 are also known as warning lights 416. The display screen 414 is a touchscreen 422 that allows an operator 152 to change setting or parameters of the mobile dishwasher 50. The control unit 410 additionally includes the audio alarm 418 for giving audible alarm noise, and a loud speaker 420 for broadcasting messages of the control unit 410.

[0064] The transparent window 424 is mounted onto the control unit 410, whilst the camera 426 is fixed inside the control unit 410. The dryer 428 is connected to the washer 54 for drying cleaned utensils, and the meter 430 keeps monitoring supplies of the first mobile dishwasher 50, such as detergent storage level and water tank level. The storage tank 432 has compartments for storing clean water, used water and detergent. The communication host 434 (e.g. computer) has antennas and communication ports for computer networking or diagnosis so that the first mobile dishwasher 50 can communicate with a neighboring mobile dishwasher and a remote data center (not shown). The control unit 410 further has a hub connector 436 that combines electric cables and fluid pipes together into a single bus.

[0065] Fig. 3 shows three side views of the mobile dishwasher 50, which consist of a front view 78, a side view 80 and a back view 82.

[0066] Fig. 4 shows a monitoring system 84 for operating the mobile dishwasher 50. The monitoring system 84 utilises IT/Internet or cloud computing technology to monitor and transmit information about the consumable items, such as detergent and detergent peripherals / refill cartridge, etc. malfunction, low level replenishment or planning of maintenance / spare parts, including remote repair. The monitoring system 84 further includes a billing system on "pay-as-you-use" (a technique for democratization of technology). The monitoring system 84 comprises a display screen, a warning light, an audio alarm, a loud speaker, a touch screen, a transparent window. The monitor or the display screen allows the user to observe the operation of the mobile dishwasher, such as examine the status of water, steam, detergent, electricity, gas, air or a combination of any of these cleaning medium during the cleaning operation. The control and monitoring system 84 further comprise of an alarm for notifying abnormality of the mobile dishwasher. Furthermore, the control and monitoring system 84 is configured to enable the mobile dishwasher to perform self-cleaning operation.

[0067] Fig. 4 shows the first mobile dishwasher 50 having a hand washing and sterilizing chamber 86. The hand washing and sterilizing chamber 86 comprises of a basin 88, a hot water tap 90 and a cold water tap 92. Each of the hot water tap 90 and the cold water tap 92 has spray heads 94, 96. When hands appear above the basin 88 and below the taps 90, 92, the hot water tap 90 or the cold water tap 92 will automatically dispense water to the hands, according to predetermined user settings. Similarly, the taps 90, 92 will cut off the water dispensing once the absence of hands is detected.

[0068] Additionally, the hand washing and sterilizing chamber 86 is connected to an electrolyser 98 (i.e. electrolyzed water generator) that passes electric current through water via an electrolyte (not shown). When selected by the user, the electrolyser 98 delivers alkali electrolysis water as the detergent via the hot water tap 90, and acid electrolysis water as the sanitizing agent. The electrolyzed water generator is also known as chlorine generator, salt cell, salt generator or salt chlorinator, which uses electrolysis in the presence of dissolved salt (NaCl) to produce hypochlorous acid

(HClO) and sodium hypochlorite (NaClO). The electrolyzed water generator can be installed locally such that freshly generated alkali electrolysis water and acid electrolysis water can be immediately delivered to detergent washing station and the sanitizing station respectively. Traditional chemical detergents (e.g. anionic
5 detergents, cationic detergents & non-ionic and zwitterionic detergents) or sanitizing agent (i.e. disinfectants are antimicrobial agents) are avoided for cost reduction and environmental protection. For example, alcohols, aldehydes (e.g. formaldehyde and glutaraldehyde) and oxidizing agents (e.g. sodium hypochlorite), phenolics or other sanitizer are reduced or avoided when using the first mobile dishwasher 50.

10 [0069] Fig. 5 shows the first mobile dishwasher 50 having a condensing unit or mist eater 100 adapted to absorb hot steam or mist in the first mobile dishwasher 50 such that the hot steam or mist is prevented from escaping from the first mobile dishwasher 50.

15 [0070] Figs. 6 and 7 show the first mobile dishwasher 50 having a spray gun 102 and an instant steam generator 104. The spray gun 64 is connected to the instant steam generator 104 via a flexible hose 106. The spray gun 102 can be detached from a holder 108 on the first mobile dishwasher 50. Referring to Fig. 7 in particular, the
20 spray gun 102 is optionally connected to the clean water, the alkali electrolysis water, the acid electrolysis water, super-heated steam from the instant steam generator 104 or mist for spray-cleaning of the first mobile dishwasher 50. Accordingly, an operator of the first mobile dishwasher 50 can use the spray gun 102 to clean both internal and external parts of the first mobile dishwasher 50 when necessary, known as CIP
25 (Clean-In-Place).

[0071] Fig. 8 shows the first mobile dishwasher 50 having a strainer 110 for separating solid particles 116 and slurry 118 from fluids (e.g. waste water, used water, sewage water or recycled water). The strainer 110 further comprises a cyclone filter
30 112 that is adapted to automatically purge out food debris from recycled water to prevent choking a fluid circulation system 114 of the first mobile dishwasher 50. Fig. 8 also shows a fluid trap 115 for draining sewage water 120 from the mobile dishwasher 50 to the drainage system 314 without spillage.

[0072] As shown in Fig. 9, the first cart 56 is provided with three racks 122, 124, 126 that are parallel to each other. The three racks 122, 124, 126 consist of a first rack 122 at bottom, a second rack 124 in the middle and a third rack 126 on top. The three racks 122, 124, 126 are mounted onto a pillar 130 at their ends such that the three racks 122, 124, 126 are able to be attached or detached to the pillar 130 when necessary. The second rack 124 and the third rack 126 are further be able to be adjusted in height by mounting onto different positions of the pillar 130. Height adjustment of the two racks 124, 126 is achieved by discrete steps/lengths according to mounting holes (not shown) on the pillar 130. Accordingly, first cart 56 comprises a height adjustment mechanism 128 that can change heights of the three racks 122, 124, 126. A first height 123 is measured from the first rack 122 to the second rack 124 for accommodating trays. A second height 125 is defined between the second rack 124 and the third rack 126 for receiving bowls. A third height 127 is indicated between a third rack 126 and an internal ceiling 129 of the washer 54 for holding mugs. These heights 123, 125, 127 are regulated by the height adjustment mechanism 128.

[0073] Each of the middle 124 and top racks 126 holds two baskets 132, 134, 136, 138, which are laid side-by side on their respective racks 124, 126. Particularly, both the first baskets 132, 134 have first jigs respectively for supporting cutlery items, such as forks, knives and chop sticks. Both the second baskets 136, 138 include second jigs 142 for holding bowl, mugs and plates. In contrast, a detachable jig 144 is mounted onto the first rack 122 for holding food trays 146 in vertical and parallel positions.

[0074] Figs. 10 to 13 shows methods of using the first mobile dishwasher 50 in a food court 148. A first view 150 illustrates that an operator 152 pushes the first cart 56 next to a dining table 154 of the food court 148. Soiled eating utensils 52 that are left on the dining table 154 by customers (not shown) are collected by the operator 152. When cleaning the dining table 154, the operator 152 disposes soiled cutlery items 156 into the first baskets 132, 134, which are further supported by the first jigs 140. The operator 152 additionally load soiled bowls, saucers and plates 158 into the

second baskets 136, 138, which are also upheld by second jigs 142 in the second baskets 138. Furthermore, the operator 152 put food trays 146 onto the detachable jig 144, which is installed on the first rack 122.

5 [0075] In a second view 162, the operator 152 pushes the first cart 56 around the food court 148 till the first cart 56 is fully loaded with soiled utensils 52, 146, 156, 158.

[0076] In a third view 164 of Fig. 10, the first cart 56 is pushed into the washer 54 such that the first cart 56 and the washer 54 are coupled together in forming a
10 hermetic chamber, concealing the soiled utensils 52, 146, 156, 158 inside for washing.

[0077] In a fourth view 166, the operator 152 removes the first cart 56 from the washer 54 after cleaning the soiled utensils 52, 146, 156, 158. The operator 152
15 distribute cleaned food utensils 52 back to the stalls 168 of the food court 148 as shown in a fifth view 170, and further collect a new batch of soiled utensils 52, 146, 156, 158 with an emptied first cart 56 as shown in a sixth view 172.

[0078] Fig. 11 illustrates how the first cart 56 is used in the food court 148.
20 Particularly, the first cart 56 carries a rubbish bin 174 at its side, and the rubbish bin 174 is attached to rails of the first cart 56 for height adjustment. When approaching the dining table 154, the rubbish bin 174 is reduced in height such that an opening of the rubbish bin 174 is closely below a top surface of the dining table 154. Food debris or rubbish 182 is easily swiped into the rubbish bin 174.

25

[0079] Fig. 12 shows that the rubbish bin 174 is rotated such that content of the rubbish bin 174 is poured into a dust bin 178 of the food court 148.

[0080] Fig. 13 illustrates the first cart 56 in various operations. Particularly, Fig. 13
30 depicts the first cart 56 having the rubbish bin 174 at a front end, and an auxiliary bin 180 at its back end. The auxiliary bin 180 carries cleaning tools 181 for cleaning rubbish 182 from dining tables 154 of the food court 148. Ascend or descend of auxiliary bin 180 is regulated by the height adjustment mechanism 128 automatically.

[0081] Fig. 14 illustrates a second mobile dishwasher 200 that has a first mobile cart 56 and a second mobile cart 202. The first mobile cart 56 and the second mobile cart 202 can be pushed into a washer 54 of the second mobile dishwasher 200 from opposite ends. Similar to the first mobile dishwasher 50, the second mobile dishwasher 200 perform dish washing operation when the two mobile carts 56, 202 are coupled to the washer 54.

[0082] Referring to Fig. 15, a first view 204 denotes the first cart 56 that stands on a floor 206 of the food court 148. A second view 208 of Fig. 15 provides a third cart 210 that has vertically aligned multiple racks 122, 124, 126 as holders for baskets or utensils. Particular, the second rack 124 (i.e. middle rack) can be pulled out of the third cart 210. A third view 212 of Fig. 15 provides a fourth cart 214 that has double-staggered sides. A fourth view 216 of Fig. 15 denotes a fifth cart 218 whose racks 124, 126 are adjustable in height and orientations. A fifth view 220 indicates that racks 122, 124, 126 are symmetrically supported by a pillar 130, whilst a sixth view 224 provides racks 122, 124, 126 to a pillar 130 at their ends, resembling three cantilevers respectively. Fig. 15 additionally shows jigs 228, 230, 232 that can support bowls in standing positions or at various heights. A seventh cart 226 carries both a rubbish bin 174 and an auxiliary bin 180.

[0083] Fig. 16 shows an eighth cart 234 having four racks 122, 124, 236, 126. The eighth cart 234 is being pushed in a myriad of tables 154 and stools 238. Heights of the racks 124, 236, 126 are adjustable such that they 124, 236, 126 are higher than heights of the stools 238, avoiding collision during travelling of the eighth cart 234.

[0084] Fig. 17 illustrates the first mobile dishwasher 50 that has a dryer 242. A first view 244 of Fig. 17 indicates that the first mobile dishwasher 50 comprises three spray arms 246, 248, 250. The three spray arms 246, 248, 250 discharge water 60 onto the soiled utensils 52 after coupling the first cart 56 with the first washer 54. The water 60 is propelled to the three spray arms 246, 248, 250 by a pump 240 connect to the three spray arms 246, 248, 250 via a fluid circulation mechanism 252 (e.g. pipes). A second view 254 of Fig. 17 shows that the three spray arms 246, 248, 250

discharge hot air from a blower 256 connected to the fluid circulation mechanism 252. Washed utensils 52 are dried up by the hot air.

[0085] A third view 258 of Fig. 17 shows that thermal drying technique is performed by the dryer 242. The dryer 242 comprise multiple frames 260 arranged vertically around the first cart 56, each of the frames 260 having lamps for emitting infrared light and ultraviolet light. A fourth view 262 of Fig. 17 shows that several electric heating elements 264 surround the first cart 56 for drying. A sixth view 266 of Fig. 17 shows that solar heating is performed by the dryer 242. Solar panels 268 on rooftop of the food court 148 is connected to the electric heating elements 264 for supplying electricity to the electric heating elements 264.

[0086] Fig. 18 illustrates the first mobile dishwasher 50 having a reservoir 268 for keeping detergent 270. The detergent 270 is mixed with water 60 for reaching predetermined levels of concentration such that the pump 240 can circulate the cleaning fluid 270 to the spray arms 246, 249, 250 for washing. The spray arm 249 has nozzles 58 that are directed towards both upwards and downwards.

[0087] Fig. 19 illustrates two embodiments of the spray arms 274, 276, 278. Referring to a first view 272, the spray arms 274, 276, 278 are rigid pipes and have fixed positions. The water 60 is spewed from nozzles 58 on the spray arms 274, 276, 278 onto soiled utensils 52. Both the middle and bottom spray arms 276, 278 have nozzles 58 at opposite sides such that the water 60 can be spurted both upwards and downwards. In contrast, the top spray arm 274 only have nozzles 58 for spraying the water 58 downwards.

[0088] Referring to a second view 280, a fluid circulation mechanism 252 comprises a top spray arm 282, a middle spray arm 284 and a bottom spray arm 286. Both the top and bottom spray arms 282, 286 have rotary discs 288, 290 respectively such that these rotary discs 288, 290 can emit the water 60 from nozzles 58 on the rotary discs 288, 290 when in use.

[0089] Fig. 20 illustrates embodiments of the fluid circulation mechanism 252, which is also known as washing mechanism 252. Referring to a first embodiment 292, the fluid circulation mechanism 252 comprises three pair of spray heads 294, 296, 298 that are vertically stacked and parallel to each other. Each of the spray heads 294, 296, 298 comprises a rotary disc 288, 290, 300 (i.e. rotary arm) and a rotary tube 302. The first rotary disc 290 and the first rotary tube 302 are coupled as the first spray head 294 together for spraying water upwards. Similarly, the rotary arm 300 and a second rotary tube 302 are joined together at their centres for spraying water upwards too. In contrast, the third rotary disc 288 and the third rotary tube 302 are connected to the fluid circulation mechanism 252 for spraying water downwards. All three spray heads 294, 296, 298 are linked to a vertical pipe 304 for receiving fluid supply.

[0090] Referring to a second embodiment 306, the fluid circulation mechanism 252 comprises a pump 240 that is connected to a vertical pipe 304. An inlet 308 of the pump 240 is connected to a strainer 110, which is mounted to a waste collector 310 at bottom. Rinsing water from the spray heads 294, 296, 298 are collected by the waste collector 310 as a basin, and further circulated to the spray heads 294, 296, 298 for recycling because the vertical pipe 304 is connected to an outlet 312 of the pump 240. The outlet 312 is further connected to an external drainage system (not shown) via a check valve (i.e. clack valve, non-return valve or one-way valve) (not shown). The spray heads 294, 296, 298 and the vertical pipe 304 are additionally joined to the instant steam generator 104, a detergent tank (not shown) and a hot air blower (not shown) for delivering clean, recycled (used or rinsed) water, saturated or super-heated steam, detergent, air or a combination of any of these cleaning medium from an external source.

[0091] Referring to Fig. 21, a third mobile dishwasher 320 comprises a ninth cart 322 and a second washer 324. The second washer 324 has two opposite sides that are open. The ninth cart 322 which is loaded with the soiled utensils 52 can move back and forth into or out of the second washer 324 through the opposite sides, known as a front side 326 and a backside 328.

[0092] Figs. 22 to 27 shows further embodiments of the application, relating to loading and unloading of carts 330 with respect to mobile dishwashers 332, 338. Referring to Fig. 22, the soiled utensils 52 on a tenth cart 330 are pushed into the fourth mobile dishwasher 332 through a first window 334 (i.e. inlet window) on a rack 66. After washing operation, clean utensils 52 are retrieved from a second window 336 (i.e. outlet window) on the rack 66, leaving the fourth mobile dishwasher 332.

[0093] Fig. 23 depicts a fifth mobile dishwasher 338 that has an eleventh cart 340. The fifth mobile dishwasher 338 has an entrance 342 for receiving the eleventh cart 340 into the fifth mobile dishwasher 338. The entrance 342 is completely shut when the eleventh cart 340 has entered into a third washer 344 of the fifth mobile dishwasher 338. The fifth mobile dishwasher 338 is also known as a single lane mobile dishwasher 338.

[0094] Fig. 24 shows a sixth mobile dishwasher 346 that comprises a fourth washer 348. The fourth washer 348 has an entrance 342 and an exit 350 such that a eleventh cart 340 can be pushed through the fourth washer 348 from the entrance 342 to the exit 350. The sixth mobile dishwasher 346 is also known as a single lane mobile dishwasher 346. Cleaned utensils 52 are carried by the two of the eleventh carts 340, departing from a backside 360 of the sixth mobile dishwasher 346. A second view 362 of the seventh mobile dishwasher 352 indicates the eleventh cart 340 can enter the seventh mobile dishwasher 352 from an entrance 342 on a front side 358 of the seventh mobile dishwasher 352, and depart from the seventh mobile dishwasher 352 at an exit 350 on the front side 358. A third view 364 of the sixth mobile dishwasher 346 indicates that the eleventh cart 340 can enter the sixth mobile dishwasher 346 from a lateral side 366 of the sixth mobile dishwasher 346, and leave the sixth mobile dishwasher 346 from an exit 350 on a front side 358.

[0095] Fig. 26 illustrates an eighth mobile dishwasher 368 that has a service compartment 370. The service compartment 370 includes a basin 372, a water tap 372, a spray scrubber 372, sanitizer 372, hand/cloth washing liquid/soap 372 and detergent dispenser 372.

[0096] Fig. 27 illustrates a ninth mobile dishwasher 374 washing compartment that has a tray washer 376 in the middle and lower portion of the ninth mobile dishwasher 374. The tray washer 376 has an entrance 376 for receiving the tray washer.

5 [0097] Figs. 28 shows examples of installation for using the sixth mobile dishwasher 346. In a first view 378, the sixth mobile dishwasher 346 is attached a sidewall 380 of a food court 148. In a second view, the sixth mobile dishwasher 346 is held by a partition wall 382 that divides two stalls 168. In a third view, the sixth mobile dishwasher 346 is installed against a column 384.

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[0098] Fig. 29 illustrates the seventh mobile dishwasher 352 that is fitted into a food stall 386 to handle washing task for the food court 148. Fig. 30 illustrates a layout of the food stall 386 for receiving the seventh mobile dishwasher 352. The food stall 386 has a natural gas supply terminal 388, a heat/fume exhaust 390, an electric socket 15 392, an incoming water tap 394 and a drainage system 314 that are connected to the seventh mobile dishwasher 352. The food stall 386 has a footprint that encloses the seventh mobile dishwasher 352.

[0099] Fig. 31 illustrates a solar water heater 396 on a rooftop 398 of the food court 20 148 for providing hot water by solar power. Cold tap water is preheated by the solar water heater 396 for reducing power consumption from the electric socket 392.

[0100] Fig. 32 illustrates an electric and gas heater 400 on the rooftop 398 of food court 148. Fig. 33 illustrates an external electrolyser 98 for providing electrolysed 25 water to the seventh mobile dishwasher 352. The external electrolyser 98 provides acidic water as sanitizer or sanitising agent, and alkaline water as detergent for washing the soiled utensils 52. Fig. 34 illustrates electric or natural air ventilation structure above a rooftop 398 of a food court 148. Walls 380 surround the seventh mobile dishwasher 352 for keeping it safe. Fig. 35 shows the sixth mobile dishwasher 30 346 that is also installed with the heat/fume exhaust 390. The sixth mobile dishwasher 346 comprises a traveller 402 that can automatically engage wheels 404 of the sixth mobile dishwasher 346 for carrying the eleventh cart 340 into or out of the fourth washer 348.

[0101] Referring to Fig. 36, the seventh mobile dishwasher 352 further comprises an AGV 406 (automated guided vehicle or automatic guided vehicle) for transporting soiled utensils 52 on a first rack 122. The AGV 406 can fetch individual racks 122, 124, 126 from an eleventh cart 340 or directly pushes the eleventh cart 340 into the seventh mobile dishwasher 352. In fact, the AGV 406 is equipped with wireless communication antennas for communicating with the fourth washer 354 for controlling collection of soiled utensils 52, washing and distribution clean utensils 52 automatically. The seventh mobile dishwasher 352 receives the AGV 406 propelled cart at a first entrance 342, and a manually pushed cart at a second entrance 356.

[0102] In the application, unless specified otherwise, the terms "comprising", "comprise", and grammatical variants thereof, intended to represent "open" or "inclusive" language such that they include recited elements but also permit inclusion of additional, non-explicitly recited elements.

[0103] As used herein, the term "about", in the context of concentrations of components of the formulations, typically means $\pm 5\%$ of the stated value, more typically $\pm 4\%$ of the stated value, more typically $\pm 3\%$ of the stated value, more typically, $\pm 2\%$ of the stated value, even more typically $\pm 1\%$ of the stated value, and even more typically $\pm 0.5\%$ of the stated value.

[0104] Throughout this disclosure, certain embodiments may be disclosed in a range format. The description in range format is merely for convenience and brevity and should not be construed as an inflexible limitation on the scope of the disclosed ranges. Accordingly, the description of a range should be considered to have specifically disclosed all the possible sub-ranges as well as individual numerical values within that range. For example, description of a range such as from 1 to 6 should be considered to have specifically disclosed sub-ranges such as from 1 to 3, from 1 to 4, from 1 to 5, from 2 to 4, from 2 to 6, from 3 to 6 etc., as well as individual numbers within that range, for example, 1, 2, 3, 4, 5, and 6. This applies regardless of the breadth of the range.

[0105] It will be apparent that various other modifications and adaptations of the application will be apparent to the person skilled in the art after reading the foregoing disclosure without departing from the spirit and scope of the application and it is intended that all such modifications and adaptations come within the scope of the
5 appended claims.

Claims

1. A mobile dishwasher comprising:
 - a washer having a nozzle for discharging a cleaning fluid,
 - 5 – a first cart being configured to be detachably coupled to the washer,
 - at least one fluid seal on connection interfaces of the washer and the first cart, and
 - a safety mechanism adapted to suspend operation of the mobile dishwasher when detecting system fault,
 - 10 wherein the first cart comprises two or more side-openings for receiving soiled utensils before being coupled to the washer.
2. The mobile dishwasher of Claim 1, wherein the first cart comprises at least one rack for holding at least one basket.
- 15 3. The mobile dishwasher of Claim 2, wherein the at least one rack comprises a first rack and a second rack for holding the utensils of different heights.
- 20 4. The mobile dishwasher of Claim 2 or 3, wherein the at least one rack is configured to detachably hold the at least one basket.
5. The mobile dishwasher of any of the preceding Claims 2 to 4, wherein the at least one rack comprises a height adjustment mechanism for holding the baskets of different heights.
- 25 6. The mobile dishwasher of any of the preceding Claims further comprising a fluid circulation mechanism for reusing the cleaning fluid.
- 30 7. The mobile dishwasher of any of the preceding Claims further comprising a dryer for drying washed eating utensils.

8. The mobile dishwasher of any of the preceding Claims, wherein the washer, the first cart or both comprise at least one ground propulsion for moving on a floor.
- 5 9. The mobile dishwasher of any of the preceding Claims further comprising a storage tank for keeping detergent, sanitizing agent or other cleaning agents.
10. The mobile dishwasher of Claim 8 further comprising a metre for showing remaining volume of the detergent, sanitizing agent or other
10 cleaning agents.
11. The mobile dishwasher of any of the preceding Claims further comprising a communication host for transmitting operation information of the mobile dishwasher remotely.
15
12. The mobile dishwasher of any of the preceding Claims further comprising an instant steam generator for providing saturated, super-heated steam, pressurised steam or a combination of any of these.
- 20 13. The mobile dishwasher of any of the preceding Claims further comprising a washing gun connected to the mobile dishwasher for spraying the cleaning agent.
14. The mobile dishwasher of any of the preceding Claims further comprising a hub connector for receiving electrical power supply, fluid supply or both from
25 an external source.
15. The mobile dishwasher of any of the preceding Claims, wherein the first cart comprises a rubbish bin.
30

16. The mobile dishwasher of Claim 15, wherein the rubbish bin is rotatable, detachable or both rotatable and detachable for emptying rubbish.
- 5 17. The mobile dishwasher of Claim 15 or 16, wherein the rubbish bin comprises a side rubbish bin for collecting sewage water from rubbish in the rubbish bin.
- 10 18. The mobile dishwasher of any the preceding Claims, wherein the first cart further comprises of an auxiliary bin for holding cleaning tools.
19. The mobile dishwasher of any of the preceding Claims further comprising a second cart, the second cart being configured to couple with the washer.
- 15 20. The mobile dishwasher of any of the preceding Claims further comprising an electrolyser for generating acidic cleaning agent, alkaline washing agent or both.
- 20 21. The mobile dishwasher of any of the preceding Claims further comprising a washing mechanism that comprises at least one spray arm, the at least one spray arm having orifices for ejecting the cleaning fluid.
22. The mobile dishwasher of Claim 21, wherein the at least one spray arm is rotatable.
- 25 23. The mobile dishwasher according to any of the preceding Claims, wherein the first cart further comprises at least one jig for spreading the utensils apart from each other.
- 30 24. The mobile dishwasher of any of the preceding Claims further comprising a hand washing and sterilizing compartment.

25. The mobile dishwasher of any of the preceding Claims further comprising multiple entrances or exits for receiving washing soiled utensils on several carts.
- 5 26. The mobile dishwasher of any of the preceding Claims further comprising a locking mechanism for preventing the first cart from decoupled when the washer is in washing operation.
27. A parking lot for accommodating the mobile dishwasher according to any of the preceding claims, the parking lot comprising:
- 10 – a tap for providing water to the mobile dishwasher;
- an electrical socket for offering electricity to the mobile dishwasher;
- a drainage system for draining waste water from the mobile dishwasher; and
- a passageway for allowing access of a cart, a washer or both pf the mobile dishwasher.
- 15
28. A method for using a mobile dishwasher comprising:
- moving a first cart of the mobile dishwasher for collecting soiled utensils of a food court;
- 20 – loading the soiled utensils into the first cart;
- coupling the first cart with a washer of the mobile dishwasher together;
- sealing the mobile dishwasher on connection interfaces of the first cart with the washer for preventing leakage;
- washing the soiled utensils by the washer;
- 25 – suspending operation of the mobile dishwasher when detecting system fault;
- detaching the first cart from the washer; and
- unloading washed utensils from the first cart.
- 30 29. The method of Claim 28 further comprising: distributing the washed utensils in the food court.

30. The method of Claim 28 or 29 further comprising:
monitoring operation status of the mobile dishwasher;
replenishing consumables when detecting low storage level of consumables.
- 5 31. The method of Claim 30, wherein
the monitoring comprises collecting information of the mobile dishwasher via a
remote electronic device connected to the mobile dishwasher.
- 10 32. The method of any of the preceding Claim 28 to 31 further comprising:
locking the mobile dishwasher in order to prevent the first cart from being
decoupled when the washer is in washing operation.
- 15 33. The method of any of the preceding Claims 28 to 32 further comprising:
– connecting to the mobile dishwasher via an electronic communication
device;
– diagnosing the mobile dishwasher with a computer programme on the
electronic communication device; and
– configuring the mobile dishwasher by the electronic communication
device.
- 20 34. The method of any of the preceding Claims 28 to 33 further comprising:
– receiving an electronic signal on a faulty part of the mobile dishwasher;
and
– replacing the faulty part.
- 25 35. The method of Claim 34 further comprising:
providing a software patch to the mobile dishwasher.

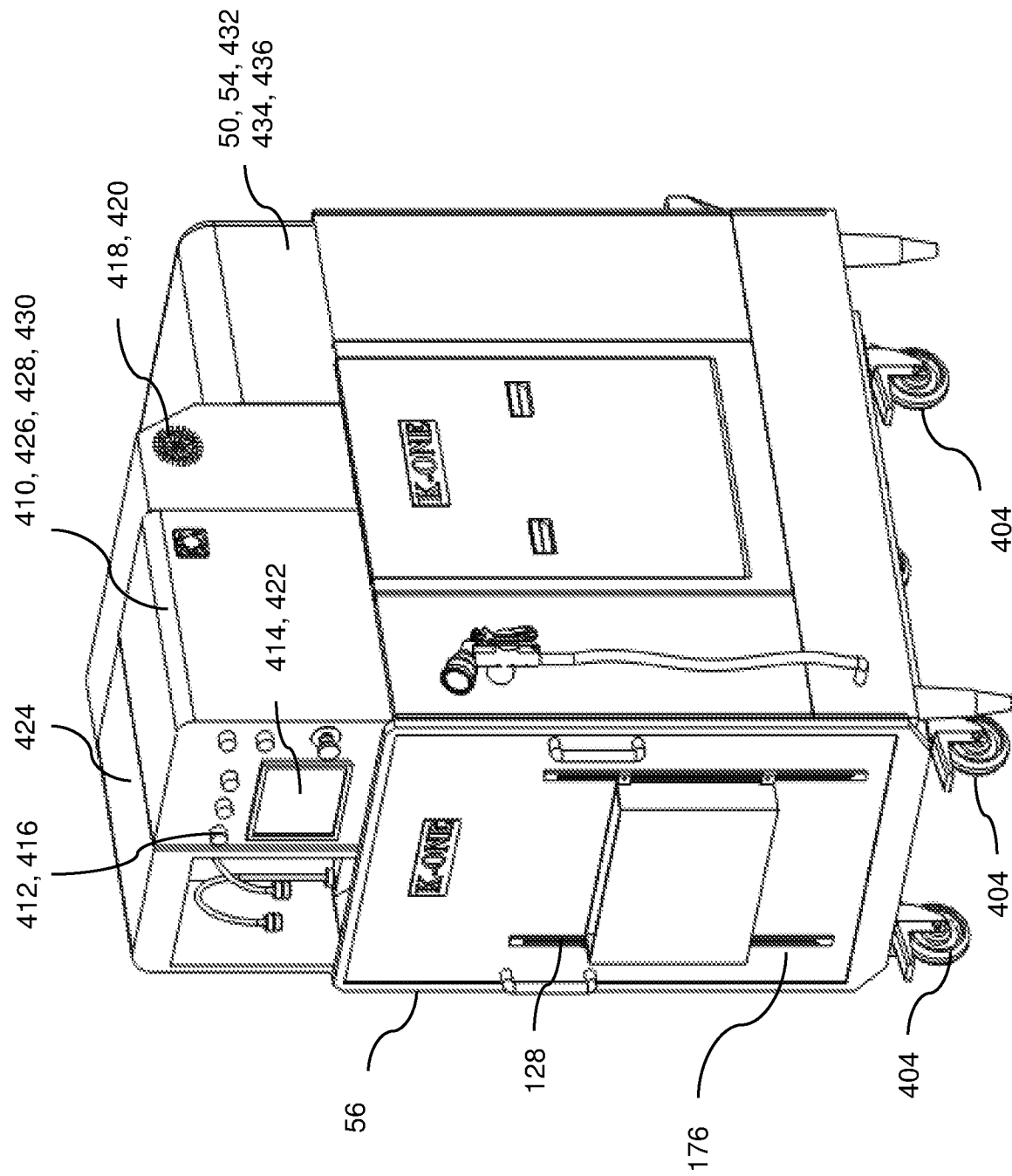


Fig. 1

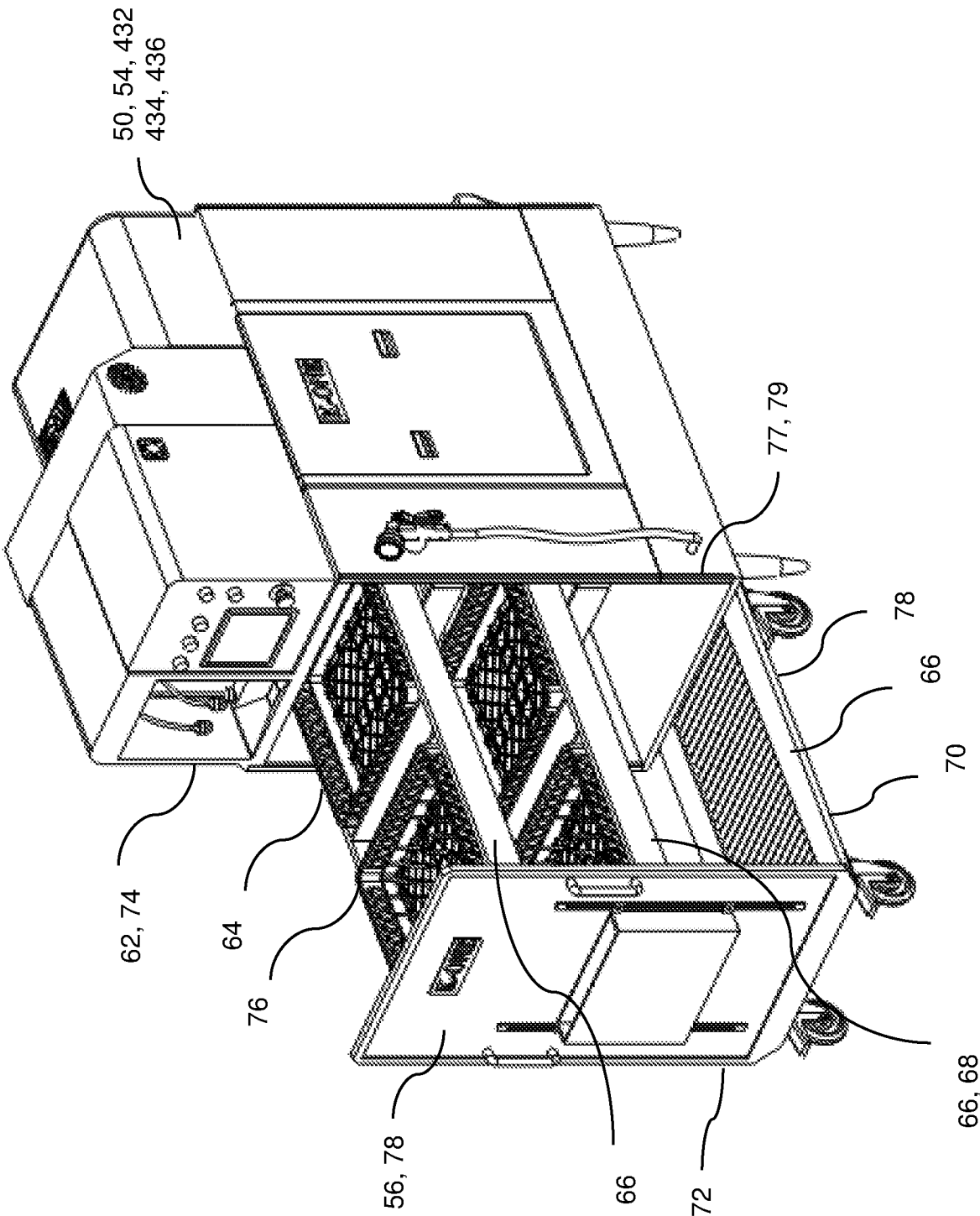


Fig. 2

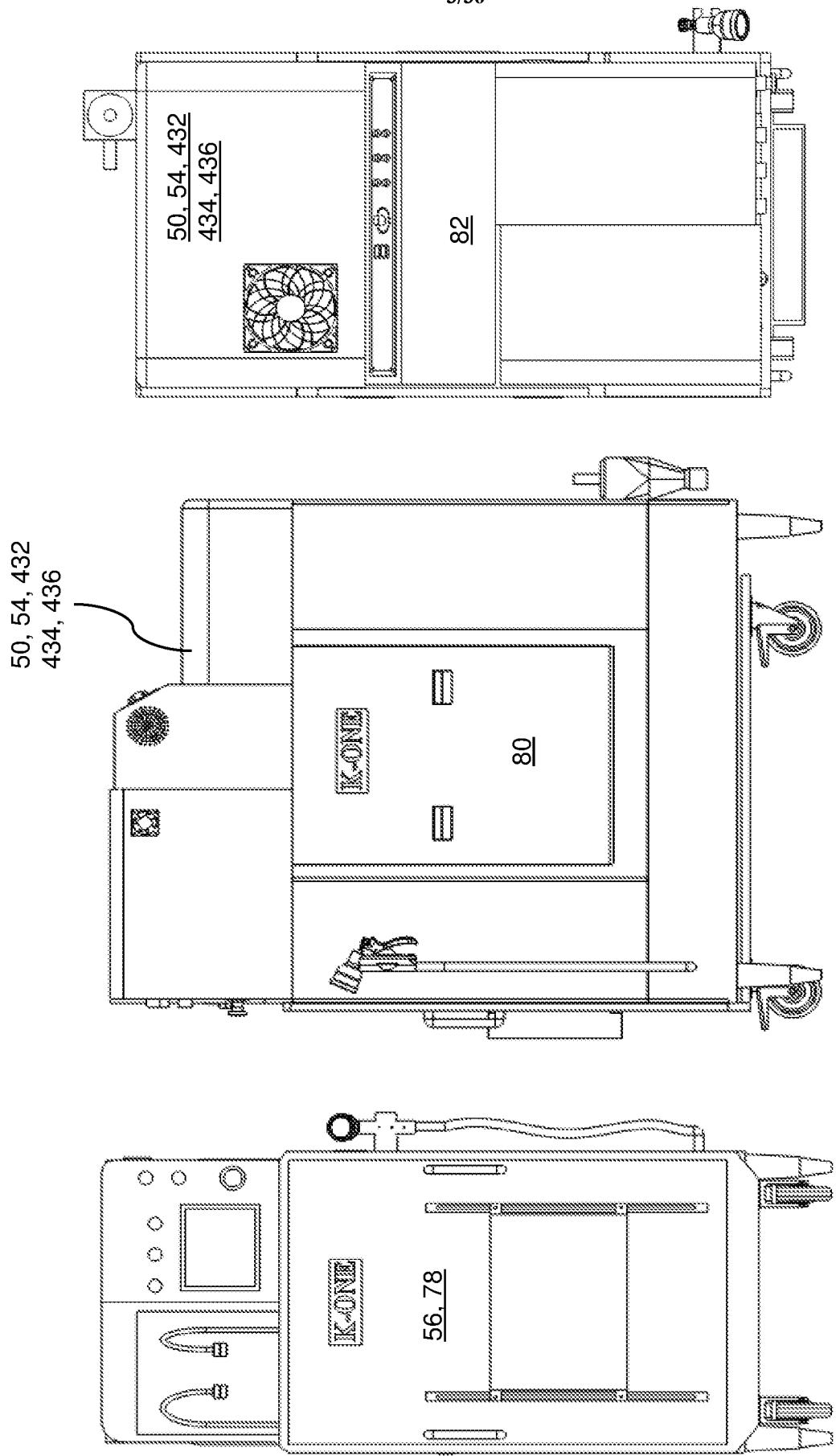


Fig. 3

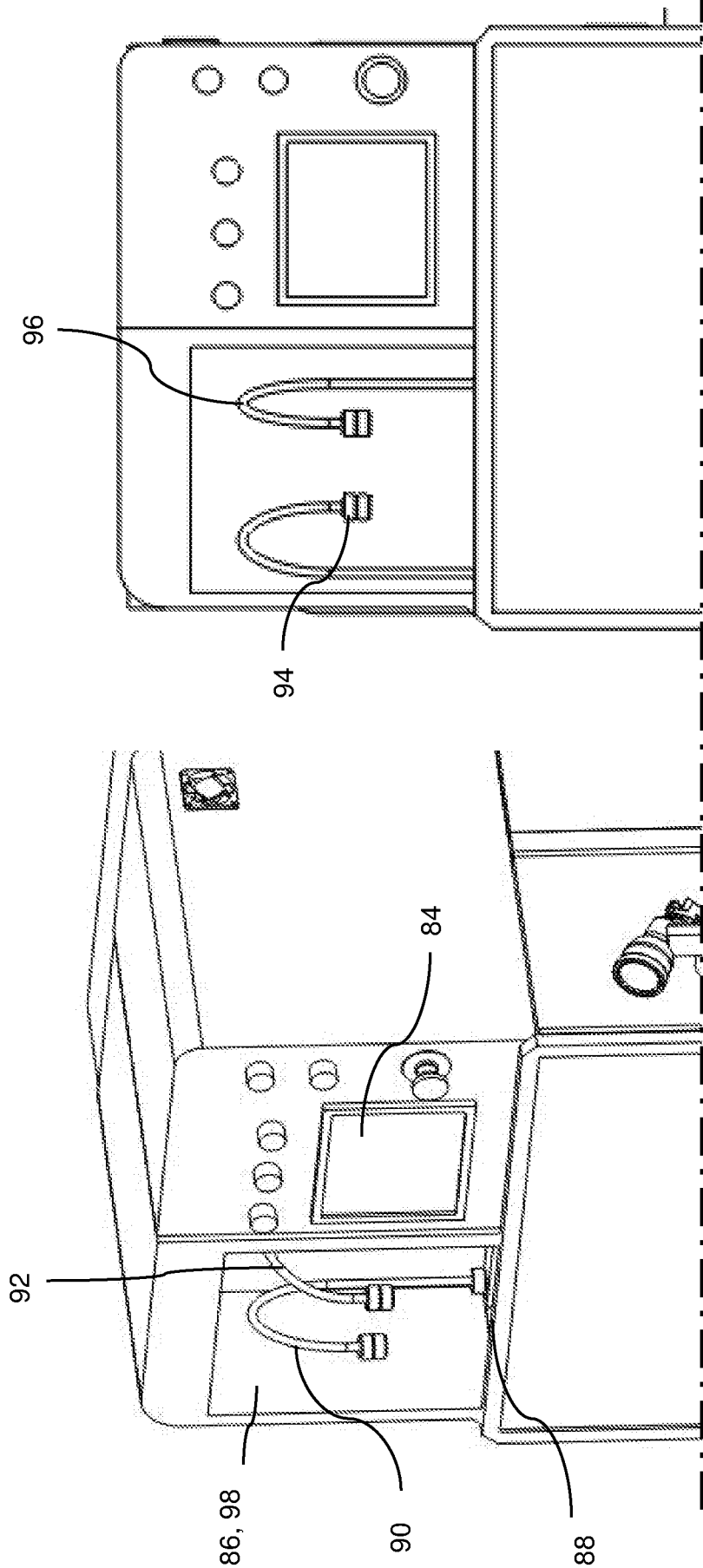


Fig. 4

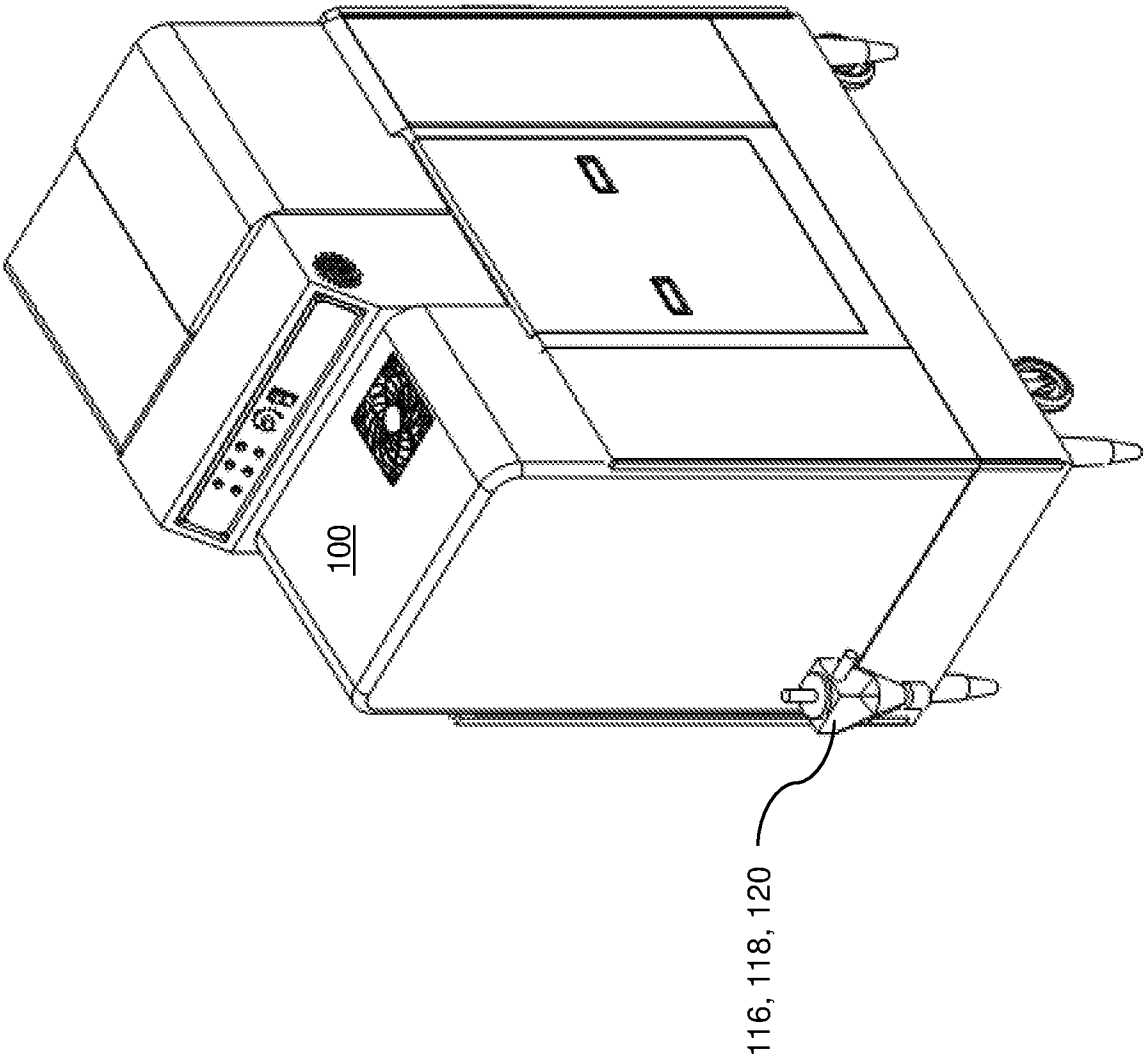


Fig. 5

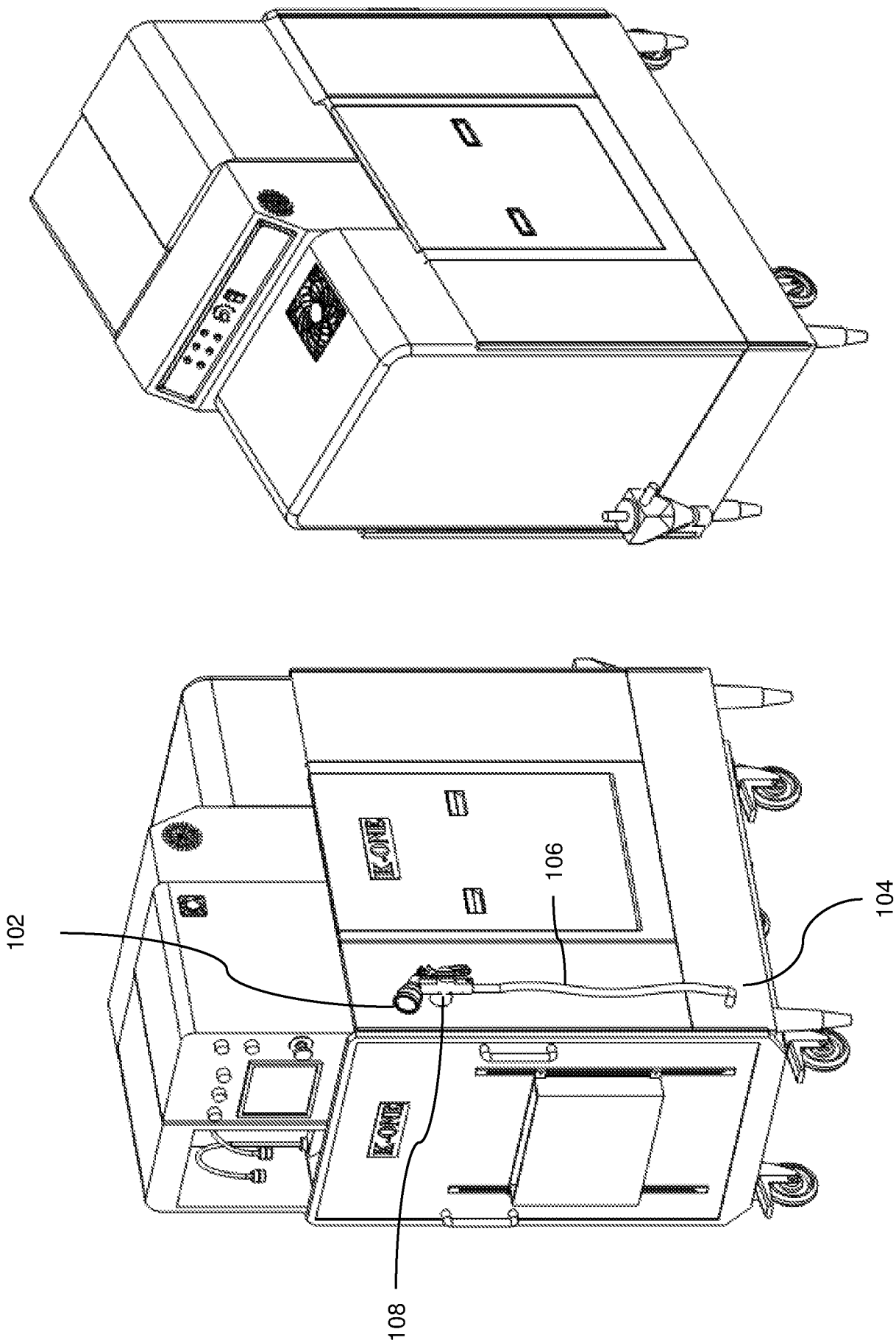


Fig. 6

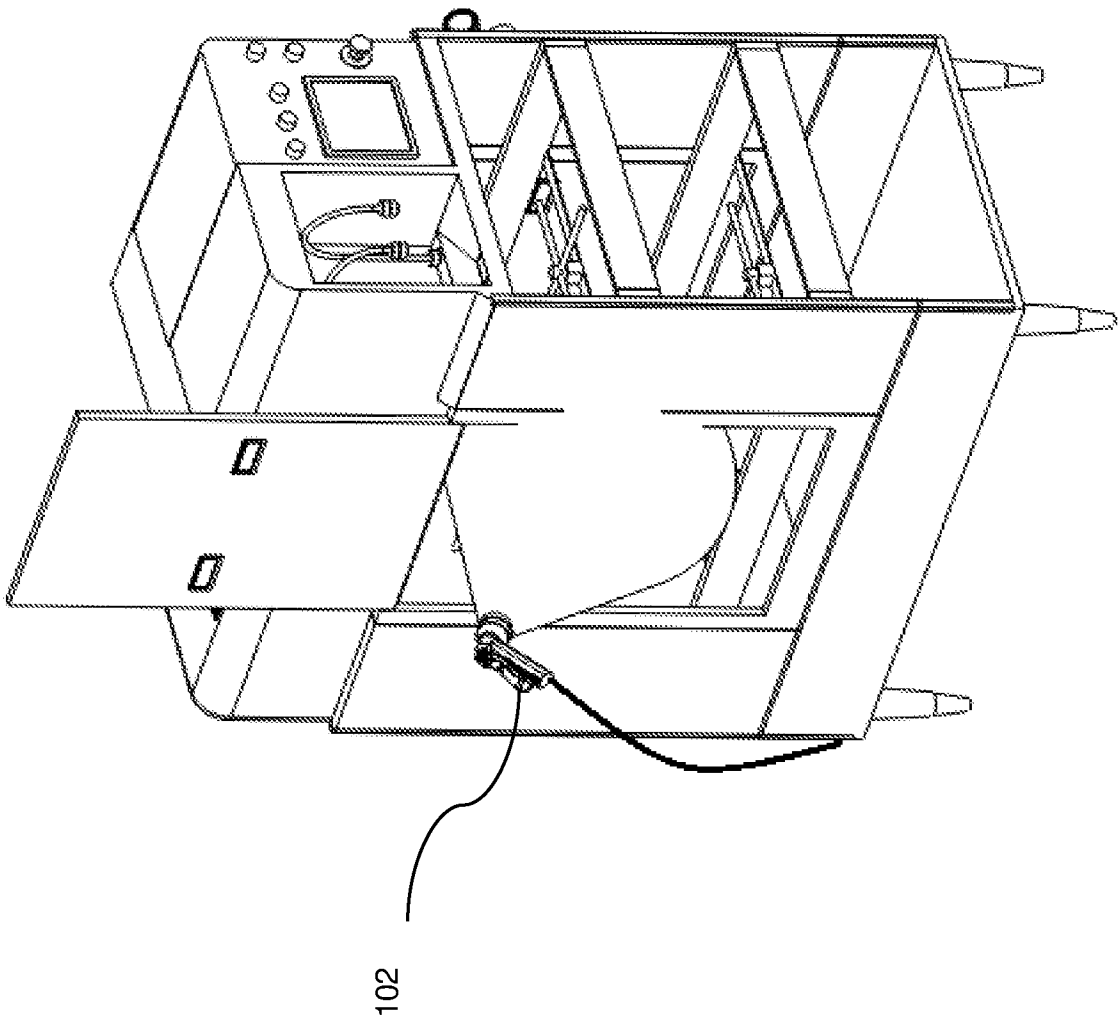


Fig. 7

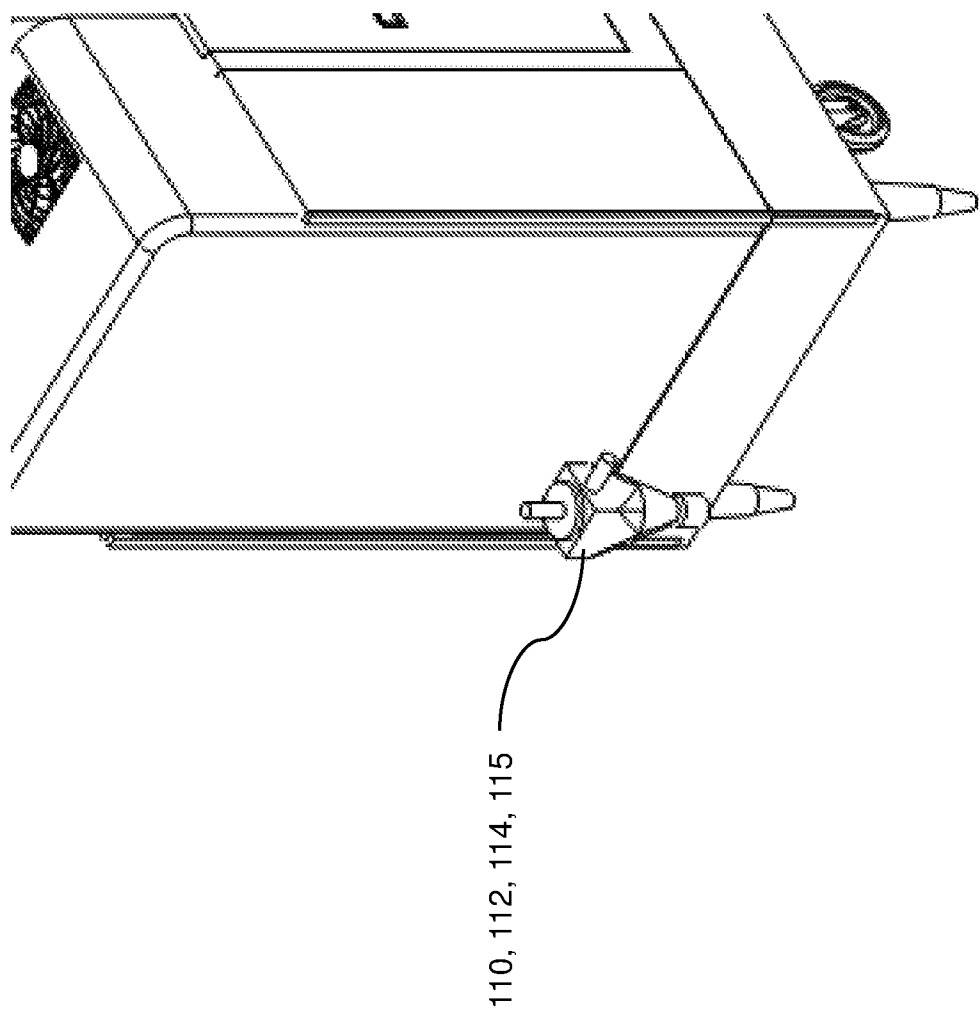


Fig. 8

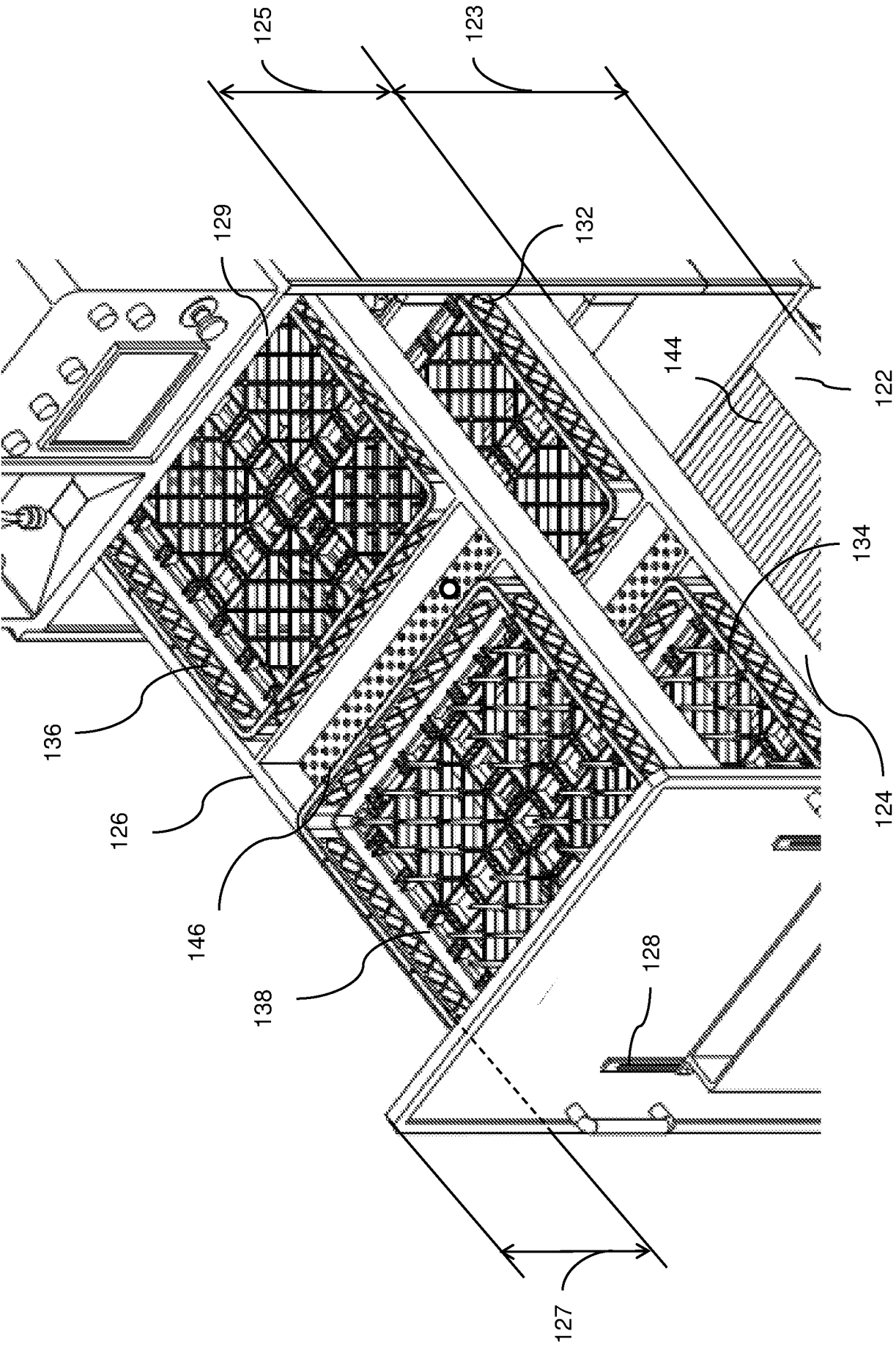


Fig. 9

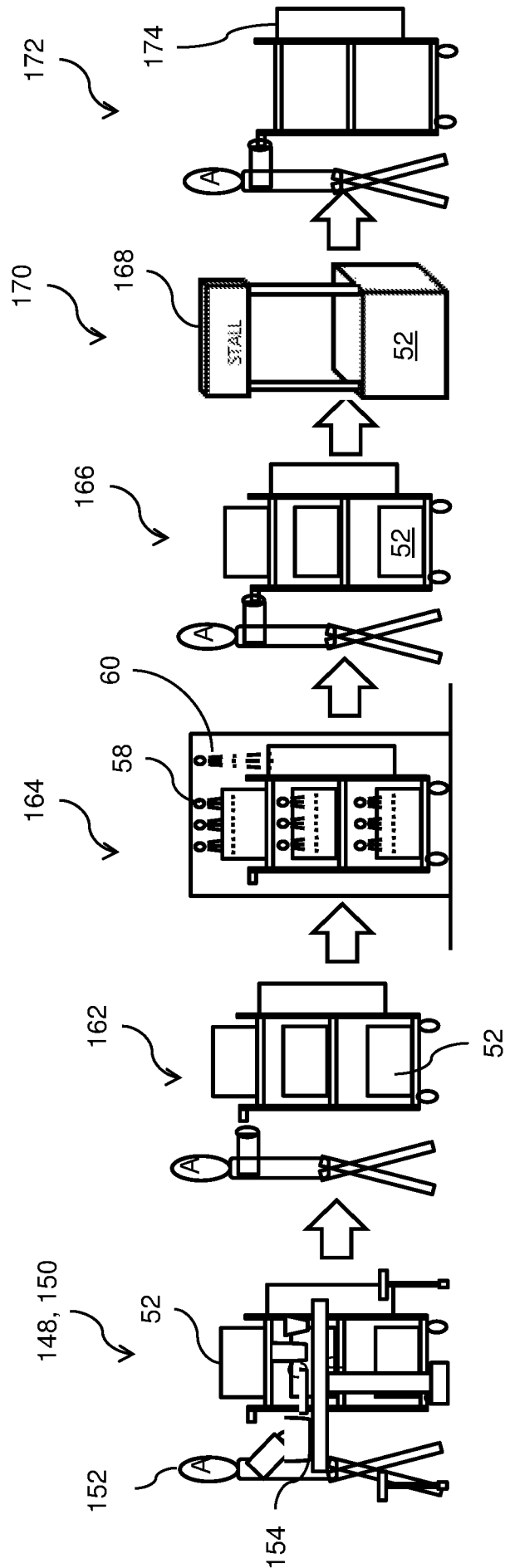


Fig. 10

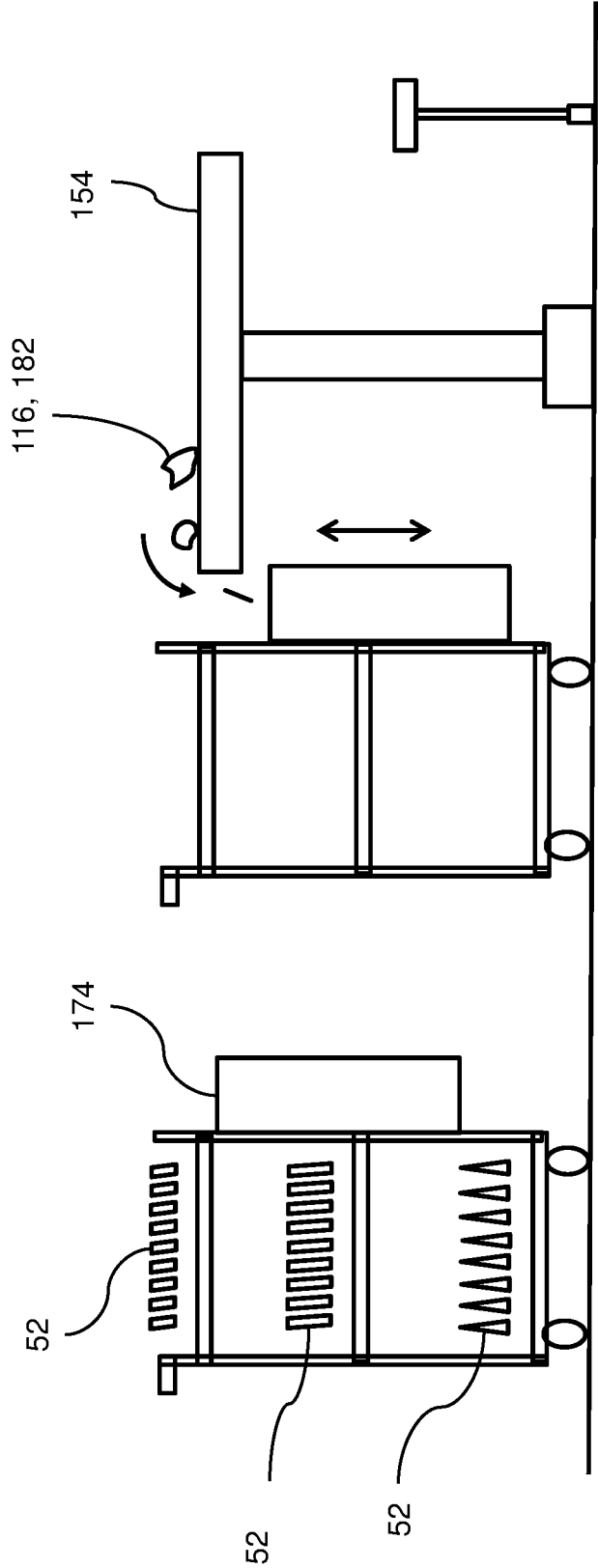


Fig. 11

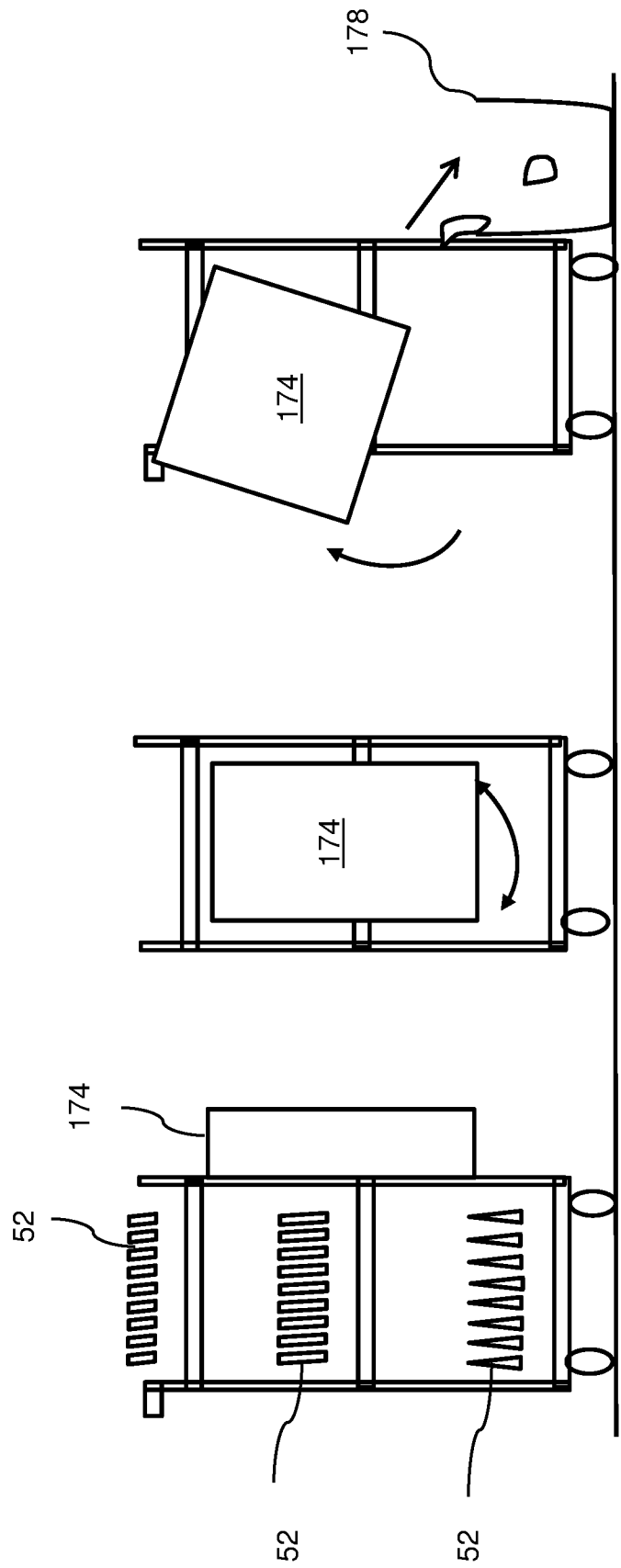


Fig. 12

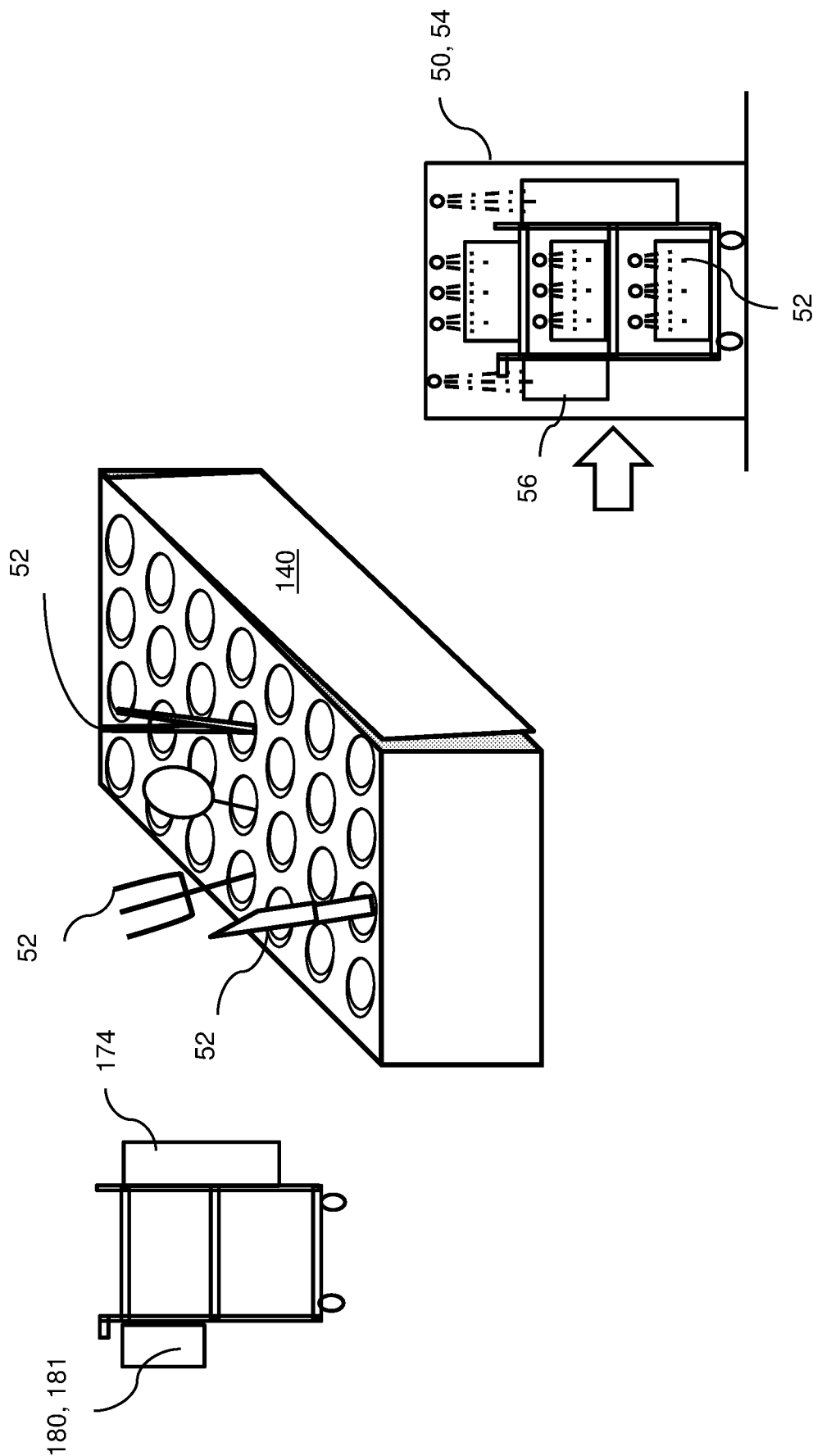


Fig. 13

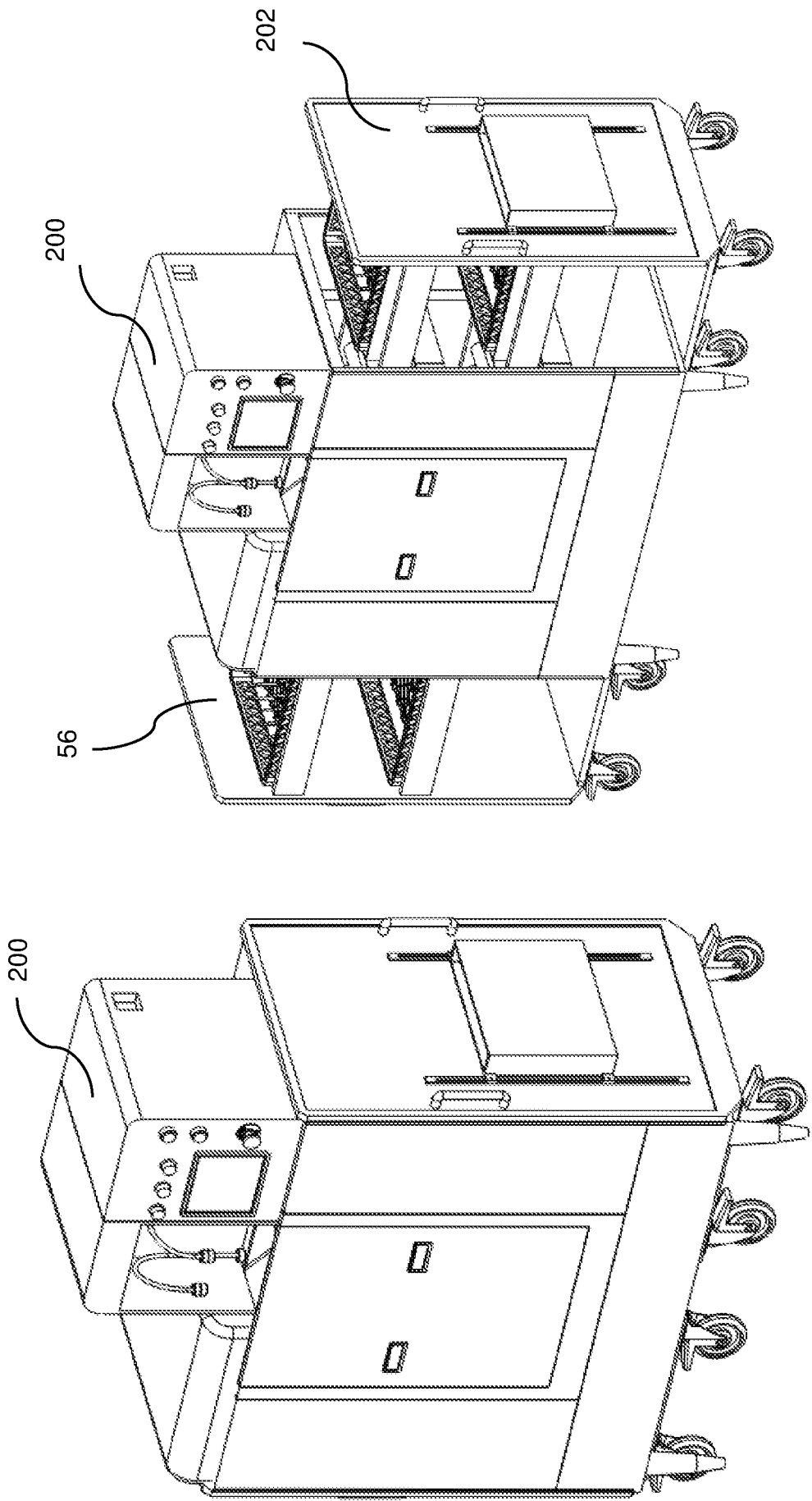


Fig. 14

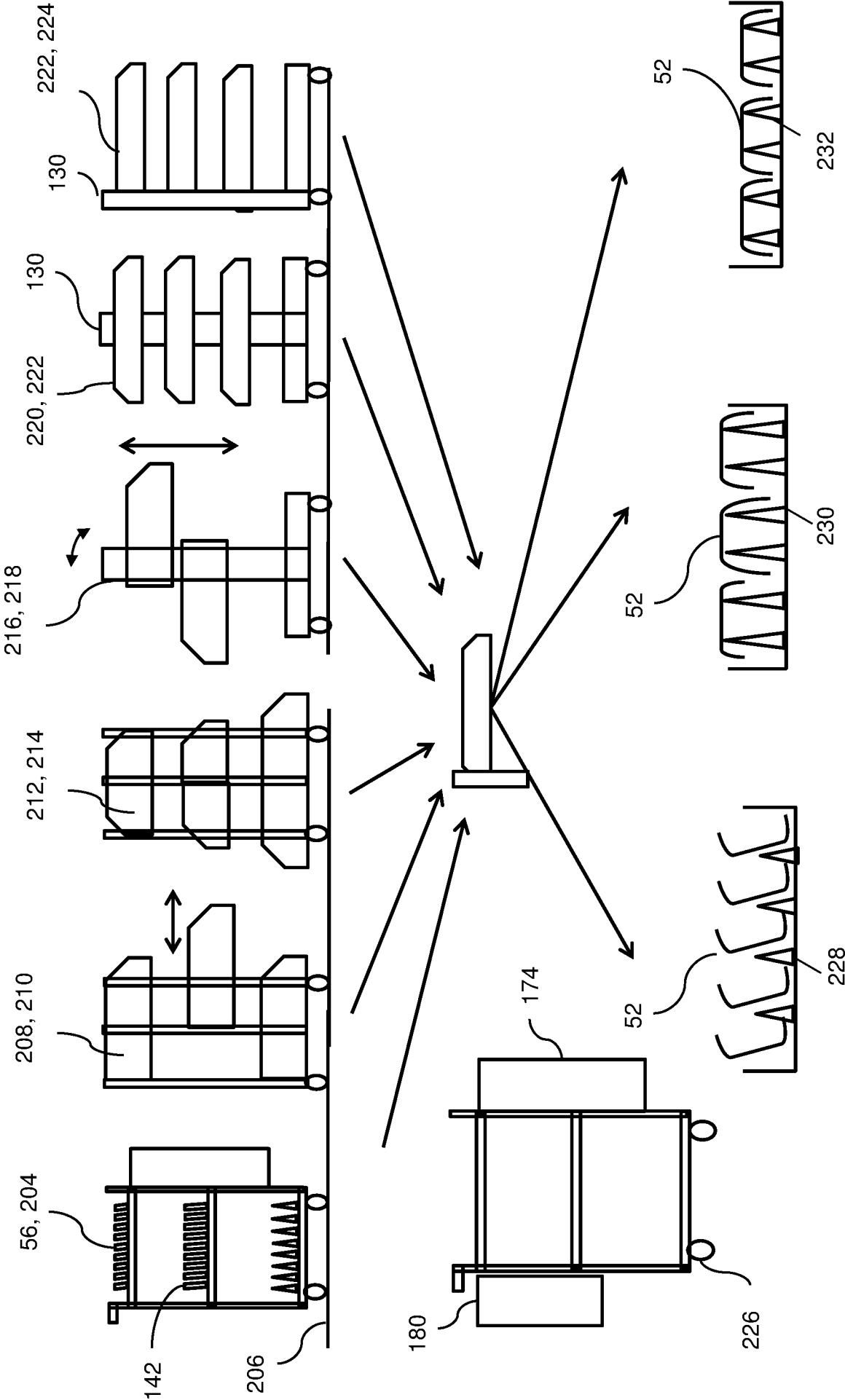


Fig. 15

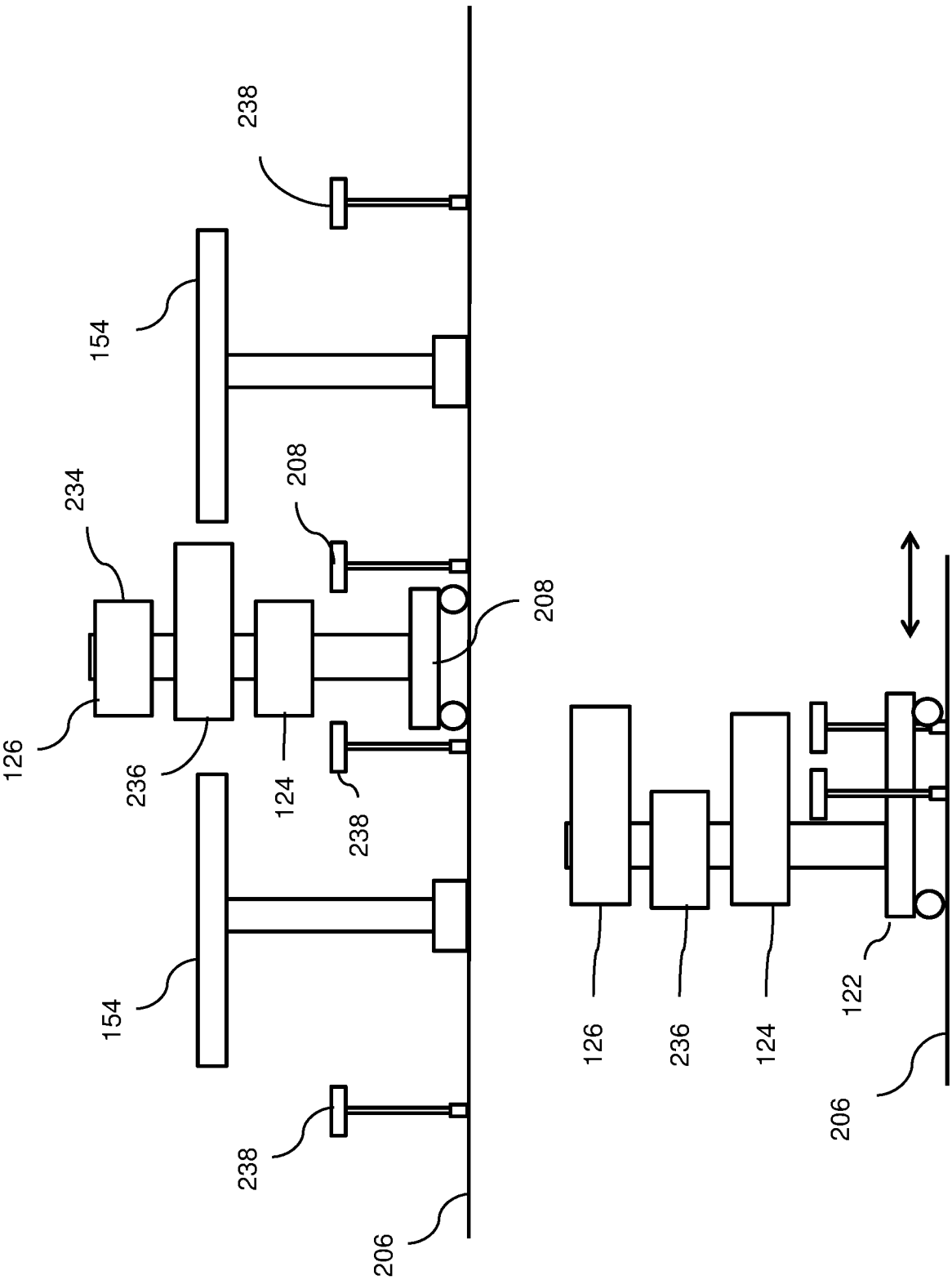


Fig. 16

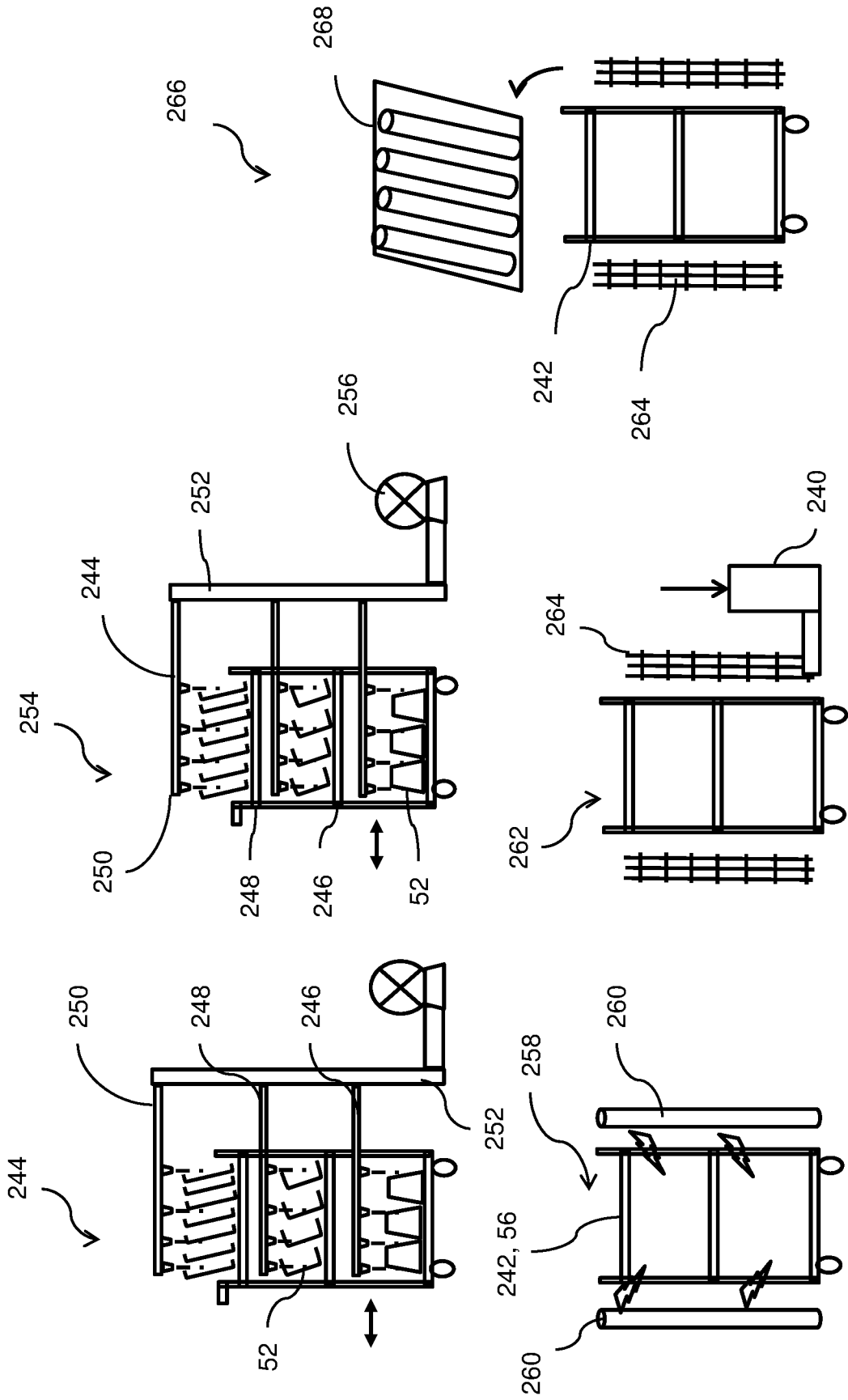


Fig. 17

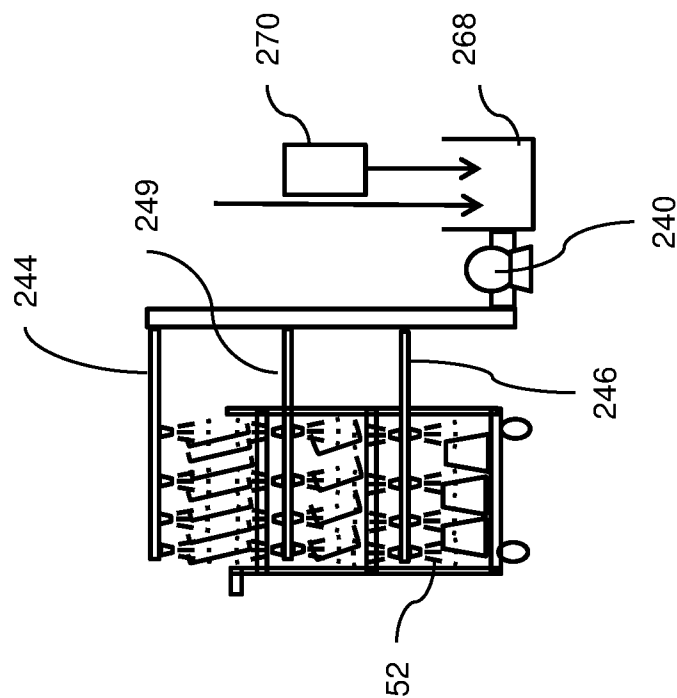


Fig. 18

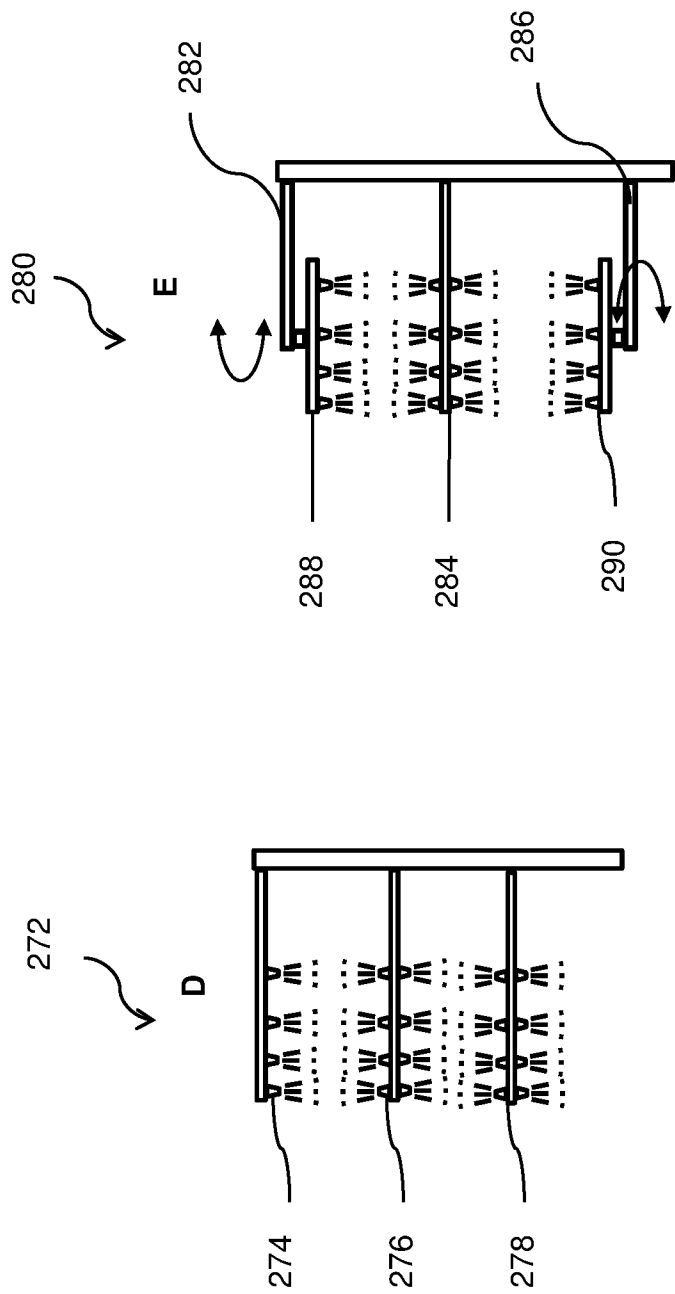


Fig. 19

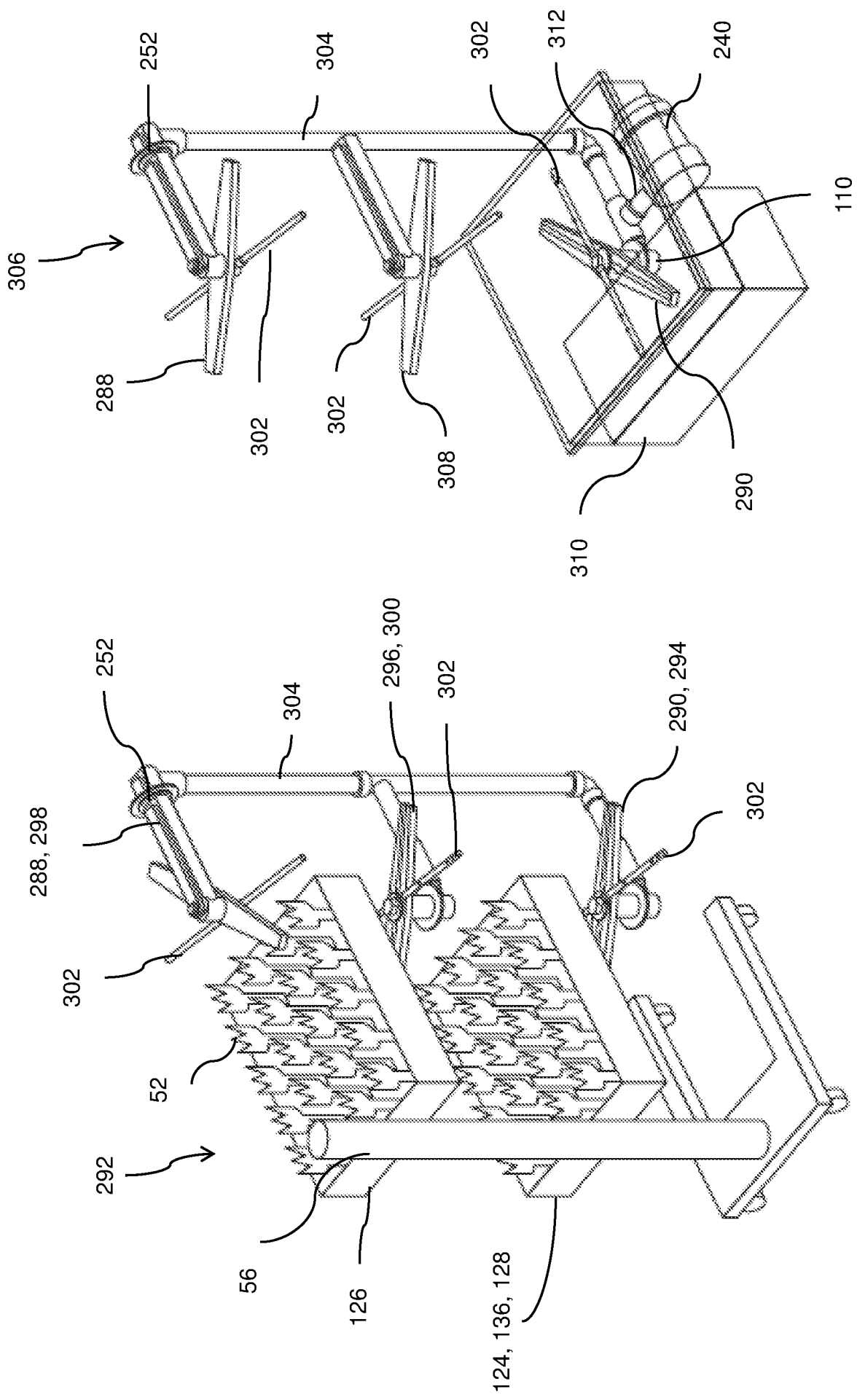


Fig. 20

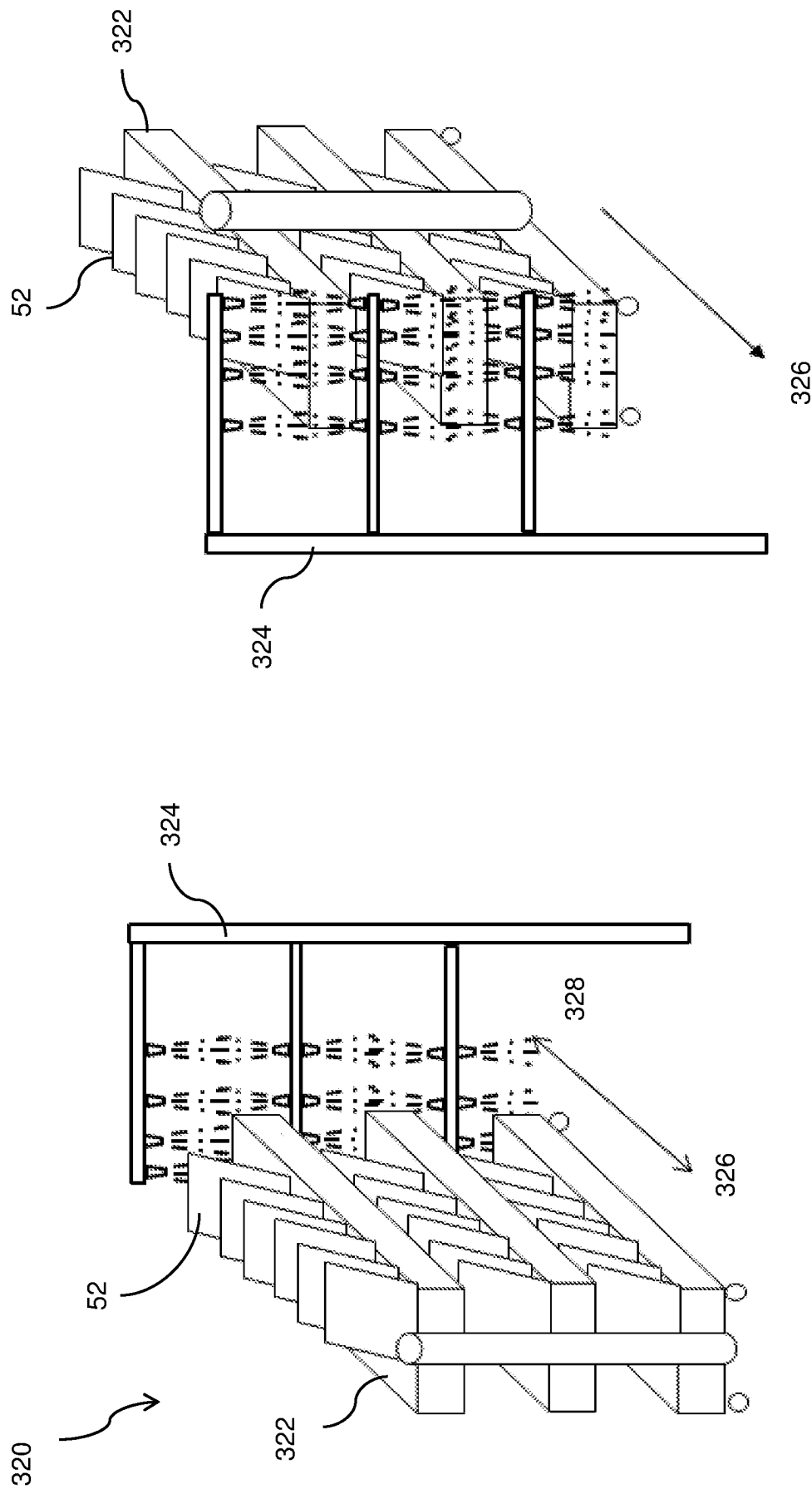


Fig. 21

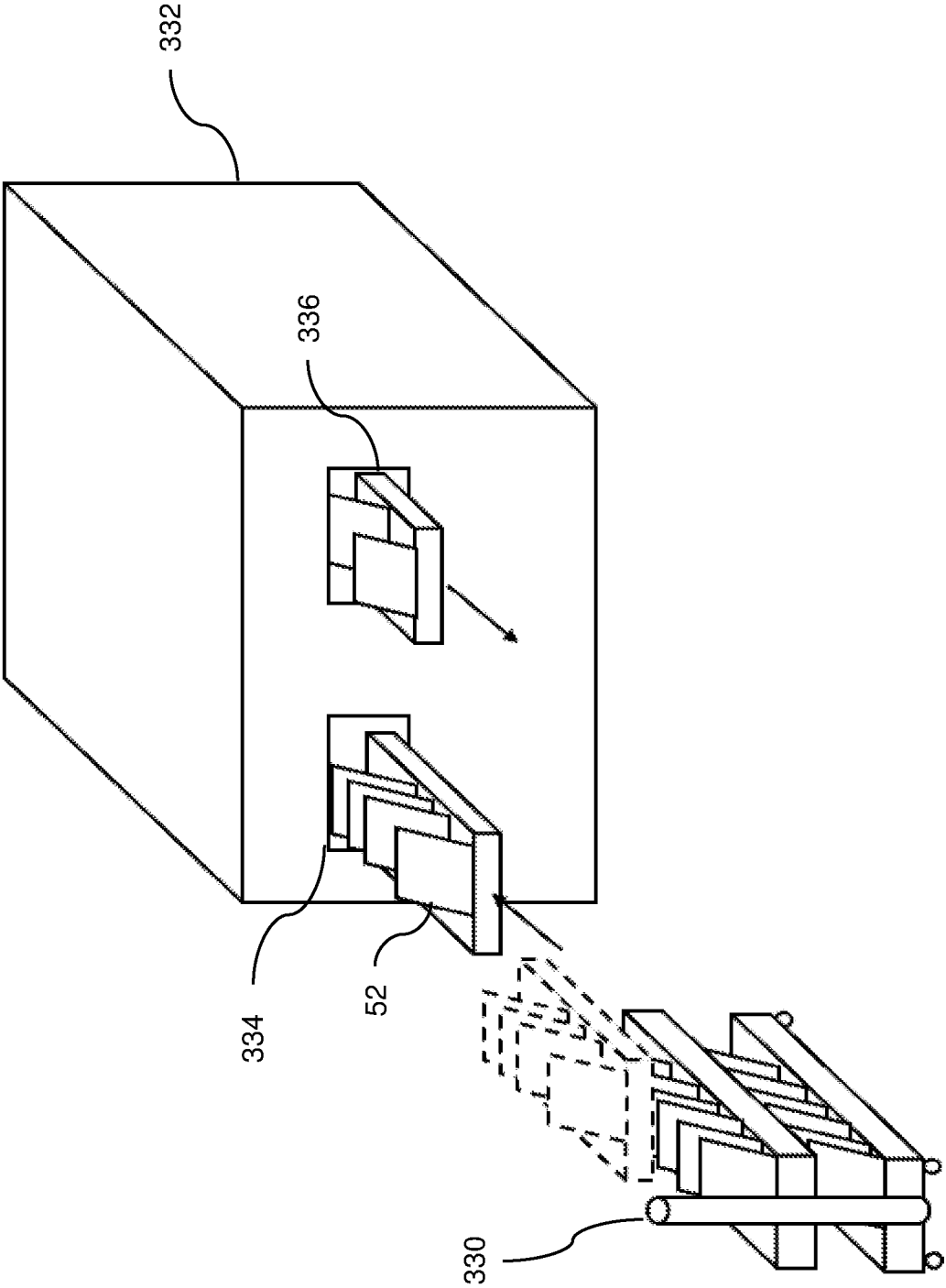


Fig. 22

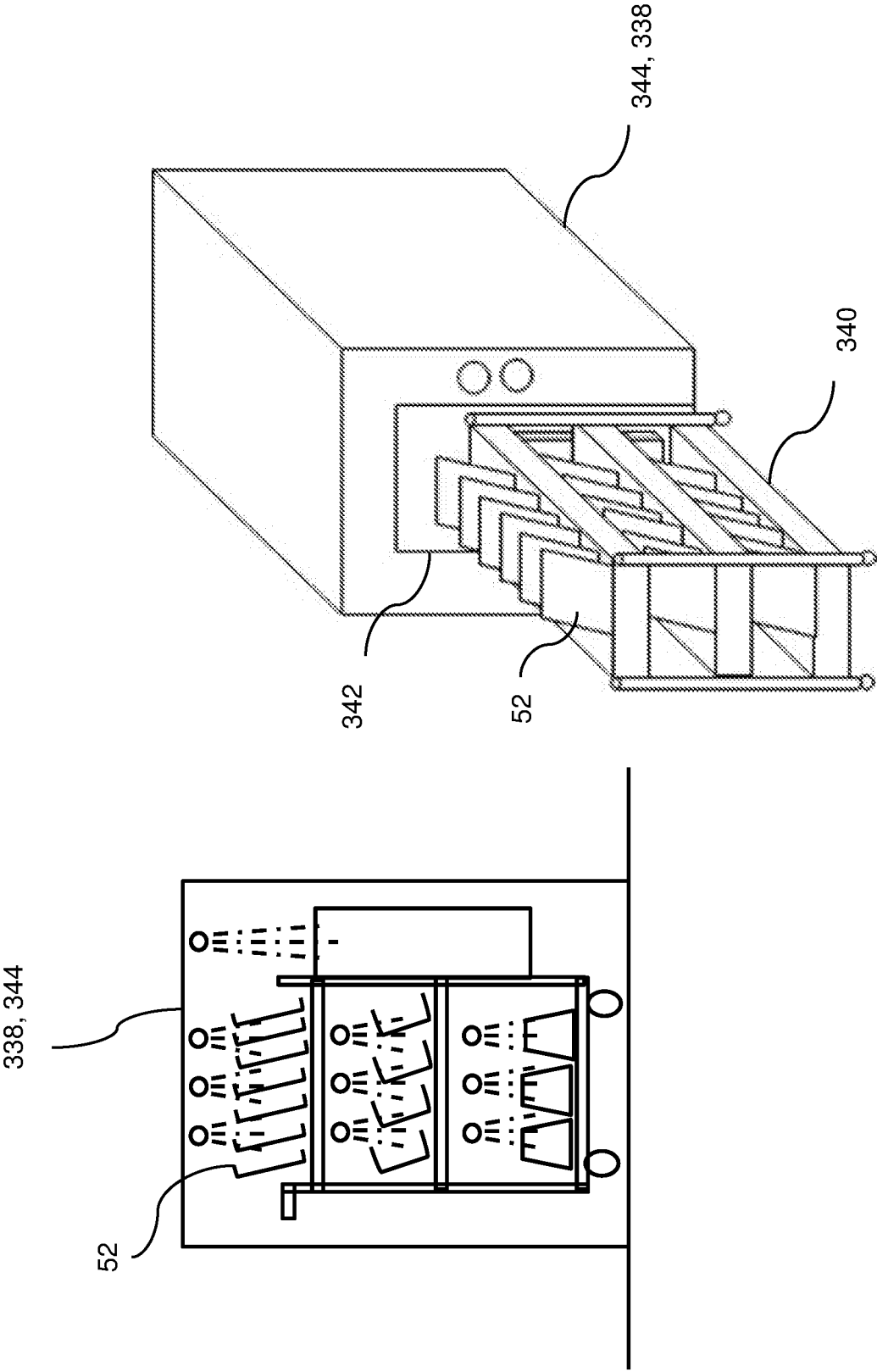
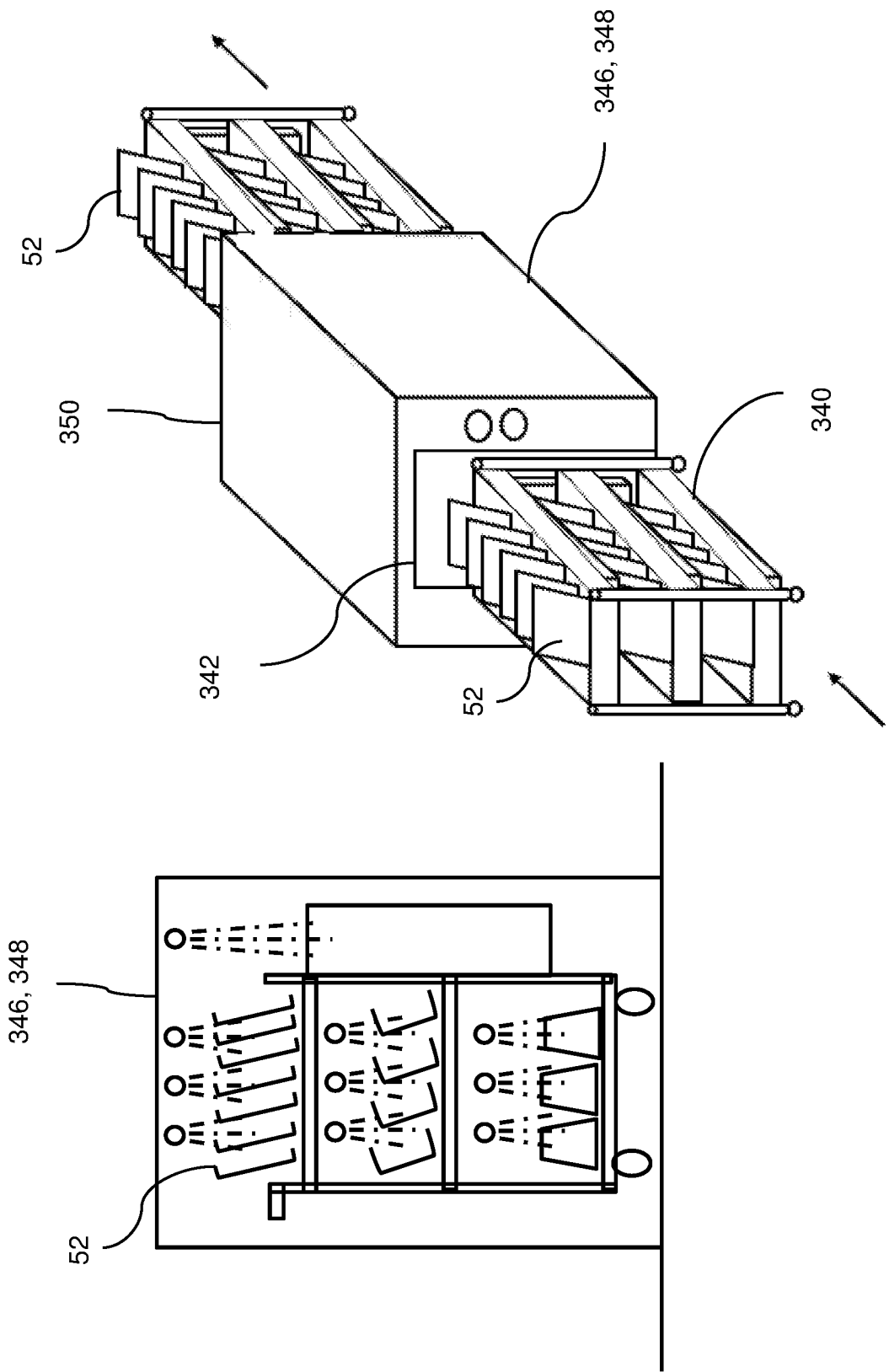


Fig. 23



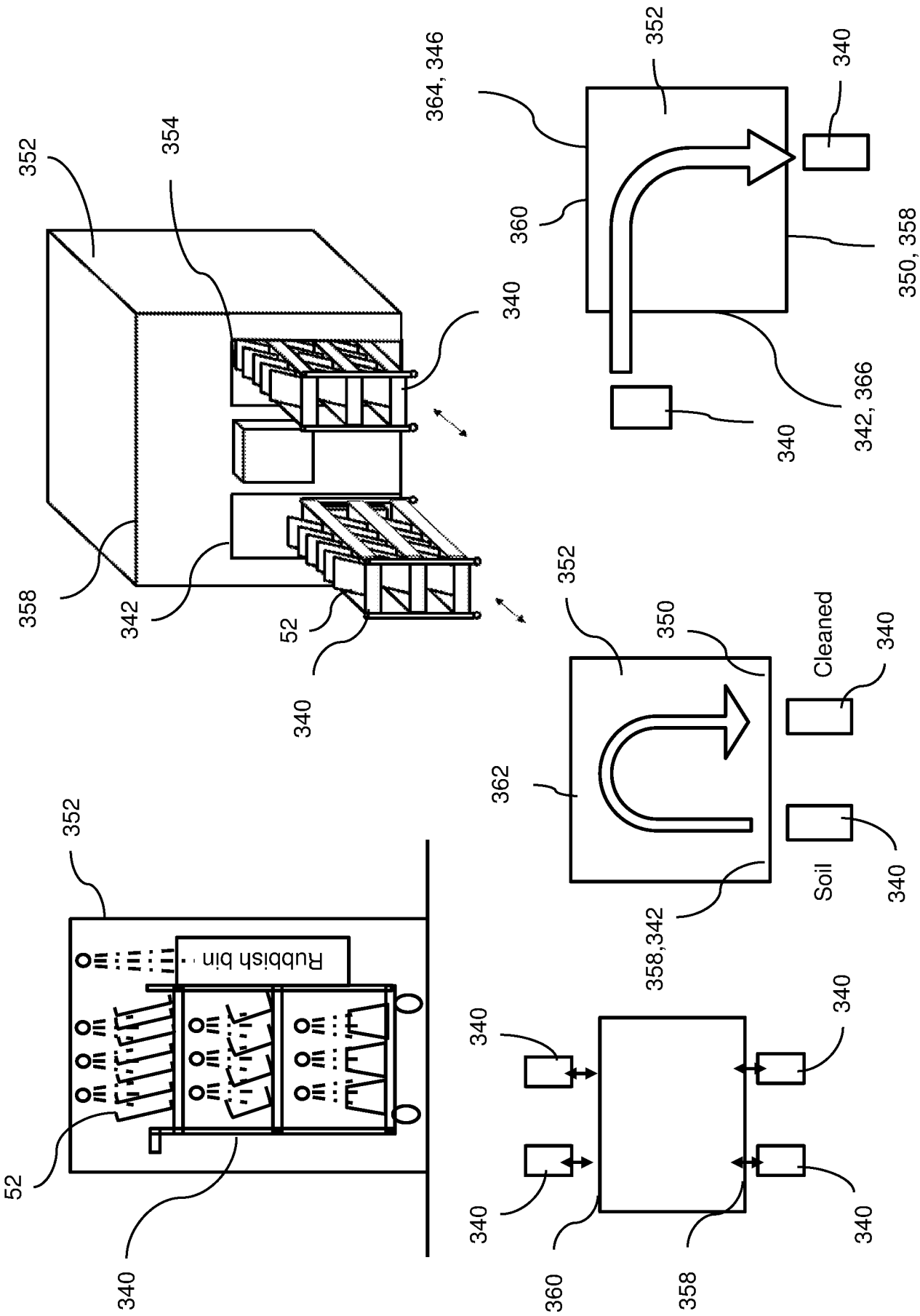


Fig. 25

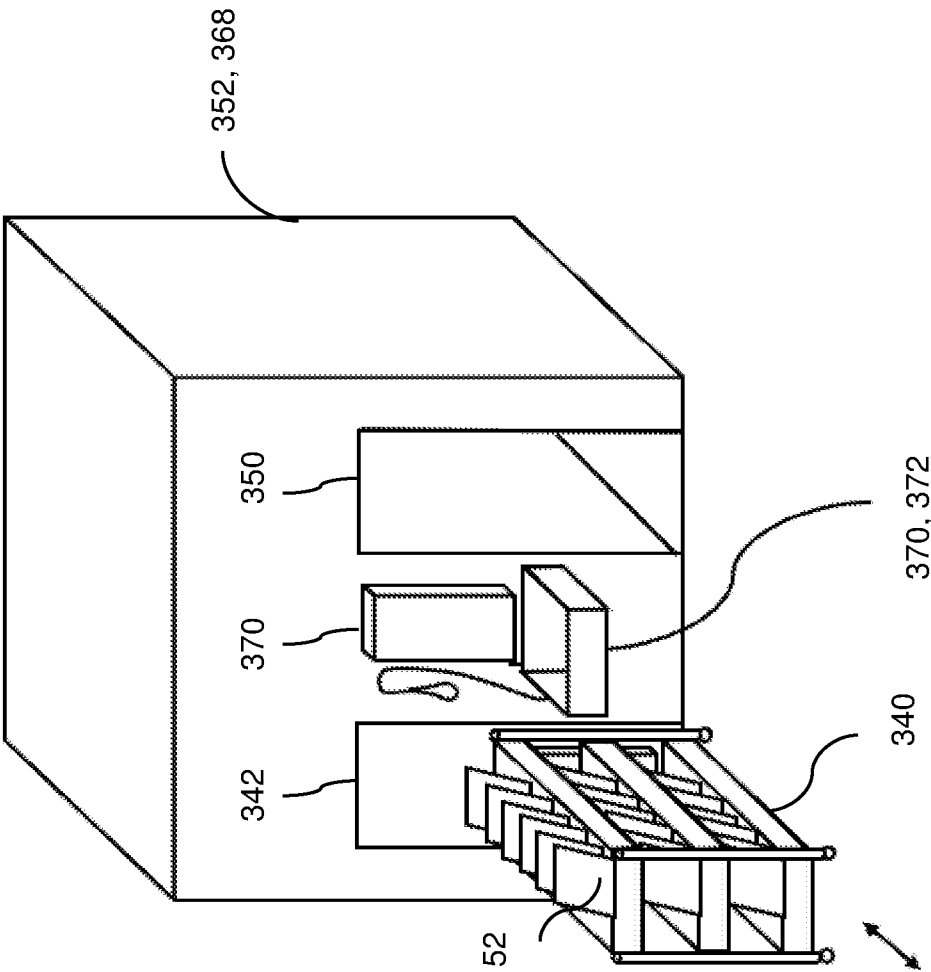


Fig. 26

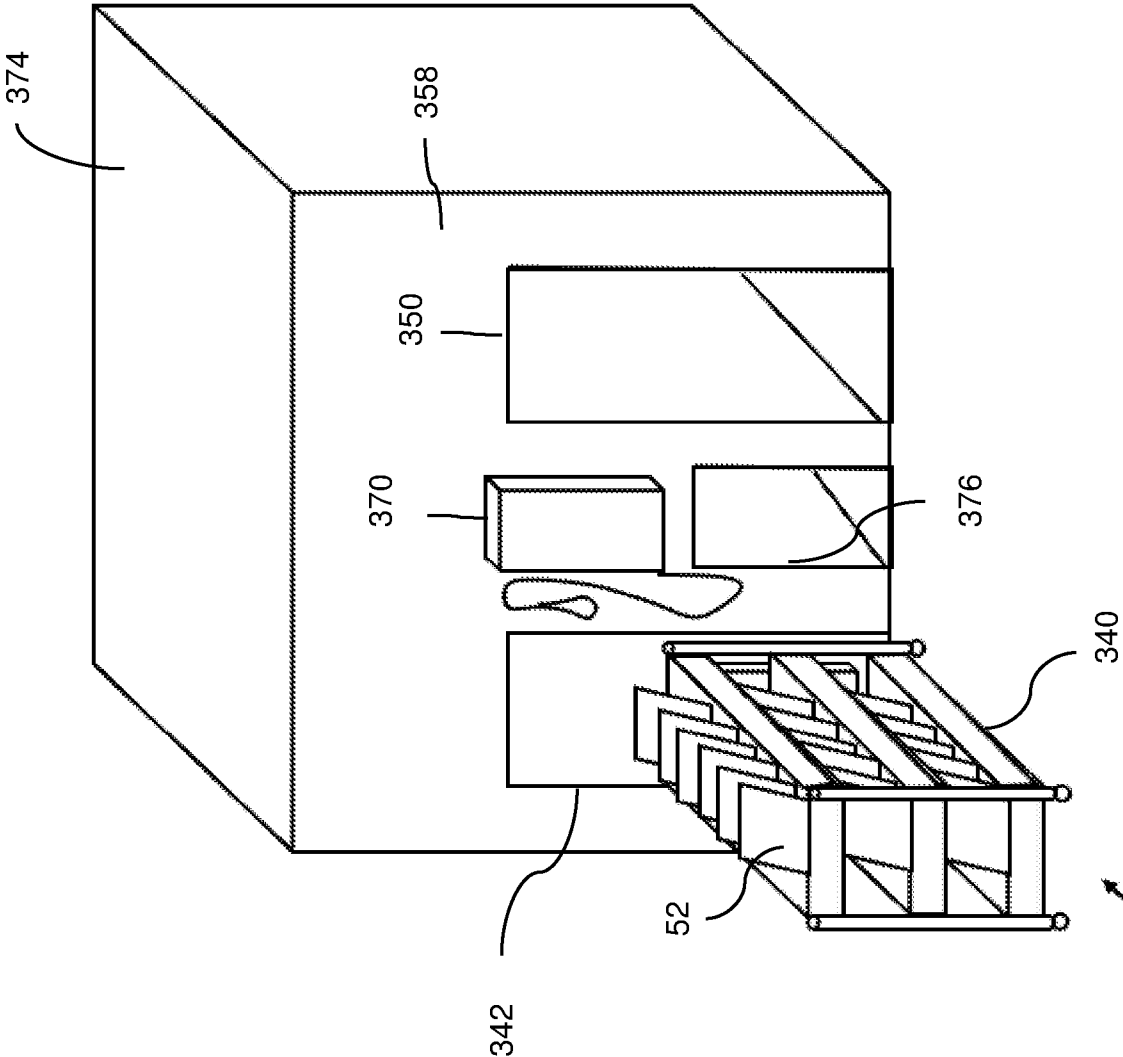


Fig. 27

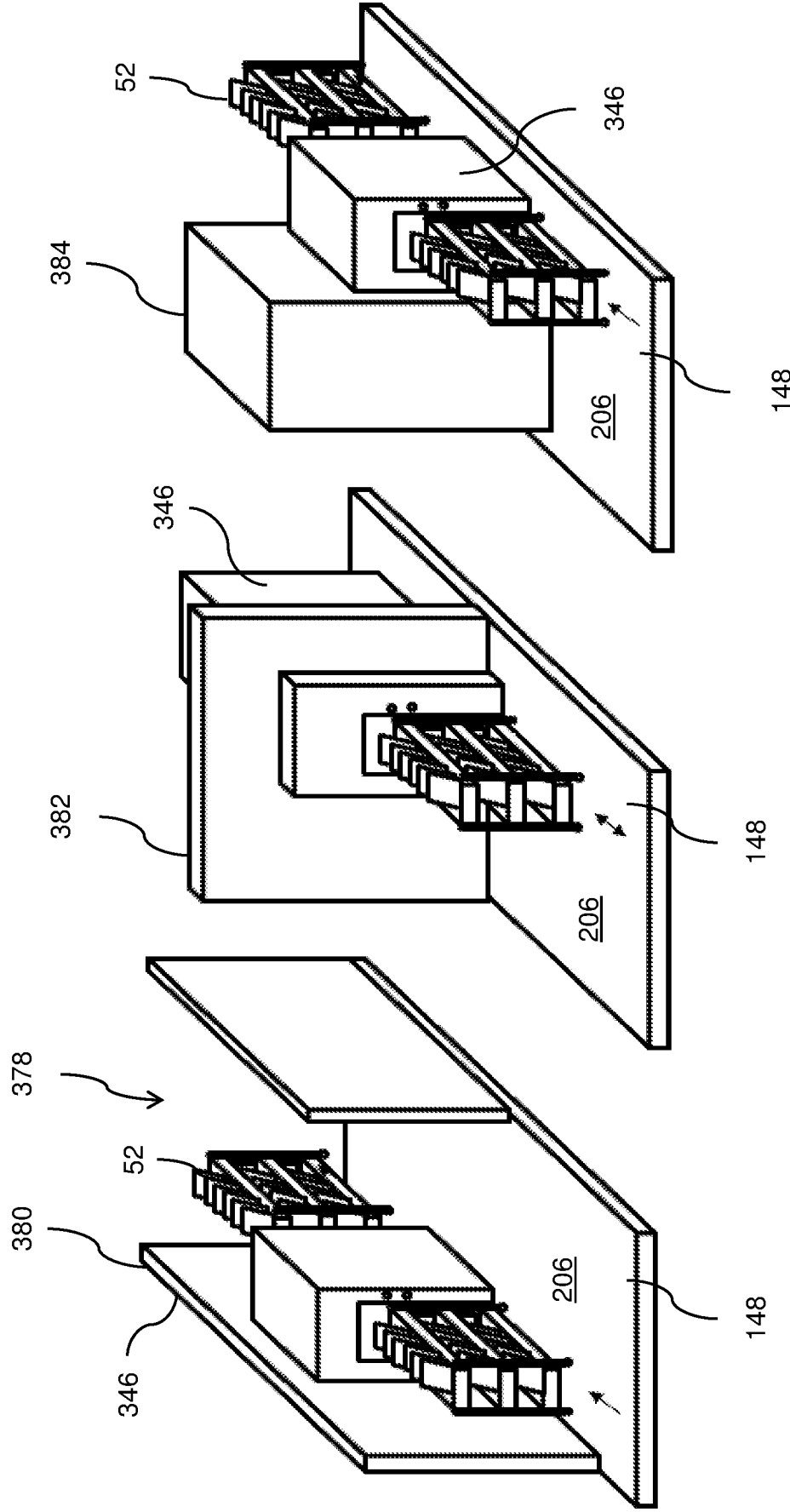


Fig. 28

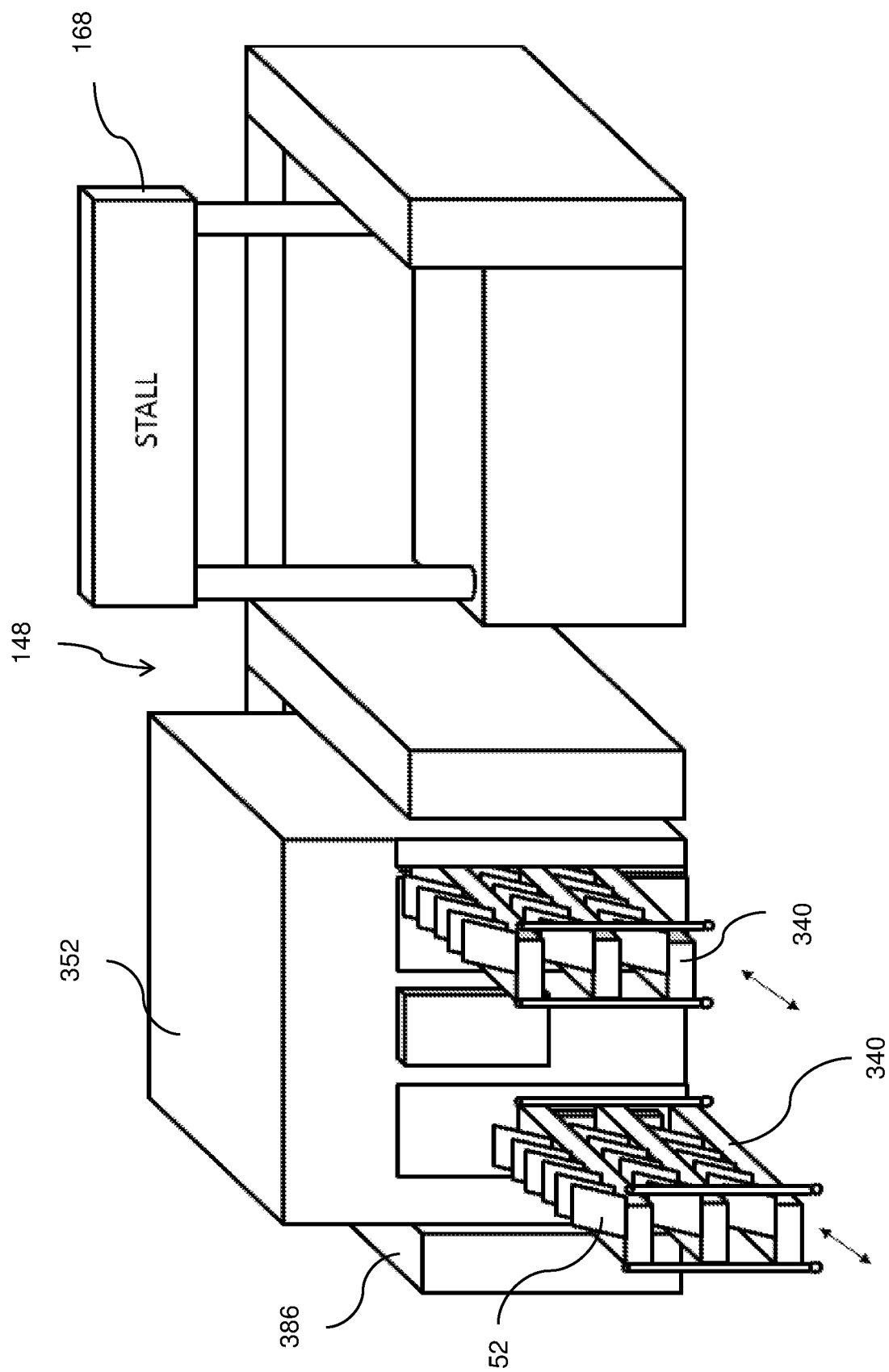


Fig. 29

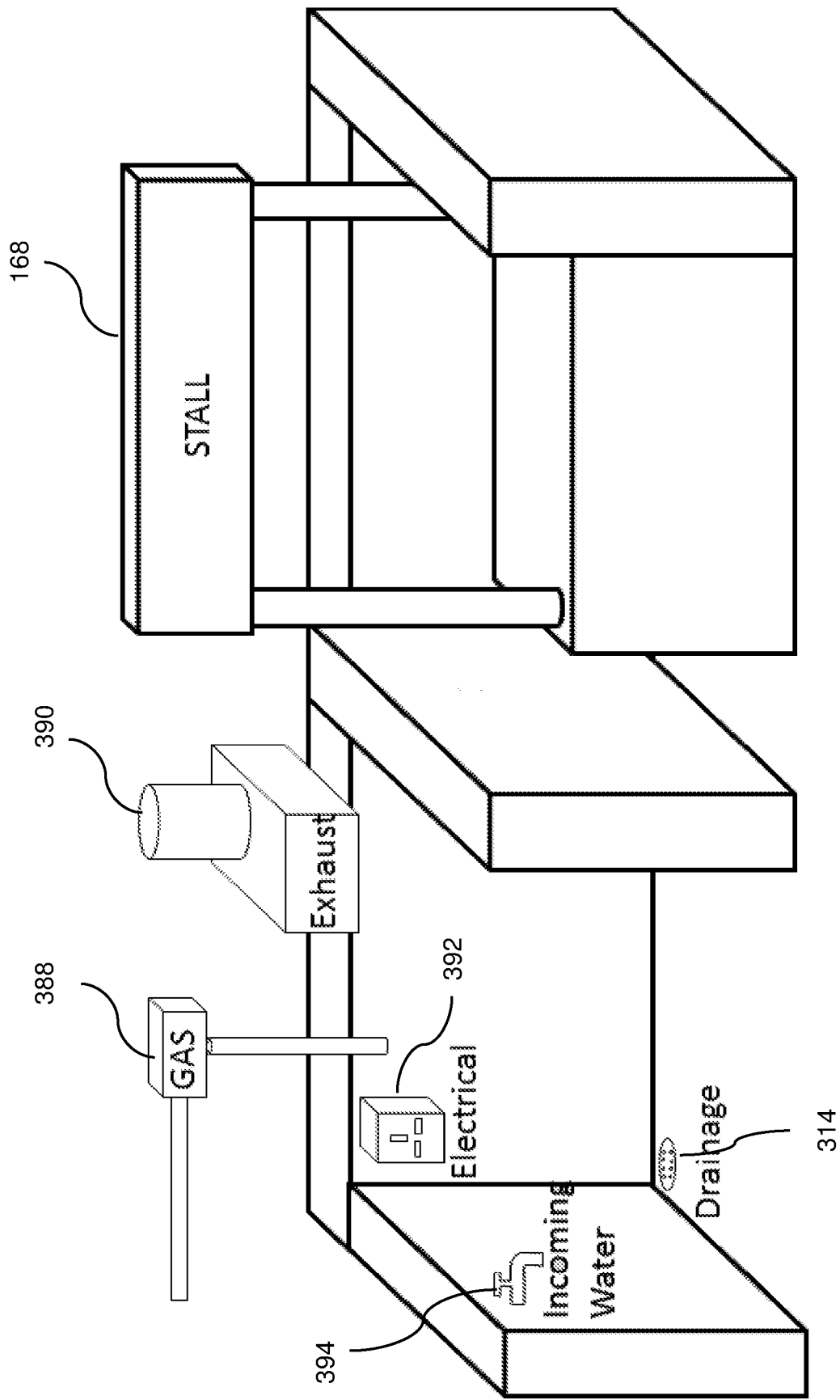


Fig. 30

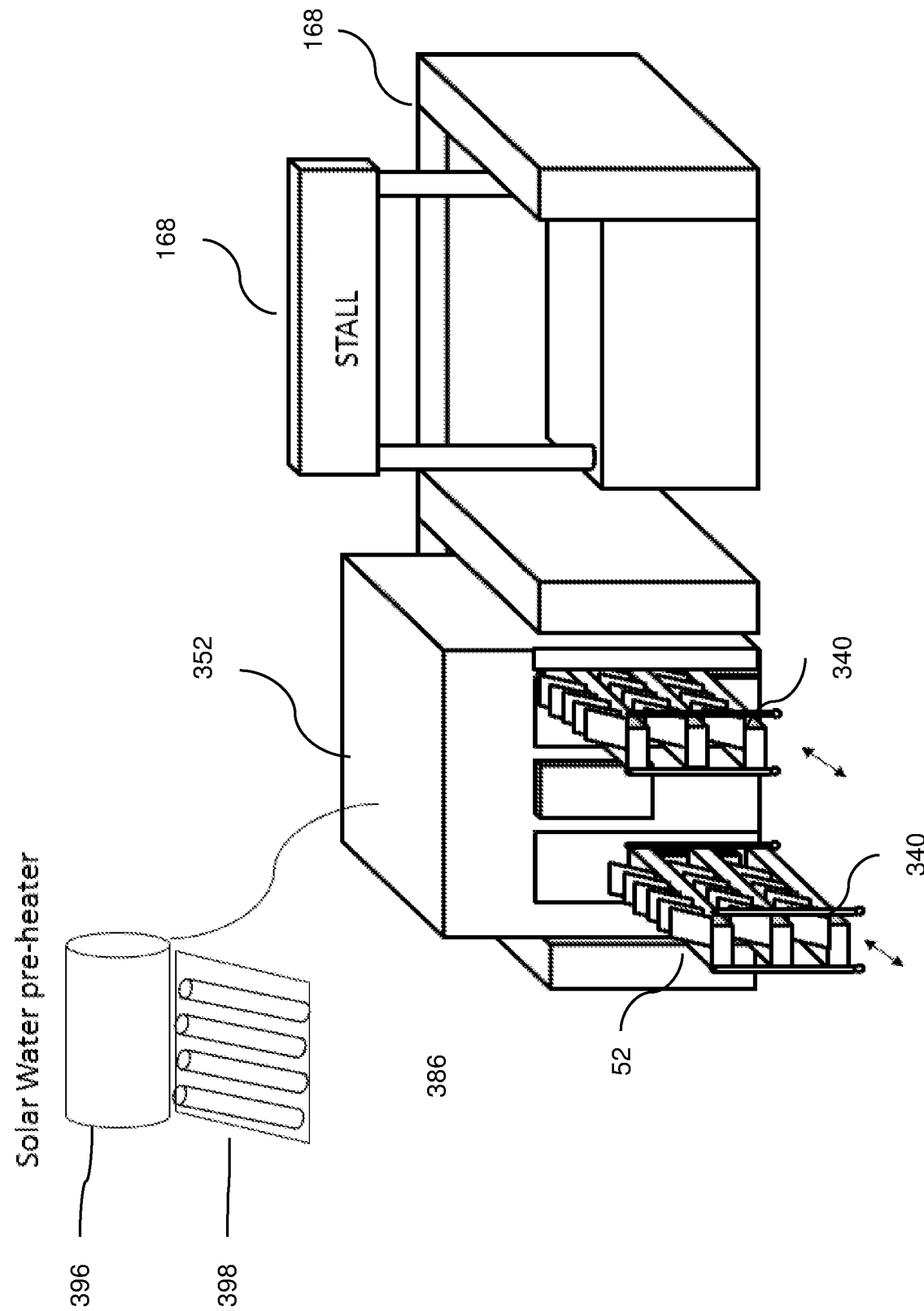


Fig. 31

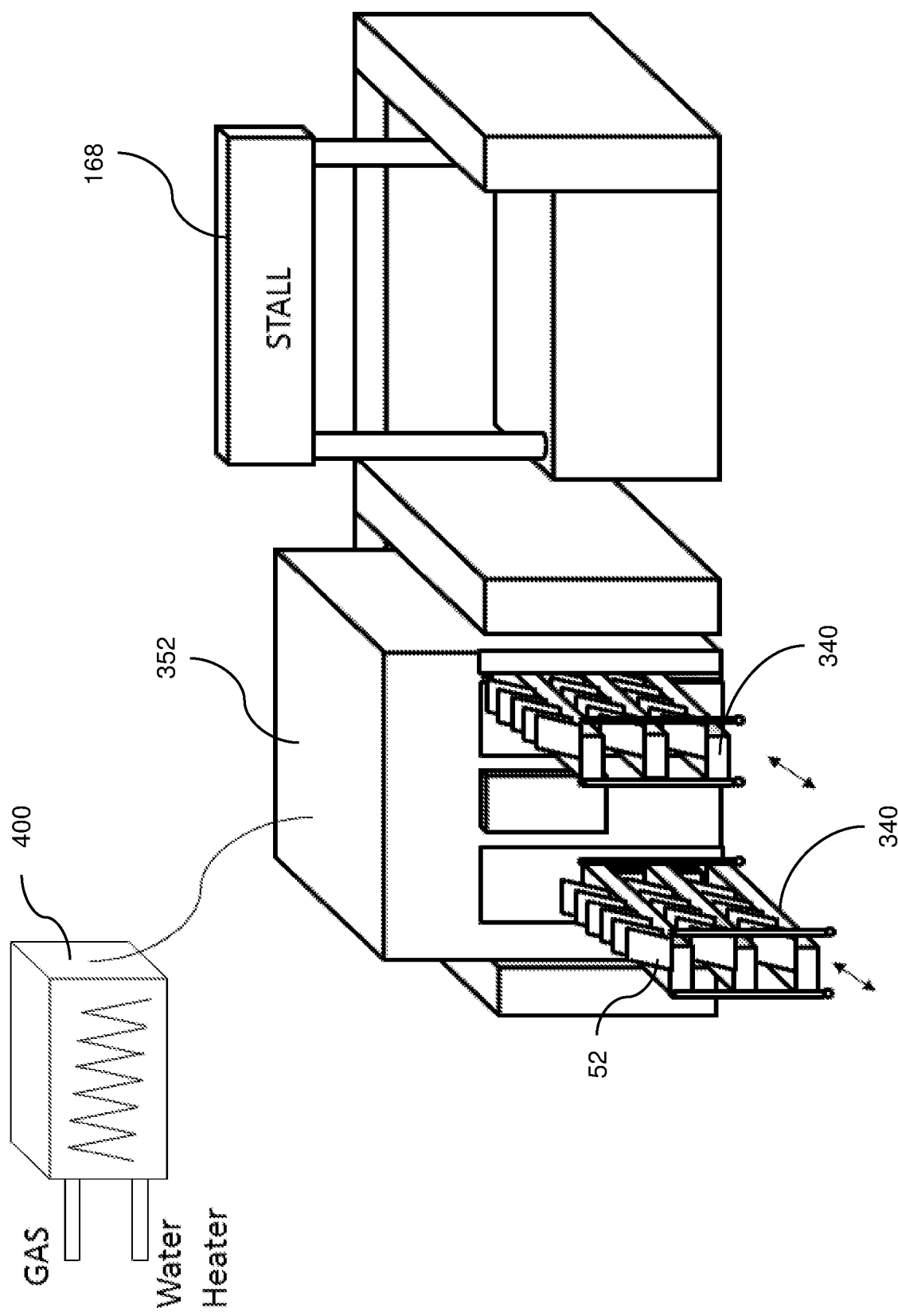


Fig. 32

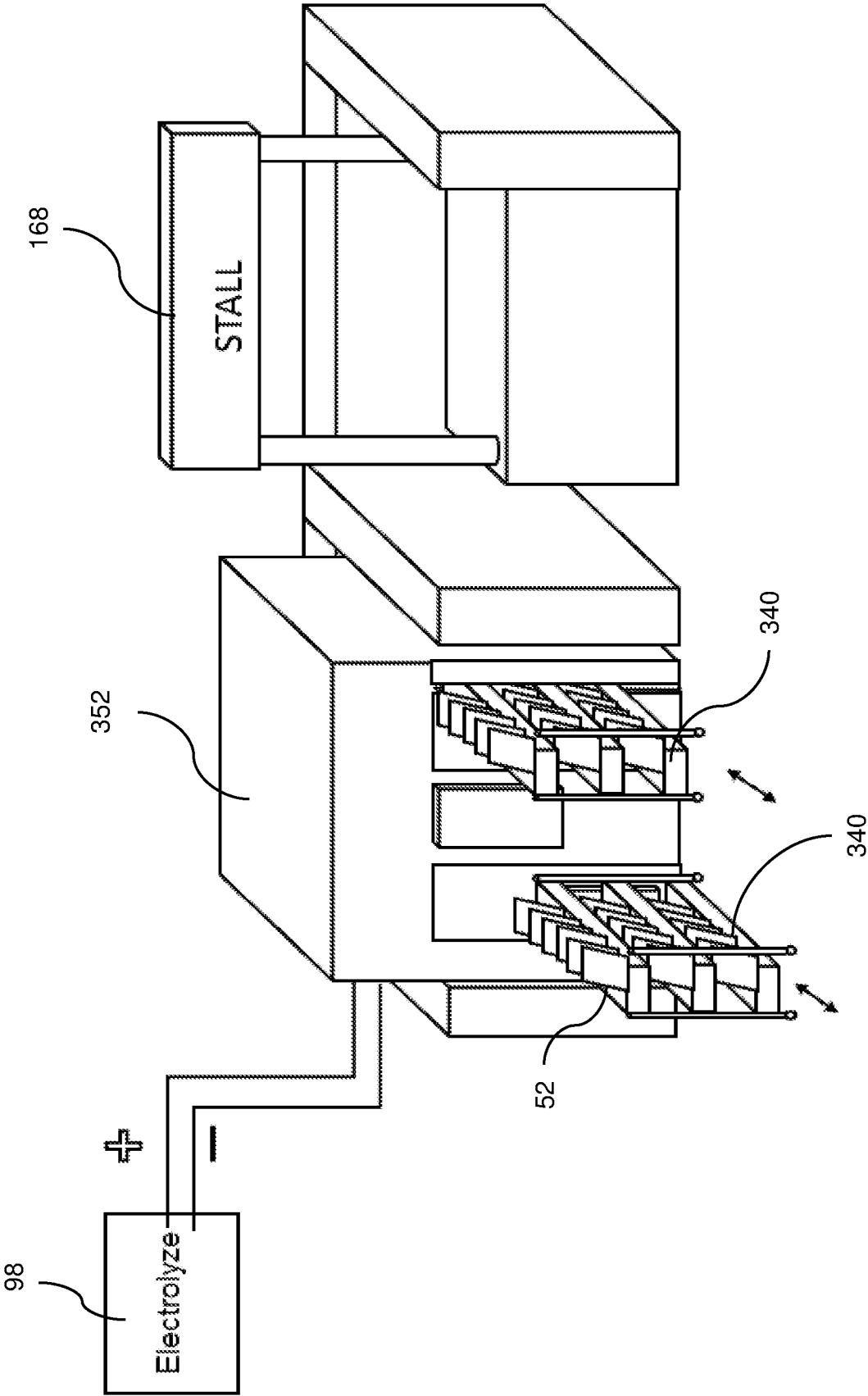


Fig. 33

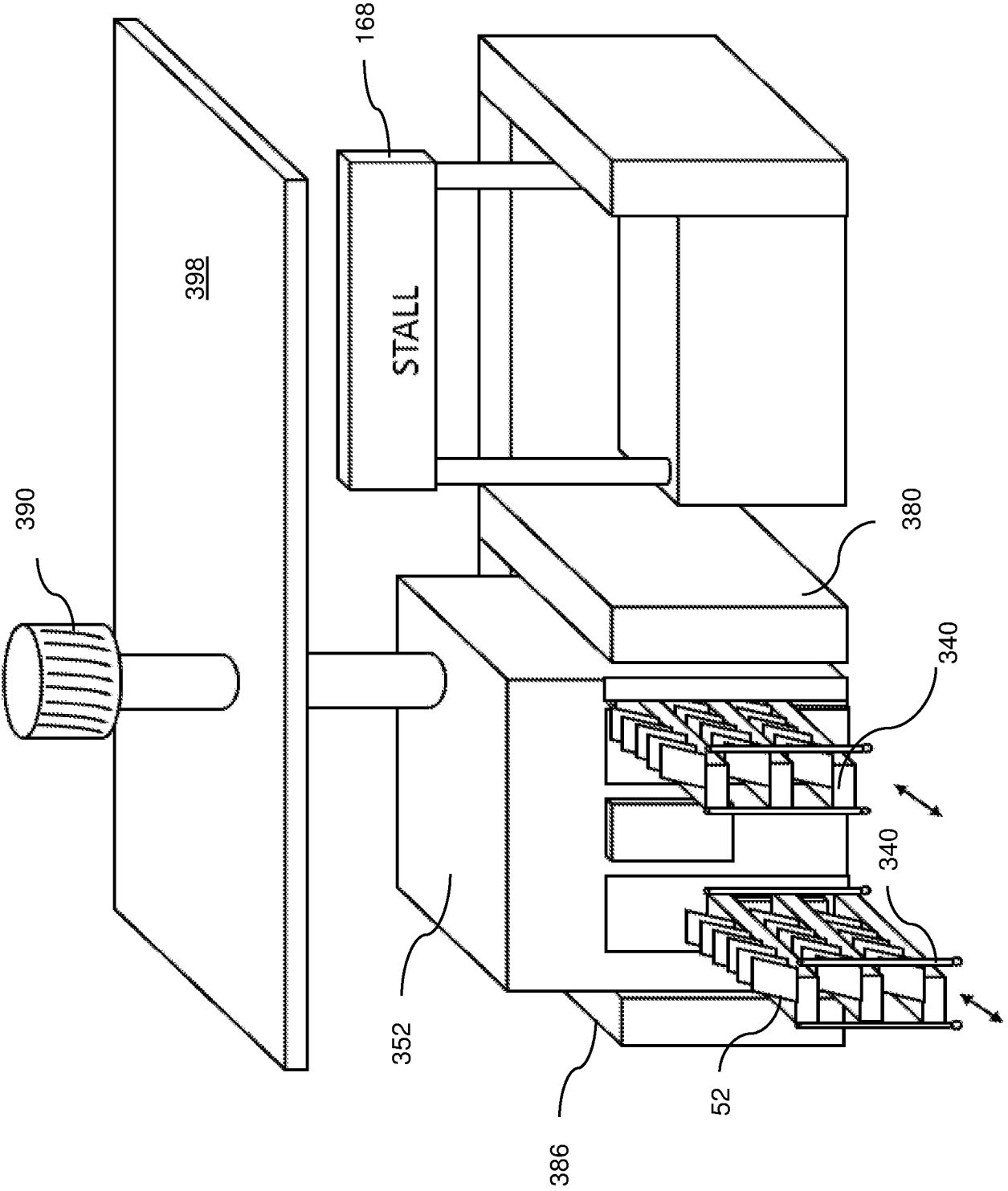


Fig. 34

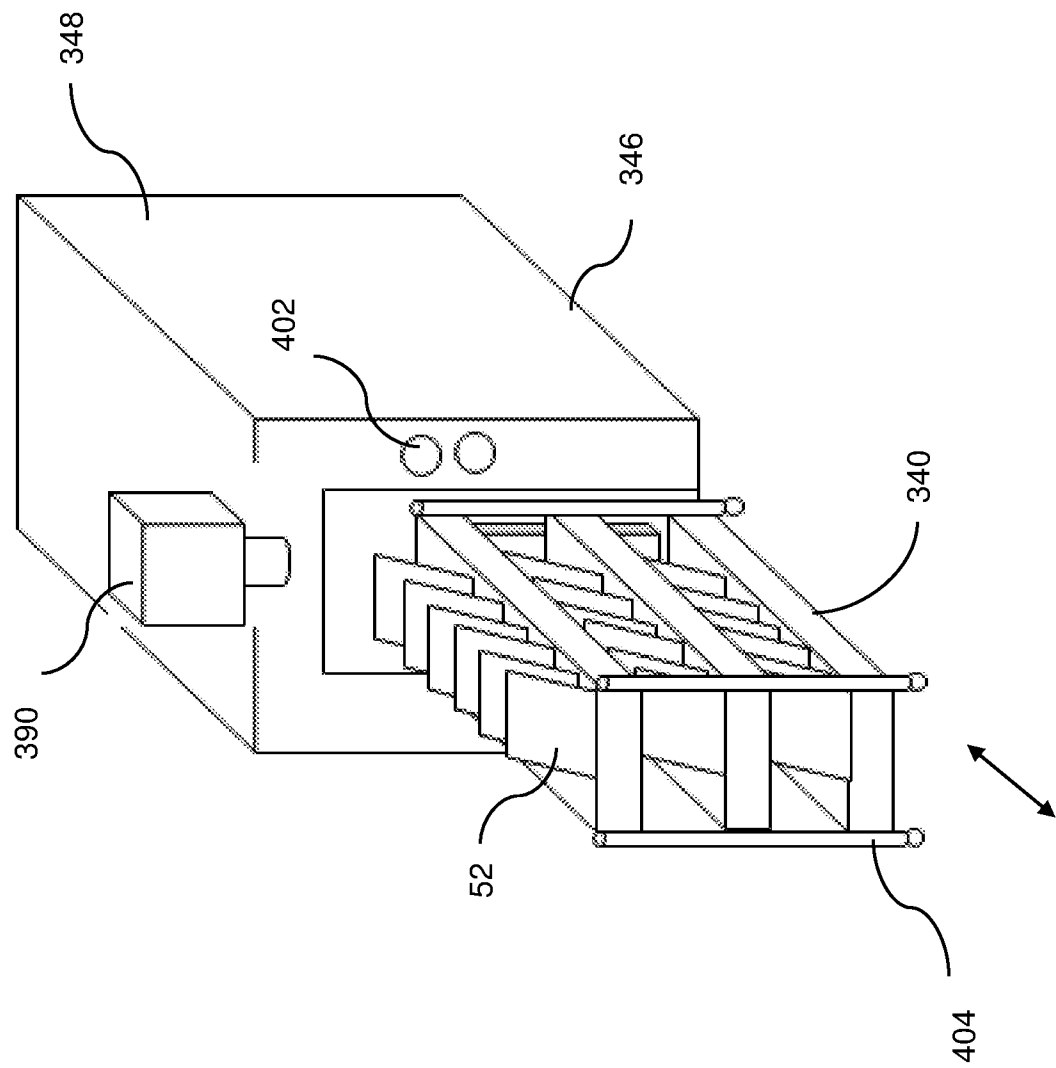


Fig. 35

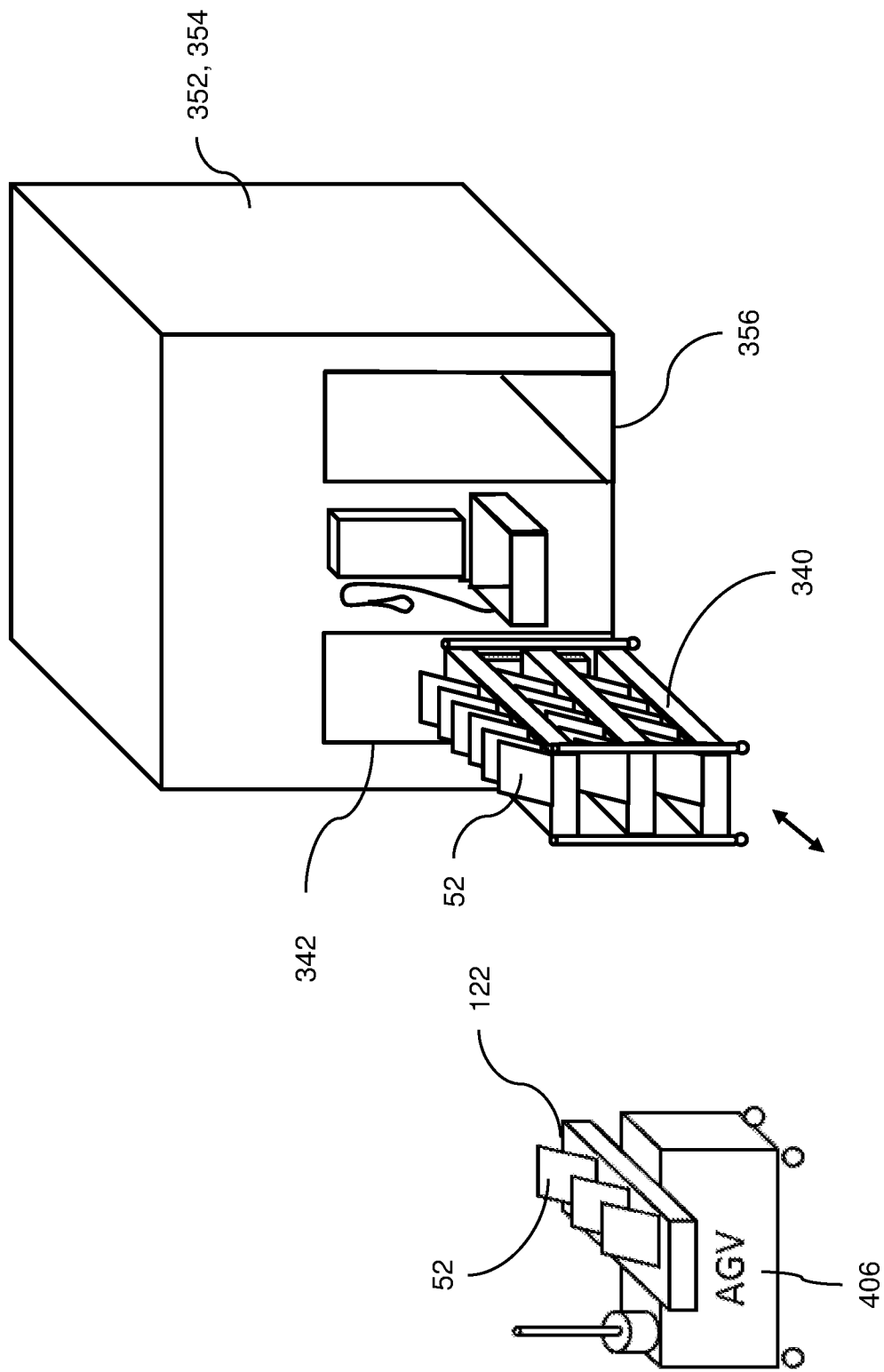


Fig. 36