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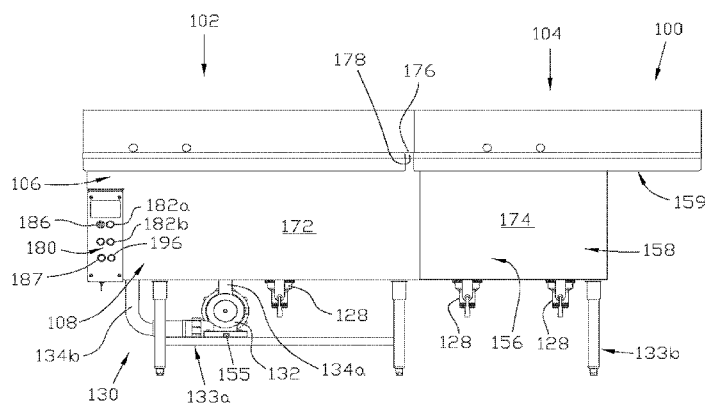
(54) **Title:** KITCHENWARE WASHING ASSEMBLIES AND RELATED METHODS

FIG. 1

(57) **Abstract:** A kitchenware washing assembly is provided for washing kitchenware. The assembly includes a tank configured to hold fluid for washing the kitchenware, a pump configured to circulate fluid within the tank, and a control system configured to control operation of the pump. The pump is operable at two or more different speeds to create two or more different levels of fluid turbulence within the tank. And, the control system is configured to operate the pump at a first one of the two or more different speeds for a specified time period and then cycle operation of the pump to a second one of the two or more different speeds. A temperature sensor configured to monitor temperature of the fluid is included in communication with the control system. And, the control system is configured to terminate operation of the pump if a temperature of the fluid falls below a specified temperature.



KITCHENWARE WASHING ASSEMBLIES AND RELATED METHODS**Cross-Reference to Related Application**

[0001] This application claims the benefit of, and priority to, U.S. Provisional Application No. 61/498,381, filed June 17, 2011, the entire disclosure of which is incorporated herein by reference.

Field

[0002] The present disclosure relates to kitchenware washing assemblies, and methods related to washing kitchenware using such assemblies.

Background

[0003] This section provides background information related to the present disclosure which is not necessarily prior art.

[0004] Commercial washers have been in the marketplace for decades. Many of the commercial washers that are currently on the market include multiple tanks for various cleaning stages (e.g., a scraping tank, washing tank, rinsing tank, and sanitizing tank, etc.). The washing tank, at a basic level, typically includes features such as a rectangular tank with a drain, a valve for closing the tank's drain, nozzles attached to walls of the tank for directing water down into the tank, and a pump to circulate water from within the tank into a manifold that feeds the water through the nozzles.

Summary

[0005] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0006] Example embodiments of the present disclosure are generally directed toward kitchenware washing assemblies. In one example embodiment, such an assembly generally includes a tank configured to hold fluid for washing kitchenware, a pump in fluidic communication with the tank and configured to circulate fluid within the tank, and a control system configured to control operation of the pump. The pump is operable at two or more different speeds to thereby create two or more different levels of fluid turbulence within the tank. And, the control system is configured to operate the pump at a first one of the two or more different

speeds for a specified time period and then cycle operation of the pump to a second one of the two or more different speeds.

[0007] Example embodiments of the present disclosure are also generally directed toward control systems for use with the kitchenware washing assemblies. In one example embodiment, a control system is configured to be coupled to a pump and a temperature sensor of a kitchenware washing assembly. Here, the control system generally includes a toggle configured to activate a pump of a kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly, and a relay configured to terminate operation of the pump if a temperature of washing fluid in the kitchenware washing assembly falls below a specified temperature as measured by a temperature sensor of the kitchenware washing assembly.

[0008] Example embodiments of the present disclosure are also directed toward methods for washing kitchenware using commercial top-loading kitchenware washing assemblies. In one example embodiment an automated method for washing kitchenware using a commercial top-loading kitchenware washing assembly generally includes agitating washing fluid in a tank for a specified time period to thereby create a first level of turbulence in the tank for washing kitchenware in the tank; after the specified time period, agitating the washing fluid in the tank to create a second level of turbulence in the tank, wherein the first level of turbulence in the tank is greater than the second level of turbulence in the tank; measuring a temperature of the washing fluid used for washing the kitchenware in the tank; and deactivating the pump if the measured temperature of the washing fluid is below a specified temperature.

[0009] Further areas of applicability will become apparent from the description provided herein. It should be understood that various aspects of this disclosure may be implemented individually or in combination with one or more other aspects, elements or features described herein and/or illustrated in the drawings, and in a wide variety of configurations. Accordingly, it should be understood that the description and specific examples in this disclosure are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

Drawings

[0010] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0011] FIG. 1 is a front elevation view of a kitchenware washing assembly according to one exemplary embodiment of the present disclosure;

[0012] FIG. 2 is a top plan view of the kitchenware washing assembly of FIG. 1;

[0013] FIG. 3 is a fragmentary front elevation view of a washing unit of the kitchenware washing assembly of FIG. 1 illustrating a scraping station and a washing station of the washing unit, and with part of a skirt removed and part of a sink of the scraping station and a tank of the washing station removed to show interior features of the kitchenware washing assembly;

[0014] FIG. 4 is the fragmentary front elevation view of the washing unit shown in FIG. 3, with an intake cover removed to expose a portion of an intake chamber of the washing unit;

[0015] FIG. 5 is the fragmentary front elevation view of the washing unit shown in FIG. 3, with a portion of the intake chamber shown in broken lines;

[0016] FIG. 6 is the fragmentary front elevation view of the washing unit shown in FIG. 4, with a portion of a rearward wall of the washing unit removed to expose an interior portion of the intake chamber of the washing unit;

[0017] FIG. 7 is a fragmentary top plan view of the washing unit of the kitchenware washing assembly of FIG. 1, with part of the sink of the scraping station and part of the tank of the washing station removed to show configuration of a circulation system of the kitchenware washing assembly;

[0018] FIG. 8 is the fragmentary top plan view of the washing unit shown in FIG. 7, further illustrating a screen positioned within the intake chamber of the washing unit;

[0019] FIG. 9 is a fragmentary perspective view of a discharge chamber and discharge cover of the kitchenware washing assembly of FIG. 1;

[0020] FIG. 10 is a front elevation view of a sanitizing unit of the kitchenware washing assembly of FIG. 1 illustrating a rinsing station and a sanitizing station of the washing unit;

[0021] FIG. 11 is a schematic of a wiring configuration for use with a control system of the kitchenware washing assembly of FIG. 1;

[0022] FIG. 12 is a schematic of a wiring configuration according to one example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0023] FIG. 13 is a schematic of a wiring configuration according to another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0024] FIG. 14 is a schematic of a wiring configuration according to yet another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0025] FIG. 15 is a schematic of a wiring configuration according to still another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0026] FIG. 16 is a schematic of a wiring configuration according to another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0027] FIG. 17 is a schematic of a wiring configuration according to still another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0028] FIG. 18 is a schematic of a wiring configuration according to another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0029] FIG. 19 is a schematic of a wiring configuration according to still another example embodiment of the present disclosure for use with a control system of a kitchenware washing assembly;

[0030] FIG. 20 is a perspective view of an intake cover according to an example embodiment of the present disclosure; and

[0031] FIG. 21 is a perspective view of a screen configured for use with the intake cover of FIG. 20.

[0032] Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

Detailed Description

[0033] Example embodiments are provided herein so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms and that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies are not described in detail.

[0034] Features of the present disclosure can be implemented into various embodiments of kitchenware washing assemblies configured for use to clean kitchenware. The kitchenware washing assemblies may be operable to clean a variety of kitchenware, including, for example, dishware, food service ware and equipment, pots, pans, food trays, grease filters, gratings, any other items found in kitchens that may require cleaning, etc. In some embodiments, the kitchenware washing assemblies are configured as commercial top-loading assemblies for use in commercial settings such as commercial kitchens, etc.

[0035] Kitchenware washing assemblies of the present disclosure include circulation systems configured to circulate washing fluid within tanks of the assemblies for cleaning kitchenware in the tanks. Circulating the washing fluid may create turbulence in the tanks to help clean the kitchenware and loosen food residues or remnants on the kitchenware. To achieve this fluid circulation, the circulation systems may include one or more pumps configured to remove washing fluid from the tanks of the assemblies and discharge the removed washing fluid back into the tanks. In some embodiments, the circulation systems may remove the washing fluid from the tanks through one or more inlets associated with the tanks and discharge the removed washing fluid back into the tanks through one or more outlets associated with the tanks. The inlets and/or the outlets may each be associated with single individual walls of the tanks, or they may each be associated with multiple walls of the tanks.

[0036] Kitchenware washing assemblies of the present disclosure may also (or alternatively) include temperature sensors configured to monitor (*e.g.*, sense, measure, track, record, report, etc.) temperature of washing fluid in tanks of

the kitchenware washing assemblies. The monitored temperature of the washing fluid may be used to help control kitchenware washing operations by ensuring sufficiently heated washing fluid is present in the assemblies during use. In some embodiments, the temperature sensors may be disposed at least partly within washing tanks of the assemblies. And in some embodiments, the temperature sensors may be disposed at least partly within chambers associated with the washing tanks (*e.g.*, intake chambers, etc.).

[0037] Kitchenware washing assemblies of the present disclosure may also (or alternatively) include screen features to protect pumps of the assemblies. For example, in some embodiments, intake covers may be provided to cover intake chambers of the kitchenware washing assemblies. The intake covers can allow fluid to flow from tanks of the kitchenware washing assemblies into the intake chambers (which then direct the fluid to the pumps), but can inhibit movement of objects (*e.g.*, kitchenware, food particles, etc.) into the intake chambers (which, if drawn into the pumps, could adversely affect their operation). The intake covers can also help direct fluid flow in the tanks and help create circular, rotating, etc. fluid patterns in the tanks to improve cleaning operations. And, in some of these embodiments, additional screens may be provided over openings in the intake chambers that lead to the pumps (and that direct the fluid from the intake chambers to the pumps). These screens can allow the fluid to flow from the intake chambers to the pumps, but can inhibit movement of any unintended objects (*e.g.*, paper, tape, plastic, knives, other kitchenware, straws, food particles, debris, etc. to the pumps (*e.g.*, any items that may inadvertently pass through the intake covers, etc.). Thus, two lines of protection can be provided to the pumps in such embodiments.

[0038] Kitchenware washing assemblies of the present disclosure may also (or alternatively) include one or more pump sensors (*e.g.*, voltage sensors, potentiometers, current sensors, power sensors, flow sensors, pressure sensors, fluid displacement sensors, or any other sensors that can sense, measure, or otherwise determine voltage, current, power, resistance, or other parameter of the pumps, etc.) configured to monitor performance of the pumps. For example, the pump sensors can be used to monitor operating parameters of the pumps (*e.g.*, voltage usage, current draw, etc.) indicative of performance of the pumps (*e.g.*, indicative of fluid flow to and/or through the pumps, etc.). As such, in some example embodiments the pump sensors can be used to sense undesired restrictions in fluid

flow to and/or through the pumps (e.g., indicating that openings, inlets, inlet covers, screens, etc. leading to the pumps may be blocked, indicating that the pumps should be cleaned, etc.) which, in turn, can be used to help optimize operation of the pumps and/or protect the pumps from damage and/or help ensure cleanliness and sanitation operations of the assemblies (e.g., help ensure that the pumps are operating properly to discharge fluid into the assemblies at sufficient pressures, velocities, etc. to properly clean kitchenware in the assemblies, etc.).

[0039] In addition (or alternatively), kitchenware washing assemblies of the present disclosure may include control systems configured to control one or more operations of the assemblies. Such operations may include circulation of washing fluid in the assemblies (e.g., degree of agitation of the washing fluid, duration of circulation of the washing fluid, volume of washing fluid being circulated, etc.), temperature of the washing fluid in the assembly, wash agent addition to the washing fluid in the assembly, etc. For example, in some embodiments, the control systems may be configured to control pump operations to circulate washing fluid in the assembly. In particular, the control systems may be configured to alter the frequencies of the pumps, when desired, to speed up or slow down or turn off the pumps. The control systems may also be configured to synchronize operations of two or more pumps (e.g., operate the two or more pumps sequentially, operate the two or more pumps in tandem at the same time, operate the two or more pumps to provide pulsating fluid flows, operating the two or more pumps to provide surging fluid flows, etc.) to achieve desired circulation of washing fluid in the assemblies (and desired cleaning operations).

[0040] In some example embodiments, the control systems may also (or alternatively) be configured to communicate with temperature sensors to receive temperature signals relating to temperature of washing fluid in the assemblies. The received temperature signals may then be used as a basis to control one or more operations of the assemblies. For example, if the received temperature signals indicate that temperature of the washing fluid is below a specified (e.g., a predetermined, a pre-programmed, a manually entered, etc.) temperature, the control systems may activate warning signals (e.g., lights, sounds, data messages, etc.) indicating that the temperature of the washing fluid is low. In embodiments in which the specified temperature is selected, set, or predetermined to be a critical washing temperature needed for effective kitchenware cleaning (e.g., about 85

degrees Fahrenheit plus/minus an acceptable variation within industry standards, etc.), then the control systems may also (or alternatively) be configured to deactivate the circulation systems and prevent further operation of the assembly, such as until the received temperature signals indicate that the temperature of the washing fluid is acceptable (e.g., at or above the critical washing temperature, etc.). In some example embodiments, the control systems may also include override features (e.g., keyed locks, coded locks, etc.) configured to override the deactivation order to allow continued use of the assemblies (e.g., continued operation of the circulation systems, etc.) even though the received temperature signals indicate that temperature of the washing fluid is below a critical washing temperature.

[0041] In some example embodiments, the control systems may also (or alternatively) be configured to communicate with the pump sensors of the kitchenware washing assemblies to receive signals indicative of the performance of the pumps. For example, if the received signals indicate that monitored parameters of the pumps deviate from specified (e.g., a predetermined, a pre-programmed, a manually entered, etc.) values, the control systems may activate warning signals (e.g., lights, sounds, data messages, etc.) indicating that the pumps should be serviced and/or that the kitchenware washing assemblies should be inspected (e.g., for items blocking fluid flow to the pumps, etc.). Further, in some of these embodiments, the control systems may also (or alternatively) be configured to deactivate the pumps and prevent further operation of the assemblies until the pumps are serviced and/or the assemblies are inspected.

[0042] In one example embodiment, a kitchenware washing assembly of the present disclosure generally includes a tank configured to hold fluid for washing kitchenware, a pump in fluidic communication with the tank and configured to circulate fluid within the tank, and a control system configured to control operation of the pump. In some aspects of the present disclosure, the kitchenware washing assembly may be a commercial top-loading kitchenware washing assembly.

[0043] In this example embodiment, the pump of the kitchenware washing assembly may be operable at two or more different speeds to thereby create two or more different levels of fluid turbulence within the tank. While not required, the first one of the two or more different speeds of the pump may create a greater level of fluid turbulence in the tank than the second one of the two or more different speeds of the pump. Also, the control system may be configured to operate the pump at a

first one of the two or more different speeds for a specified time period and then cycle operation of the pump to a second one of the two or more different speeds.

[0044] In some aspects of the present disclosure, the kitchenware washing assembly may also include a sensor configured to monitor temperature of fluid held within the tank. Here, the control system may be in communication with the sensor and may be configured to activate at least one indicator when the temperature of the fluid held within the tank falls below a specified temperature. The at least one indicator may be selected from the group consisting of a visual indicator and an audible indicator. In addition, the control system may be configured either to manually receive the specified temperature from a user or to be preprogrammed with the specified temperature. Also (or alternatively), the control system may be configured to deactivate the pump when the temperature of the fluid held within the tank falls below the specified temperature.

[0045] In some aspects of the present disclosure, the kitchenware washing assembly may include a pump sensor configured to monitor at least one operational parameter of the pump. Here, the control system may be in communication with the pump sensor and may be configured to activate the at least one indicator when the at least one operational parameter of the pump deviates from a specified value.

[0046] In some aspects of the present disclosure, the tank of the kitchenware washing assembly may include first and second opposing walls and third and fourth opposing walls defining at least part of the tank. Further, an intake chamber may be associated with the first wall of the tank and configured to receive fluid from out of the tank, and a discharge chamber may be associated with the third wall of the tank and configured to receive fluid for discharge into the tank. Here, the second and fourth walls of the tank do not include either an intake chamber or a discharge chamber associated therewith. And, the sensor may be located within the intake chamber of the assembly.

[0047] In some aspects of the present disclosure, the kitchenware washing assembly may also include an intake cover configured to be positioned over the intake chamber and/or a discharge cover configured to be positioned over the discharge chamber. Here, the intake cover may include multiple openings uniformly positioned along at least part of the intake cover to allow fluid to move through the openings from the tank to the intake chamber. And, the discharge cover may include openings through which fluid is discharged from the discharge chamber and into the

tank. Further, the discharge openings of the discharge cover may be located toward one side portion of the discharge cover to thereby promote generally horizontal circulation of fluid within the tank.

[0048] In some aspects of the present disclosure, the kitchenware washing assembly may further include at least one or more of a scraping station coupled to the tank to remove bulk food items that have stuck to the kitchenware prior to washing the kitchenware in the tank, a rinsing station coupled to the tank to rinse the washed kitchenware, and a sanitizing station coupled to the rinsing station to sanitize the washed kitchenware.

[0049] In another example embodiment, a control system is configured to be coupled to a pump and a temperature sensor of a kitchenware washing assembly. Here, the control system generally includes a toggle configured to activate a pump of a kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly, and a relay configured to terminate operation of the pump if a temperature of washing fluid in the kitchenware washing assembly falls below a specified temperature as measured by a temperature sensor of the kitchenware washing assembly. The toggle may include at least two speed settings for activating the pump of the kitchenware washing assembly. And, an actuator may be configured to cycle the pump from a first speed setting to a second speed setting, as desired.

[0050] In some aspects of the present disclosure, the control system may also include one or more of a timer, a hold relay, a float relay, motor speed relay, a load relay, a fluid level sensor, an override, and a warning indicator. For example, the hold relay may be configured to maintain operation of the pump at a desired speed setting for a specified period of time as monitored by the timer. The motor speed relay may be configured to control changes of the speeds of a motor of the pump. The load relay may be configured to accommodate higher electrical loads than other components of the control system. The float relay (and/or the toggle) may be configured to deactivate operation of the pump if a fluid level in the kitchenware washing assembly is below a specific fluid level, as measured by the fluid level sensor. The warning indicator (e.g., a visual indicator, an audible indicator, etc.) may be configured to activate if the temperature of washing fluid in the kitchenware washing assembly falls below the specified temperature. And, the override (e.g., a keyed lock, etc.) may be configured to allow reactivation of the operation of the

pump, after termination by the relay, while the temperature of the washing fluid in the kitchenware washing assembly remains below the specified temperature

[0051] In some aspects of the present disclosure, the control system may be configured for use with kitchenware washing assemblies having two or more pumps. Here, the toggle may be configured to activate the first pump and a second pump of the kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly, and the control system may then be configured to cycle operation from the first pump to the second pump as desired.

[0052] In some aspects of the present disclosure, the control system may further include (or alternatively include) a pump protection relay configured to terminate operation of the pump if at least one operational parameter of the pump deviates from a specified value as measured by a pump sensor of the kitchenware washing assembly.

[0053] In another example embodiment, an automated method for washing kitchenware using a commercial top-loading kitchenware washing assembly generally includes agitating washing fluid in a tank for a specified time period to thereby create a first level of turbulence in the tank for washing kitchenware in the tank; after the specified time period, agitating the washing fluid in the tank to create a second level of turbulence in the tank, wherein the first level of turbulence in the tank is greater than the second level of turbulence in the tank; measuring a temperature of the washing fluid used for washing the kitchenware in the tank; and deactivating the pump if the measured temperature of the washing fluid is below a specified temperature.

[0054] In some aspects of the present disclosure, agitating the washing fluid in the tank to thereby create a first level of turbulence in the tank may include operating a pump at a first speed for the specified time period to thereby create the first level of turbulence in the tank for washing kitchenware in the tank, and agitating the washing fluid in the tank to create the second level of turbulence in the tank may include cycling operation of the pump to a second speed and operating the pump at the second speed to thereby create the second level of turbulence in the tank. In addition (or alternatively), agitating the washing fluid in the tank may include discharging fluid into the tank from a single side of the tank and at a generally downward angle to thereby promote generally vertical circulation of fluid within the

tank and/or discharging the fluid into the tank from the single side of the tank to thereby promote generally horizontal circulation of the fluid within the tank.

[0055] In some aspects of the present disclosure, measuring a temperature of the washing fluid used for washing the kitchenware in the tank includes measuring a temperature of the washing fluid when the washing fluid is received from out of the tank and into an intake chamber associated with the tank.

[0056] In addition (or alternatively), in some aspects of the present disclosure the automated method may also include activating an indicator if the temperature of the washing fluid falls below the specified temperature, where the indicator may be selected from the group consisting of a visual indicator and an audible indicator.

[0057] In some aspects of the present disclosure, the specified temperature is a first specified temperature, the method further comprising activating an indicator if the temperature of the washing fluid falls below a second specified temperature, the first specified temperature being lower than the second specified temperature. For example, the first specified temperature is about 85 degrees Fahrenheit and the second specified temperature is about 95 degrees Fahrenheit.

[0058] Further, in some aspects of the present disclosure, the automated method may also (or alternatively) include monitoring at least one operational parameter of the pump, and deactivating the pump if the at least one operational parameter of the pump deviates from a specified value.

[0059] It should be appreciated that individual elements or features of particular embodiments described herein are generally not limited to those particular embodiments but, where applicable, are interchangeable and can be used in other selected embodiments, even if not specifically shown or described. The same may also be varied in many ways. Thus, kitchenware washing assemblies and methods of washing kitchenware using such assemblies may have any desired combination of aspects, elements and/or features described herein.

[0060] FIGS. 1-11 illustrate a kitchenware washing assembly 100 according to one example embodiment of the present disclosure. The illustrated washing assembly 100 is a commercial top-loading washing assembly 100. For example, the assembly 100 can be used in commercial settings such as commercial kitchens, etc. to clean a variety of kitchenware, including, for example, dishware,

food service ware and equipment, pots, pans, food trays, grease filters, gratings, or any other items found in commercial kitchens that may require cleaning.

[0061] As shown in FIGS. 1 and 2, the illustrated assembly 100 generally includes a modular washing unit 102 and a sanitizing unit 104. The washing unit 102 is used to pre-rinse and then clean desired kitchenware. And, the sanitizing unit 104 is used to rinse the cleaned kitchenware and then sanitize the kitchenware in preparation for subsequent use. The sanitizing unit 104 is coupled (e.g., releasably coupled, etc.) to the washing unit 102 for support, generally to the right of the washing unit 102 (as viewed in FIGS. 1 and 2). This allows for easy setup of the washing unit 102 and the sanitizing unit 104 in any desired facility (e.g., in any desired sized/shaped room, etc.). This also allows for convenient transfer of cleaned kitchenware from the washing unit 102 to the sanitizing unit 104. In other example embodiments, washing assemblies may include washing units and sanitizing units coupled differently than disclosed herein (e.g., not coupled; coupled to different portions of the units; coupled to form different shapes, for example, L-shapes to thereby accommodate different installation needs, different sized/shape rooms, etc.; etc.).

[0062] The washing unit 102 generally includes a scraping station 106 and a washing station 108. The scraping station 106 is used to initially rinse and remove bulk food items and other residue from the kitchenware prior to cleaning. And, the washing station 108 is used to then wash the kitchenware as desired. The scraping station 106 is located to the left of the washing station 108 (as viewed in FIGS. 1 and 2), again to allow convenient (and staged) transfer of kitchenware from the scraping station 106 to the washing station 108. In other example embodiments, washing units may include washing stations without scraping stations. In other example embodiments, washing units may include scraping stations and washing stations oriented differently than disclosed herein (e.g., scraping stations not part of the same unit as washing stations, scraping stations releasably coupled to washing stations, scraping stations positioned toward a different side of washing stations, etc.). In other example embodiments, splash guards may be coupled (e.g., releasably coupled, bolted, snap-fit coupled, quick-release coupled, etc.) around perimeters of scraping stations and/or washing stations of kitchenware washing assemblies, for example, to help inhibit fluid spillage from out of the stations, to help inhibit

contamination of the washing stations with scraped food particles from the scraping stations, etc.

[0063] Any suitable washing fluid can be used in the scraping station 106 and washing station 108 to initially rinse and/or clean the kitchenware (*e.g.*, water, etc.). And, any suitable wash agent (*e.g.*, soap, etc.), chemical, etc. can be added to the washing fluid to help with, enhance, etc. rinsing and/or cleaning of the kitchenware. Further, the wash agent (*e.g.*, soap, etc.), chemical, etc. can be added to the washing fluid (*e.g.*, in the washing station 108, in a stream of flow of the washing fluid, etc.) manually, by automated injection systems (*e.g.*, such as injection devices disclosed in U.S. 2010/0139701, etc.), etc.

[0064] With additional reference to FIG. 3, the illustrated scraping station 106 includes a sink 110 configured to catch bulk food items and residue removed from the kitchenware prior to cleaning. A drain 112 is provided in the sink 110 to remove any fluid from the sink 110 used to initially rinse the kitchenware, along with any removed bulk food items and/or residue. The sink 110 is sloped toward the drain 112 to cause the fluid to flow to the drain 112. The drain 112 can be conventionally coupled to plumbing and/or drainage systems to ultimately dispose of the fluid, food items, and/or residue. And, as noted above, splash guards may be coupled around a perimeter of the sink 110 of the scraping station 106, for example, to help inhibit contamination of the washing station 108 with scraped food particles from the scraping station 106, etc.

[0065] While not illustrated, the scraping station 106 may also be equipped to separate bulk food items and/or residue pre-rinsed from the kitchenware from the rinsing fluid. The separated food items and/or residue can then be disposed separately from the rinsing fluid. For example, a removable perforated cover or screen may be provided over the sink of the scraping station 106 to help catch large food items and/or residue and allow for separate disposal thereof. In addition, the scraping station 106 may further be equipped with structure to dispose of grease, etc. pre-rinsed from the kitchenware as desired.

[0066] The washing station 108 includes a tank 114 configured to hold washing fluid for use in cleaning the kitchenware. The illustrated tank 114 is generally rectangular in shape and is defined by side walls 116, 118, a rearward wall 120, a forward wall 122, and a bottom wall 124. In the illustrated embodiment, lower portions of the side walls 116, 118 are angled generally downwardly toward the

bottom wall 124 (e.g., between about sixty degrees and about eighty degrees, etc.). A drain 126 is provided in the bottom wall 124 of the tank 114 to remove the washing fluid from the tank 114 (e.g., following cleaning operation, etc.). The bottom wall 124 is downwardly sloped toward the drain 126 to cause fluid to flow to the drain 126. A valve 128 is positioned in communication with the drain 126 and can be selectively opened to allow washing fluid to be removed from the tank 114 and closed to allow for retention of washing fluid in the tank 114. The drain 126 can be conventionally coupled to plumbing and/or drainage systems to ultimately dispose of washing fluid removed from the tank 114.

[0067] With reference now to FIGS. 3-6, the washing unit 102 also includes a circulation system 130 in fluidic communication with the tank 114 of the washing station 108. The circulation system 130 operates to circulate washing fluid within the tank 114 for cleaning kitchenware in the tank 114. For example, the circulation system 130 can circulate fluid within the tank 114 to create turbulence in the tank 114 (e.g., to move, agitate, etc. the washing fluid in the tank 114, etc.) to help clean the kitchenware and loosen tough food residues or remnants that can become caked onto kitchenware during cooking or food preparation processes. The circulation system 130 can also create different levels of turbulence in the tank 114, for example, to clean kitchenware with different types of food residues thereon, to clean different types of kitchenware (e.g., plastic kitchenware, glass kitchenware, metal kitchenware, etc.).

[0068] The illustrated circulation system 130 includes a pump 132 positioned on a support platform 133a of the washing unit 102 and conduits 134 interconnecting (e.g., via welds, mechanical fasteners, adhesives, friction, etc.) the pump 132 between an intake chamber 136 of the tank 114 and a discharge chamber 138 of the tank 114. As such, the pump 132 is in fluidic communication with the tank 114 via the intake chamber 136 and the discharge chamber 138. The pump 132 can then operate to circulate washing fluid out of the tank 114, through the intake chamber 136, to the discharge chamber 138, and back into the tank 114. This operation will be described in more detail hereinafter. With that said, it should be appreciated that the assembly 100 could include two or more pumps to circulate washing fluid in the tank 114 (e.g., with the pumps operating together to create different levels of fluid turbulence in the tank 114, with the pumps operating independently to create different levels of fluid turbulence in the tank 114, etc.).

[0069] The pump 132 is located on the support platform 133a under the tank 114 of the washing station 108. The pump 132 is a variable speed pump that can operate at two or more different operating speeds (in addition to an “off” condition). The pump 132 can thus create two or more different levels of turbulence of washing fluid within the tank 114, depending on the operating speed. For example, at one operating speed the pump 132 can provide a higher level of turbulence for cleaning kitchenware (e.g., for removing inordinately caked-on food from the kitchenware, for cleaning durable kitchenware such as glass and metal kitchenware, etc.). And at a second operating speed (e.g., at an idle mode, etc.), the pump 132 can provide a lower level of turbulence (e.g., for preventing grease, debris, etc. suspended in the washing fluid from settling back onto the cleaned kitchenware; for cleaning delicate kitchenware such as plastic kitchenware; etc.). The cleaned kitchenware can also be easily removed from the tank 114 at this lower level of turbulence with reduced risk of splashing an operator with the washing fluid. A drain can be positioned toward a low point of the pump 132 to drain fluid from the pump 132 as needed. In some embodiments, circulation systems (e.g., utilizing single pumps, utilizing multiple pumps, etc.) may provide at least three levels of turbulence, including first, high levels of turbulence for cleaning kitchenware with caked-on food residue and/or durable kitchenware; second, medium levels of turbulence for cleaning kitchenware with only moderate food residue and/or delicate kitchenware; and third, low levels of turbulence as an idle mode (e.g., for preventing grease, debris, etc. suspended in the washing fluid from settling back onto the cleaned kitchenware, etc.).

[0070] The intake chamber 136 is positioned along the rearward wall 120 of the tank 114 in fluidic communication with pump 132. The intake chamber 136 is also in fluidic communication with the tank 114 through an opening 140 (FIG. 4) defined in the rearward wall 120 of the tank 114. In the illustrated embodiment, the intake chamber 136 is the only intake chamber in the tank 114. Additional intake chambers are not located on other walls (e.g., walls 116, 118, 122, etc.) of the tank 114. With that said, the intake chamber 136 could alternatively be positioned along another of the walls (e.g., walls 116, 118, 122, etc.) of the tank 114, or along a different portion of the rearward wall 120 than illustrated herein. In other example embodiments, washing assemblies may include intake chambers located on multiple

different walls of tanks, multiple intake chambers located on common walls in tanks, etc.

[0071] An intake cover 142 (FIG. 3) is positioned over the intake chamber 136 (FIG. 4) at opening 140 and is coupled to the tank 114 via suitable fasteners (e.g., mechanical fasteners, etc.). The intake cover 142 includes multiple inlets 144 (e.g., openings, etc.) uniformly and evenly spaced across at least part of the intake cover 142. The inlets 144 allow fluid to be drawn (e.g., via suction, etc.) into the intake chamber 136 (through the inlets 144), while the intake cover 142 restricts unintended objects (e.g., food debris, kitchenware items like silverware, etc.) from entering the intake chamber 136 (and the pump 132). The location and/or orientation and/or size of the inlets 144 can also help improve cleaning operation of the assembly 100 by, for example, assisting in shaping desired wave forms in the tank 114, directing flow of fluid in the tank 114 in desired patterns, and/or lofting/floating/circulating kitchenware in the tank 114 (e.g., in combination with the fluid being discharged into the tank 114 via the discharge chamber 138 to thereby create a push/pull action on the kitchenware in the tank, etc.).

[0072] In the illustrated embodiment, the intake cover 142 is positioned over a portion of the intake chamber 136 (with the rearward wall of the tank 114 covering a remaining portion of the intake chamber 136) away from an opening 154 (FIG. 5) where the conduit 134a couples the pump 132 to the intake chamber 136. This configuration helps maintain generally constant fluid pressure within the intake chamber 136 at the opening 154, and thus helps provide generally uniform flow of fluid to the pump 132 (e.g., helps inhibit low pressure conditions from developing within the pump 132, etc.). In other example embodiments, intake covers may be positioned over substantially entire portions of intake chambers, with openings formed, patterned, etc. in the intake covers at locations away from where pumps draw fluid out of the intake chambers (such that the intake covers may have no openings at locations adjacent where the pumps draw fluid out of the intake chambers and then have openings (e.g., uniformly spaced openings, etc.) at locations spaced away from where the pumps draw fluid out of the intake chambers to thereby allow the fluid to move from tanks into the intake chambers and provide generally uniform fluid flow to the pumps from the chambers).

[0073] Also, the inlets 144 are spaced laterally away from the opening 154 where the conduit 134a couples the pump 132 to the intake chamber 136. For

example, in the illustrated embodiment each of the inlets 144 is spaced laterally away from the opening 154 a distance 145 (FIG. 5) of at least about ten inches (e.g., about ten inches, about eleven inches, about twelve inches, about fourteen inches, about eighteen inches, about twenty-four inches, etc.). As discussed above, this spacing can assist in shaping desired wave forms in the tank 114, directing flow of fluid in the tank, and lofting kitchenware in the tank, each of which can help in cleaning operation.

[0074] The intake cover 142 also includes a projection 146 extending into the tank 114 and positioned along at least part of the intake cover 142. The projection 146 helps keep kitchenware (e.g., plates, pans, dishware, trays, etc.) from being drawn up flush against the intake cover 142 and blocking fluid movement through the inlets 144 (which could decrease operational efficiency of the washing unit 102). The projection 146 of the intake cover 142 defines a generally V-shaped rib that extends longitudinally across a substantial length of the intake cover 142. In other example embodiments, intake covers may include projections that extend across less than a substantially entire length of the intake covers. In still other example embodiments, intake covers may include one or more vertically extending projections. In some example embodiments, intake covers may include projections having cross-sectional shapes and geometric configurations that are hemispherical and have substantially solid cross-sections (e.g. trapezoidal, triangular, rectangular, etc.) and that do not define a channel.

[0075] With that said, the inlets 144 of the intake cover 142 are not necessarily configured to avoid suction at the surface of the intake cover 142 facing into the tank 114. In fact, the inlets 144 can be configured (e.g., sized, shaped, oriented, etc.) to help promote slight suction at the surface of the intake cover 142. This suction/pulling action on the kitchenware in the tank 114, together with the pushing action on the kitchenware created by the fluid being discharged into the tank 114 via the discharge chamber 138, helps create a lifting action (e.g., a circular, rotating motions via the fluid, etc.) of the kitchenware in the tank 114 which in turn helps improve cleaning operation of the assembly 100. This is particularly beneficial in the illustrated embodiment because the fluid is being discharged into the tank 114 from only one discharge chamber 138 located on only one side of the tank 114 (as opposed to being discharged from two or more discharge chambers located on two or more different sides of the tank 114 where such suction/pulling action may not be

needed to provide desired lifting action on kitchenware in the tank 114). As such, in the illustrated embodiment the suction/pulling action at the intake cover 142 compliments the single side discharge of fluid into the tank 114 from the discharge chamber 138 and helps provide the desired lifting action of the kitchenware in the tank. The projection 146 is then provided to help counteract this slight suction and help keep kitchenware from being drawn up flush against the intake cover 142 and blocking fluid movement through the inlets 144.

[0076] With additional reference to FIGS. 6 and 8, an additional screen 147 is provided within the intake chamber 136, and positioned over the opening 154 where the conduit 134a couples the pump 132 to the intake chamber 136. This additional screen 147 is configured (e.g., includes perforations, etc.) to allow fluid to flow from the intake chamber 136, through the screen 147, and to the pump 132, while at the same time inhibiting movement of any unintended objects (e.g., kitchenware, food particles, etc.) that enter the intake chamber 136 from further traveling to the pump 132 (which could inadvertently affect operation of the pump 132). As such, the additional screen 147 provides a second line of protection to the pump 132.

[0077] In the illustrated embodiment, the screen 147 is configured to be slid into and out of the intake chamber 136 through opening 140 (e.g., via handle 149, etc.). When slid into the intake chamber 136, the screen 147 is positioned over opening 154 with edge portions 151 of the screen 147 located under mounting clips 153. And, the intake cover 142 can then be positioned over opening 140. To remove the screen 147, the intake cover 142 is first removed from the opening 140, and the edge portions 151 of the screen 147 are slid out of the mounting clips 153 and the screen 147 is then removed from the intake chamber 136 through the opening 140. In other embodiments, screens may be incorporated into intake covers such that they can be installed and/or removed from kitchenware washing assemblies together with the intake covers.

[0078] With additional reference now to FIG. 9, the discharge chamber 138 is positioned along the side wall 116 of the tank 114 in fluidic communication with the pump 132. The discharge chamber 138 is also in fluidic communication with the tank 114 through an opening defined in the side wall of the tank 114. In the illustrated embodiment, the discharge chamber 138 is the only discharge chamber associated with the tank 114. Additional discharge chambers are not located on other walls

(e.g., walls 118, 120, 122, etc.) of the tank 114. Further, the discharge chamber 138 could alternatively be positioned along another of the walls (e.g., walls 118, 120, 122, etc.) of the tank 114, or along a different portion of the side wall 116 than illustrated herein. In other example embodiments, however, washing assemblies may include discharge chambers located on multiple different walls of tanks, multiple discharge chambers located on common walls in tanks, etc.

[0079] A discharge cover 148 (FIG. 6) is positioned over the discharge chamber 138 and is coupled thereto via suitable fasteners (e.g., mechanical fasteners, etc.). The discharge cover 148 includes outlets 150 (e.g., openings, etc.) configured to discharge washing fluid from the discharge chamber 138 (through the discharge cover 148) into the tank 114. The outlets 150 are configured (e.g., sized, shaped, positioned, etc.) to provide a desired discharge volume, velocity, flow rate, and/or flow pattern of washing fluid into the tank 114. This configuration of the outlets 150 can be altered as desired to adjust any one or more of these features. In the illustrated embodiment the outlets 150 are located toward one longitudinal side portion of the discharge cover 148 (e.g., toward the side portion of the discharge cover 148 located toward the front wall 122 of the tank 114, etc.). As such, washing fluid is discharged into the tank 114 adjacent the front wall 122 and circulates generally horizontally in the tank 114 (e.g., generally counterclockwise as viewed in FIG. 5, etc.). In addition, because it is desirable to have the washing fluid directed downward into the tank 114 to avoid splashing fluid out of the tank 114, the discharge chamber 138 (and the discharge cover 148) is located in the illustrated embodiment along the downwardly angled portion of side wall 116. Thus, the washing fluid is also discharged downwardly into the tank 114 and further circulates generally vertically (e.g., generally counterclockwise as viewed in FIG. 4, etc.). In other embodiments, discharge covers can have other configurations of outlets within the scope of the present disclosure (e.g., outlets located toward bottoms of the covers, tops of the covers, differently sized openings across the covers, etc.).

[0080] The intake cover 142 and the discharge cover 148 are both configured to be uncoupled and re-coupled to the tank 114 as desired (e.g., slidably uncoupled and re-coupled, for example, via keyholes and pins, etc.; etc.). Advantageously, this allows the interior of the intake and discharge chambers 136, 138 (and any components therein) to be readily accessed, for example, for cleaning and sanitizing. This also allows the intake and discharge covers 142, 148

themselves, and their inlets 144 and outlets 150, to be more easily serviced, for example, to replace the covers 142, 148, clean out the inlets 144 and outlets 150, and/or clean other portions of the covers 142, 148. In addition, this allows the intake and discharge covers 142, 148 to be interchanged with other intake and discharge covers (*e.g.*, other covers having different opening configurations therein, etc.).

[0081] With continued description of the washing station 108, in the illustrated embodiment a temperature sensor 152 (*e.g.*, a thermocouple, etc.) is located within the intake chamber 136 (FIG. 4), adjacent the opening 154 where the conduit 134a couples the pump 132 to the intake chamber 136 (FIG. 5). The temperature sensor 152 is positioned within the intake chamber 136 (*e.g.*, entirely, etc.) so that the screen 147 can be positioned within the intake chamber 136 and the intake cover 142 can be positioned over the intake chamber 136 without interference from the temperature sensor 152. The temperature sensor 152 is configured to monitor (including measuring) temperature of the washing fluid in the tank 114 (and more particularly in the chamber 136 as the washing fluid is drawn out of the tank 114) to help ensure properly heated washing fluid is used to clean the kitchenware. The temperature sensor 152 can include any suitable sensor capable of monitoring fluid temperature. And, the temperature sensor 152 can be coupled to the intake chamber 136 (within the intake chamber 136) by suitable means (*e.g.*, by mechanical fasteners, by releasable couplings such as described in U.S. 7,578,305 (which is incorporated herein by reference in its entirety), etc.). The temperature sensor 152 may be configured to send and/or receive temperature signals to a control system 180, as desired. In some example embodiments, the temperature sensor 152 may be included as part of a heating unit for controlling temperature of washing fluid in the assembly 100. In some example embodiments, the temperature sensor 152 may be located differently than disclosed herein (*e.g.*, other than within the intake chamber 136, etc.) to monitor temperature of washing fluid in the assembly 100 (*e.g.*, even other than within the tank 114 such as within a flow path of the washing fluid when outside the tank 114, etc.).

[0082] A pump sensor 155 is located adjacent the pump 132 for monitoring at least one or more desired parameters (*e.g.*, voltage usage, current draw, pressure, fluid displacement, etc.) of the pump. In the illustrated embodiment, the pump sensor 155 includes a current sensor configured to monitor current draw of the pump 132. The current draw of the pump 132 can then be used to evaluate

operational performance of the pump 132 such as, for example, fluid flow to and/or through the pump 132 (or restriction thereof), etc. For example, if the monitored current draw of the pump 132 deviates from a specified value, this may suggest that fluid flow to and/or through the pump 132 is being restricted (e.g., by debris, etc.) and the pump 132 needs to be cleaned and/or the assembly 100 needs to be inspected. This will be described in more detail hereinafter.

[0083] Further, a fluid level sensor 194 (e.g., a float, a float switch, etc.) is provided for monitoring fluid level in the assembly 100. In the illustrated embodiment, the fluid level sensor 194 is provided within the intake chamber 136, and is positioned (e.g., entirely, etc.) so that the screen 147 can be positioned within the intake chamber 136 and the intake cover 142 can be positioned over the intake chamber 136 without interference from the fluid level sensor 194. The fluid sensor 194 could be located at other locations in the kitchenware washing assembly 100 as desired. In addition, in other example embodiments, capacitive sensors (e.g., switches, etc.) may be provided to monitor fluid levels in tanks, for example, to determine fluid levels at give times, to determine when fluid levels are low, to determine when tanks are full (e.g., in use with automatic filling operations of tanks, etc.), etc.

[0084] With reference now to FIGS. 1, 2, and 10, the sanitizing unit 104 of the illustrated assembly 100 generally includes a rinsing station 156, a sanitizing station 158, and a drain board 159. The rinsing station 156 is used to rinse washing fluid, wash agent (e.g., soap, etc.), wash chemical, etc. from the cleaned kitchenware received from the washing station 108. The sanitizing station 158 is used to sanitize the rinsed kitchenware as desired. And, the drain board provides a transition surface for the kitchenware after it is rinsed and sanitized. Any suitable fluid can be used to rinse and/or sanitize the cleaned kitchenware (e.g., water, heated water, etc.). In other example embodiments, splash guards may be coupled (e.g., releasably coupled, bolted, snap fit coupled, quick release coupled, etc.) around perimeters of rinsing stations, sanitizing stations, and/or drain boards of kitchenware washing assemblies to, for example, help inhibit fluid spillage from out of the stations, etc. In other example embodiments, kitchenware washing assemblies may include drain boards releasably coupled thereto (e.g., to sanitizing stations, etc.), where the drain boards may also include adjustable legs to help position them as desired relative to the kitchenware washing assemblies.

[0085] The rinsing station 156 includes a sink 160 configured to catch rinsing fluid and any washing fluid, wash agent (*e.g.*, soap, etc.), wash chemical, etc. removed from the cleaned kitchenware (as well as any food items or residue inadvertently removed from the tank 114 of the washing unit 102 with the kitchenware). A drain 162 (and valve 128) is provided in the sink 160 to remove the rinsed fluids, wash agents, chemicals, etc. from the sink 160. And, an overflow 164 is provided to channel rinsed fluids, wash agents, chemicals, etc. to the drain 162 as needed (*e.g.*, upon reaching a certain level in the sink 160, etc.). The drain 162 can be conventionally coupled to plumbing and/or drainage systems to ultimately dispose of the rinsed fluids, wash agents, chemicals, etc.

[0086] The sanitizing station 158 also includes a sink 166. Here, the sink 166 is configured to catch fluid used to sanitize the cleaned and rinsed kitchenware. A drain 168 (and valve 128) is provided in the sink 166 to remove the sanitizing fluid from the sink 166. And, an overflow 170 is provided to channel rinsed fluids, wash agents, chemicals, etc. to the drain 168 as needed (*e.g.*, upon reaching a certain level in the sink 166, etc.). The drain 168 can be conventionally coupled to plumbing and/or drainage systems to ultimately dispose of the sanitizing fluid when needed.

[0087] While not illustrated, the rinsing station 156 and/or the sanitizing station 158 may be equipped with removable perforated covers, screens, etc. to help catch food items, residue, or other items from falling into their sinks. The covers screens, etc. can also provide additional work space over the sinks as needed.

[0088] With reference again to FIG. 1, a skirt 172 is provided generally around the sink 110 of the scraping station 106 and the tank 114 of the washing station 108. And, the support platform 133a supports the skirt 172 (and the sink 110 and the tank 114) above the ground (*e.g.*, at a desired height, etc.). A skirt 174 is also provided generally around the sink 160 of the rinsing station 156 and the sink 166 of the sanitizing station 158. And a support platform 133b is provided to support the skirt 174 (and sinks 160, 166) above the ground (*e.g.*, at a desired height, etc.). The skirt 174 of the sanitizing unit 104 includes a flange 176 configured to couple the skirt 174 to the skirt 172 of the washing unit 102. The flange 176 is configured to fit over (and be fastened to (*e.g.*, via mechanical fasteners, etc.)) a lip 178 of the washing unit skirt 172 to thereby couple the washing unit 102 and the sanitizing unit 104.

[0089] The illustrated assembly 100 also includes the control system 180, which is shown mounted to the washing unit 102 generally under the scraping station 106. The control system 180 is configured to control operation of the pump 132 for circulating washing fluid in the tank 114. In particular, the control system 180 is configured to alter the frequency and/or speed of the pump 132 when desired to speed up, or slow down, or turn off the pump 132. To help accomplish this, the control system 180 can also be configured to monitor temperature of the washing fluid in the tank 114 (via communication with the temperature sensor 152) and monitor performance of the pump 132 (via communication with the pump sensor 155). The control system 180 may include a user interface (*e.g.*, a graphical user interface such as a touchpad, etc.) configured to receive at least one user input related to operation of the assembly 100 (*e.g.*, fluid temperature, pump operation, etc.).

[0090] In the illustrated embodiment, the control system 180 is programmed (*e.g.*, preprogrammed prior to use, programmed via operator inputs at the time of use, etc.) to control operation of the pump 132 as a function of time and/or as a function of temperature and/or as a function of performance and/or as a function of fluid level.

[0091] For example, the control system 180 can operate the pump 132 for a desired period of time (*e.g.*, a preprogrammed period of time, a manually entered period of time, etc.) at a desired frequency (*e.g.*, a preprogrammed frequency, a manually entered frequency, etc.) and/or at a desired speed (*e.g.*, a preprogrammed speed, a manually entered speed, etc.) to thereby provide a desired level of turbulence of washing fluid in the tank 114. Then, after the desired period of time is expired, the control system 180 can change operation of the pump 132 to a different frequency and/or speed to thereby provide a different level of turbulence of the washing fluid in the tank 114. For example, this pump operation can promote a generally high level of turbulence of washing fluid in the tank 114 for cleaning the kitchenware therein for the desired period of time (*e.g.*, in a wash mode, etc.). And when the desired period of time expires, the control system 180 is programmed to cycle the pump 132 to an idle mode having a lower frequency and/or speed. In the idle mode, the pump operation (which can be maintained for any desired length of time) promotes a generally low level of turbulence of the washing fluid in the tank 114 that helps inhibit material removed from the kitchenware from settling back onto

the kitchenware (while the kitchenware remains in the tank 114 prior to removal) and that allows for removal of the cleaned kitchenware from the tank 114 by a user without splashing the user with washing fluid. In addition in the idle mode, the low level of turbulence of the washing fluid in the tank 114 helps inhibit oil slicks from forming at the surface of the washing fluid (*e.g.*, low foam soap may be used for cleaning the kitchenware, and the low turbulence of the washing fluid in the idle mode helps keep grease encapsulated within the soap to inhibit oil slicks from forming, *etc.*) such that cleaned kitchenware can be removed from the tank 114 without moving through an oil slick. With that said, it should be appreciated that a third operating mode can also be included in the assembly which provides a medium level of fluid turbulence in the tank 114, between the high turbulence level and the idle mode level, which can also be selected, for example, to wash delicate kitchenware, plastics, *etc.*

[0092] In addition, the control system 180 can receive temperature signals from the temperature sensor 152 in the intake chamber 136 of the washing unit 102 and use the received signals as another basis for controlling operation of the pump 132. In the illustrated embodiment, if the temperature signal indicates that the temperature of the washing fluid in the intake chamber 136 is below a first specified temperature (*e.g.*, about 95 degrees Fahrenheit, *etc.*) (*e.g.*, a preprogrammed temperature, a manually entered temperature, *etc.*), the control system 180 activates a first signal 182a (*e.g.*, a visual warning alarm, an amber light, *etc.*) indicating that the temperature of the washing fluid is low. If the temperature signal indicates that the temperature of the washing fluid is below a second, lower specified temperature (*e.g.*, about 85 degrees Fahrenheit, *etc.*) (*e.g.*, a preprogrammed temperature, a manually entered temperature, *etc.*), the control system 180 activates a second signal 182b (*e.g.*, a visual warning alarm, a red light, *etc.*) indicating that the temperature of the washing fluid is below a minimum acceptable temperature. Here, the control system 180 then also deactivates the pump 132 and prevents further operation of the washing assembly 100 until the temperature signal indicates that the temperature of the washing fluid is acceptable.

[0093] Further, the control system 180 can receive signals from the pump sensor 155 and use the received signals as still another basis for controlling operation of the pump 132. In the illustrated embodiment, for example, if the signal indicates that the monitored parameter (*e.g.*, the current draw of the pump 132, *etc.*)

is below a specified value (*e.g.*, a preprogrammed value, a manually entered value, etc.) (*e.g.*, the monitored current draw is below about ten amps as measured when the pump 132 is operating at a higher frequency wash mode, etc.), the control system 180 may activate a signal 187 (*e.g.*, a visual warning alarm, an amber light, etc.) indicating that performance of the pump 132 is low (*e.g.*, fluid flow to and/or through the pump 132 is restricted, etc.), and that the pump 132 needs service and/or the kitchenware washing assembly 100 needs inspection. Here, the control system 180 then also deactivates the pump 132 and prevents further operation of the washing assembly 100 until the pump 132 is serviced and/or the assembly 100 is inspected (*e.g.*, until the measured parameter of the pump 132 is again acceptable, etc.). Alternatively, in some example embodiments, if pump signals indicate that monitored parameters (*e.g.*, current draws, etc.) are below first specified values (*e.g.*, monitored current draws are below about ten amps as measured when the pumps are operating at higher frequency wash modes, etc.), control systems may activate signals indicating that performance of the pumps is low. Then, if the pump signals indicate that the monitored parameters (*e.g.*, the current draws, etc.) are below second specified values (*e.g.*, monitored current draws of about seven amps as measured when the pumps are operating at higher frequency wash modes, etc.), the control systems activate second signals and also deactivate the pumps and prevent further operations.

[0094] The control system 180 can also receive signals from the fluid level sensor 194 and use the received signals as still another basis for controlling operation of the pump 132. In the illustrated embodiment, for example, if the signal indicates that the fluid level in the assembly 100 (*e.g.*, in the tank 114, in the intake chamber 136, etc.) is below a first specified level (*e.g.*, a preprogrammed value, a manually entered value, etc.), the control system 180 deactivates the pump 132 and prevents further operation of the washing assembly 100 (*e.g.*, dry operation of the pump 132, etc.) until fluid is added. In addition, in some example embodiments, if fluid temperature signal indicate that fluid levels are below first specified levels, control system may activate first signals indicating that the fluid levels are low and that fluid should be added. Then, if the signals indicate that the fluid levels are below second specified values, the control systems activate second signals indicating that the fluid levels are unacceptable, and also deactivate the pumps.

[0095] In the illustrated embodiment, an override 196 (e.g., a unique keyed lock, a digital lock, a pin code, etc.) is included with the control system 180 to manually restore operation to the assembly (e.g., to allow for reactivation of the pump 132, etc.) if operation has been terminated, for example, due to low fluid level, low fluid temperature, poor pump performance, etc. but not rectified (to thereby allow continued operation if needed). The override 196 is typically open (e.g., an override switch is typically open, etc.) during normal operation of the control system 180. However, the override 196 is configured to close if, as noted above, operation has been terminated due to low fluid level, low temperature, poor pump performance, etc. (and the low fluid level or low temperature or poor pump performance is not rectified).

[0096] It should be appreciated that the control system 180 can be used to generate any desired signal to indicate, for example, low temperature of the washing fluid, low or unacceptable performance of the pump 132, low fluid levels, etc. For example, the control system 180 can be used to generate the signals just described (e.g., the visual signals, etc.). In addition (or alternatively), the control system 180 could be used to generate additional signals associated with various different operations of the washing assembly 100 and/or statuses of components thereof. Further, any of the generated signals may be transmitted to desired locals remotely located from the assembly 100. Signals may include (but are not limited to) visual signals, audible signals, sensory signals, data based signals, alarm-type signals, other output-type signals, combinations of any desired signals, groups of any desired signals, etc. In one example embodiment, a kitchenware washing assembly may include a control system having a touch screen, where all features of the system are controlled through the touch screen (e.g., via one or more microprocessors, etc.). Here, backlighting of the touch screen may be configured to change to a desired color (e.g., red, etc.) and flash as a signal to indicate, for example, low temperature of washing fluid in the assembly, low or unacceptable operation of the pump 132, low fluid level, etc.

[0097] The control system 180 can also be configured to receive one or more inputs from other sensors (e.g., other temperature sensors, other fluid level sensors, pH sensors, other pump monitoring sensors, etc.) and/or other components of the assembly 100 located in and/or about the kitchenware washing assembly 100. The control system 180 can also be configured to receive one or more inputs from

external sources for use in determining washing operations. And, the control system 180 can be configured to activate desired signals (as just described, for example, alarms, etc.) in response to any one or more of such inputs. In addition, the control system 180 can be configured to control operations of the assembly 100 as a function of computer executable instructions, user inputs, and/or data inputs.

[0098] With reference now to FIG. 11, an example wiring configuration for use with the (or as the) control system 180 of the kitchenware washing assembly 100 is schematically illustrated. The configuration generally includes a power switch 186 (broadly, a toggle) configured to turn the control system 180 on and off and to select desired turbulence levels in the tank, and a momentary switch 188 (broadly, an actuator) configured to cycle operation of the pump 132 between an idle speed operating mode, a low speed operating mode, and a higher speed operating mode. A timer 190 is configured to control a duration of operation of the pump 132 at one or more of the idle speed operating mode, the low speed operating mode, and the higher speed operating mode (*e.g.*, a duration of 10 minutes, greater than 10 minutes, less than 10 minutes, etc.; a duration based on real time such as, for example, specifying operation at one or more operating modes based on real time values; etc.). The configuration also generally includes a power coupling 195 and a wired controller 198 for use in operation.

[0099] Various relays 192 are provided to control different operations of the pump 132 including, for example, a speed relay 792b for use in controlling operation of the pump 132 at the idle, low, and/or higher speed operating modes and for use in controlling changes of the pump motor speeds, a temperature fault relay 192c for use in terminating operation of the pump 132 if a temperature of the washing fluid falls below a specified level, a float relay 192f for use in deactivating operation of the pump 132 if the fluid level is below a specific fluid level, etc. Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature), and are self-explanatory in nature such that they are not further discussed herein.

[00100] An example operation of the illustrated assembly 100 will be described next. It should be appreciated that various features associated with such example operation can include manual features and/or automated features as desired. In addition, programmable controllers (*e.g.*, programmable logic controllers, microprocessors, etc.) may be used within the scope of the present disclosure.

[00101] The drain 126 of the washing station tank 114 is initially closed (via the valve 128). And, the tank 114 is filled with heated washing fluid (e.g., water at about 120 degrees Fahrenheit with wash agent added thereto, etc.) to a desired operating level (e.g., to a desired level indicated on a wall of the tank 114, etc.). The control system 180 is then activated. In particular, the power switch 186 is activated to engage initial operation of the pump 132 in either the idle operating mode, or one of the desired higher speed operating modes. The pump 132 operates to draw, remove, etc. washing fluid from out of the intake chamber 136 (from the tank 114 through the inlets 144 of the intake chamber 136) to the pump 132 (via conduit 134a) (FIG. 5). The pump 132 then directs the washing fluid to the discharge chamber 138 (via conduit 134b) for discharge back into the tank 114 through the discharge cover 148 (FIG. 5). The discharge cover 148 is configured to build up washing fluid in the discharge chamber 138 (behind the discharge cover 148) prior to discharge back into the tank 114. Thus, the washing fluid is discharged into the tank 114 through the outlets 150 of the discharge cover 148 under pressure. This pressurized discharge helps provide the turbulence in the tank 114 for agitating, mixing, etc. the washing fluid. In the idle operating mode, the pump 132 operates at a generally low frequency and/or speed and produces a generally low level of turbulence of the washing fluid in the tank 114. During this operation, the sensors 152, 155, 194, etc. communicate with the control system 180. And, operation of the pump 132 continues as desired until, for example, the power switch 186 is deactivated, a temperature of the washing fluid in the tank falls below a specified temperature, the fluid level sensor 194 indicates a fluid level is below a specified level, the pump sensor 155 indicates low or unacceptable performance of the pump 132, a specified time elapses, etc.

[00102] Once the control system 180 is activated and the pump 132 is operating, for example, in the idle mode, kitchenware initially rinsed over the sink 110 of the scraping station 106 can be placed in the agitated washing fluid in the tank 114 for cleaning. When the desired amount of kitchenware is in the tank 114, the control system 180 can be used to increase the operational speed of the pump 132 to thereby increase the level of turbulence of the washing fluid in the tank 114 (e.g., to clean the kitchenware in the tank 114, etc.). This is done by activating the momentary switch 188 (e.g., manually, automatically, etc.) which cycles operation of the pump 132 from the idle speed operating mode to a desired one of the generally higher speed operating modes (e.g., a higher operating mode selected using the

power switch 186 when initiating operation of the assembly 100, etc.). At this higher speed operating mode, the pump 132 provides an increased level of turbulence of the washing fluid in the tank (e.g., for washing kitchenware, etc.). This increased level of turbulence is maintained in the tank 114 by the pump 132 for a desired period of time, after which the control system 180 decreases the operational speed of the pump 132 thus reducing the level of turbulence of the washing fluid in the tank 114. For example, at about the same time the pump 132 is cycled to the generally higher operating speed mode, the timer 190 also activates and begins counting down a specified period of time for which the pump 132 will operate at the higher speed operating mode (or, it may alternatively specify a real time value at which the pump 132 will cycle back to the lower operating speed mode). Following completion of the specified time, the control system 180 cycles operation of the pump 132 back to a lower speed operating mode (e.g., the idle speed operating mode, etc.) as desired. If operation is cycled to the idle speed operating mode, the kitchenware can then be removed from the tank 114 and processed as desired (e.g., rinsed at the rinsing station 156, sanitized at the sanitizing station 158, dried, combinations thereof, etc.).

[00103] When desired to again increase the level of turbulence of the washing fluid in the tank, the momentary switch 188 can again be activated to cycle operation of the pump 132 back to a generally higher speed operating mode (thereby increasing the level of washing fluid turbulence in the tank). This again activates the timer 190 to begin counting down the specified period of time at which the pump 132 will operate at the higher speed operating mode. And, following completion of the specified time, the control system 180 cycles operation of the pump 132 back to a lower speed operating mode.

[00104] As the control system 180 is active (and as the pump 132 is operating), the control system 180 receives temperature readings from the thermocouple 152, pump readings from the pump sensor 155, and fluid level readings from the fluid level sensor 194.

[00105] For example, if a temperature reading received from the thermocouple 152 is below a first specified temperature, the control system 180 activates the first signal 182a indicating that the temperature of the washing fluid is low. If a temperature reading received from the thermocouple 152 is below a second, lower specified temperature, the control system 180 activates the second signal

182b indicating that the temperature of the washing fluid is below a minimum acceptable temperature. Here, the control system 180 also activates the low temperature fault relay 192a and deactivates operation of the pump 132. The control system 180 then prevents further operation of the pump 132 until the temperature signal indicates that the temperature of the washing fluid is acceptable or until the override 196 is activated.

[00106] Similarly, if a pump status reading received from the pump sensor 155 is below a specified value, the control system 180 activates the signal 187 indicating that performance of the pump 132 is low and that the pump 132 needs service and/or the kitchenware washing assembly needs inspection (e.g., for blockage, etc.). Here, the control system 180 also deactivates the pump 132 (e.g., via a pump protection relay, etc.) and prevents further operation of the washing assembly 100 until the pump 132 is serviced and/or the assembly 100 is inspected, or until the override 196 is activated.

[00107] Further, if a fluid level reading received from the fluid level sensor 194 is below a specified fluid level, the control system 180 activates a signal indicating that the fluid level is low and deactivates operation of the pump 132. Here, the control system 180 may also activate the float relay 192f and deactivate operation of the pump 132. The control system 180 then prevents further operation of the pump 132 until the fluid level signal (e.g., via the fluid level sensor 794, etc.) indicates that the fluid level of the washing fluid in the tank is acceptable or until the override 196 is activated.

[00108] Alternatively (or in addition), the timer 190 may be activated when the pump 132 begins operating at a lower speed operating mode. And, after a specified period of time, the control system 180 may cycle operation of the pump 132 from the lower speed operating mode to a higher speed operating mode. The timer 190 may then again be activated and begin counting down a specified period of time at which the pump 132 will operate at the higher speed operating mode. Following completion of the specified time, the control system 180 may then cycle operation of the pump 132 back to the lower speed operating mode. Or, alternatively (or in addition), the timer 190 may be activated when the pump 132 begins operating at the lower speed operating mode. And, after a specified period of time, the control system 180 may turn off the pump 132. The timer 190 may then again be activated and

begin counting down a specified period of time at which the pump 132 will again then activate.

[00109] It should be appreciated that the control system 180 (including the example wiring configuration) could be used in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly as desired.

[00110] While not shown, a spraying fixture could be mounted to a rearward wall of the washing unit 102 and/or the sanitizing unit 104, for example, generally above (or between, etc.) the scraping station 106 and the washing station 108 and/or generally above (or between) the rinsing station 156 and the sanitizing station 158. As such, the spraying fixtures could operate to provide fluid (*e.g.*, water, etc.) as desired to the scraping station 106, the washing station 108, the rinsing station 156, and/or the sanitizing station 158 for use in their various operations (*e.g.*, rinsing kitchenware, cleaning kitchenware, sanitizing kitchenware, rinsing surfaces of the sinks and tank 114, etc.). A discharge faucet could be mounted to the rearward wall of both the washing unit 102 and the sanitizing unit 104 (*e.g.*, in connection with the spraying fixtures, etc.). For example, the discharge faucets could be mounted generally above the washing station 108 for use in providing fluid (*e.g.*, water, etc.) to the tank 114 for filling the tank 114, and generally above the rinsing station 156 for use in rinsing the cleaned kitchenware. The discharge faucets may be formed as single units with the spraying fixtures, or they may be separate units. When included, at least one of the discharge faucets could be used to fill the tank 114 with heated washing fluid, for example, in preparation for washing kitchenware, for adding additional heated washing fluid to the tank 114 as needed, etc.

[00111] Further, filter systems could also be included in the assembly 100 with any one or more of the scraping station 106, the washing station 108, the rinsing station 156, and the sanitizing station 158 (*e.g.*, in connection with the drains thereof, etc.). The filter systems could, for example, assist in reducing presence of food particles, debris, other contaminants, etc. within the sinks and/or the tank 114, and/or within waste fluid from the assembly 100. Any suitable type of filter system may be used within the scope of the present disclosure.

[00112] A wide range of materials can be used for the sinks 110, 160, 166, the tank 114, and the skirts 172, 174 of the illustrated kitchenware washing assembly 100. For example, the sinks 110, 160, 166 and/or the tank 114 and/or the skirts 172,

174 may be constructed from stainless steel, thus providing a sturdy, long-lasting structure, or other suitable material. The tank may be constructed by suitable operations including, for example, operations described in U.S. 7,578,305 (which is incorporated herein by reference in its entirety).

[00113] In addition, any suitable pump can be used in connection with operation of the washing unit 102 of the illustrated kitchenware washing assembly 100. For example, pumps operable at about 100 gallons per minute, more than 100 gallons per minute, less than 100 gallons per minute, etc. can be used. In addition, single-phase pumps, three-phase pumps, etc. may be used. Further, multiple pumps (e.g., two or more pumps, etc.) may be used together in combination in the kitchenware washing assembly 100 as desired.

[00114] In some example embodiments, control systems may be programmed to operate pumps for desired periods of time (e.g., about three minutes, about ten minutes, about thirty minutes, etc.) at desired frequencies and/or at desired speeds. In some example embodiments, desired frequencies of the pumps may range from about 30 hertz (e.g., in idle modes, etc.) to about 70 hertz (in wash modes, etc.). And, in some example embodiments, the pumps may operate at about four amps at lower frequencies and/or speeds (e.g., in idle modes, etc.) and at about fifteen amps at higher frequencies and/or speeds (e.g., in wash modes, etc.). It should be appreciated that the numeric values included herein are exemplary in nature and do not limit the scope of the present disclosure.

[00115] FIG. 12 is a schematic illustrating a wiring configuration according to one example embodiment of the present disclosure for use with or as a control system 280 of a kitchenware washing assembly. The control system 280 (including the example wiring configuration) could be used in connection with the assembly previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00116] The illustrated configuration generally includes a toggle 286 (e.g., an on/off switch, a power switch, a relay, a selector, etc.) configured to automatically (or alternatively or in addition allow a user to manually) turn the control system 280 on and off, a push actuator 288 (e.g., a momentary switch, etc.) configured to cycle operation of a pump 232 between at least one low speed operating mode (e.g., an idle operating mode, etc.) and at least one higher speed operating mode (e.g., a

wash mode, etc.), and a timer 290 configured to control (*e.g.*, automatically, etc.) a duration of operation of the pump 232 at a low speed operating mode and/or at a higher speed operating mode. The configuration also generally includes a power coupling 295 and a wired controller 298 for use in operation.

[00117] As further shown in FIG. 12, a thermocouple 252 is provided in the illustrated configuration for monitoring temperature of fluid in an assembly in which the control system 280 is installed. And, various relays 292 are provided to control different operations of the pump 232 (*e.g.*, a hold relay 292a for holding operation of the pump 232 at a low speed and/or at a higher speed for a desired period of time as determined by the timer 290, a speed relay 292b for use in controlling changes of the pump motor speeds, a low temperature protection relay 292c for use in terminating operation of the pump 232 if a temperature of washing fluid falls below a specified level, etc.). Further, visual indicators 282a, 282b are provided to indicate different states (*e.g.*, warning states, etc.) in the assembly (*e.g.*, low temperature warning states of the washing fluid, etc.). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 12), and are self-explanatory in nature such that they are not further discussed herein.

[00118] To activate the control system 280, the toggle 286 is moved (*e.g.*, manually by the operator, automatically by the control system 280, etc.) from the “off” position to the “on” position. This initiates operation of the pump 232 in a low speed operating mode (*e.g.*, the idle mode, etc.) which provides a generally low level of washing fluid turbulence in a tank of the assembly. This low speed operation of the pump 232 continues, as desired, until the toggle 286 is activated back to the “off” position (*e.g.*, manually by the operator, automatically by the control system 280, etc.) or a temperature of the washing fluid in the tank falls below a specified temperature.

[00119] To increase the level of turbulence of the washing fluid in the tank (*e.g.*, to clean kitchenware in the tank, etc.), the push actuator 288 is depressed (*e.g.*, manually by the operator, automatically by the control system 280, etc.) which cycles operation of the pump 232 from the low speed operating mode to a higher speed operating mode. At this higher speed operating mode, the pump 232 provides an increased level of turbulence of the washing fluid in the tank. At about the same time, the timer 290 also activates (*e.g.*, automatically, etc.) and begins counting

down a specified period of time at which the pump 232 will operate at the higher speed operating mode. Following completion of the specified time, the control system 280 cycles operation of the pump 232 back to a low speed operating mode. When desired to again increase the level of turbulence of the washing fluid in the tank, the push actuator 288 is depressed (*e.g.*, manually by the operator, automatically by the control system 280, etc.) to cycle operation of the pump 232 back to a higher speed operating mode (thereby increasing the level of washing fluid turbulence in the tank). This again activates the timer 290 to begin counting down the specified period of time at which the pump 232 will operate at the higher speed operating mode. And, following completion of the specified time, the control system 280 cycles operation of the pump 232 back to a low speed operating mode.

[00120] As the control system 280 is active (and as the pump 232 is operating), the control system 280 receives temperature readings from the thermocouple 252. If a temperature reading received from the thermocouple 252 is below a first specified temperature, the control system 280 activates an amber visual signal 282a indicating that the temperature of the washing fluid is low. If a temperature reading received from the thermocouple 252 is below a second, lower specified temperature, the control system 280 activates a red visual signal 282b indicating that the temperature of the washing fluid is below a minimum acceptable temperature. Here, the control system 280 also activates the low temperature protection relay 292c and immediately (*e.g.*, automatically, etc.) deactivates the operation of the pump 232. The control system 280 then prevents further operation of the pump 232 until the temperature signal indicates that the temperature of the washing fluid is acceptable.

[00121] FIG. 13 is a schematic illustrating a wiring configuration according to one example embodiment of the present disclosure for use with or as a control system 380 of a kitchenware washing assembly. The control system 380 (including the example wiring configuration) could be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00122] The illustrated configuration generally includes a toggle 386 configured to turn the control system 380 on and off and cycle a pump 332 between an "off" position, a "low" operating condition, and a "high" operating condition. The

configuration also generally includes a power coupling 395 and a wired controller 398 for use in operation. A thermocouple 352 is provided for monitoring temperature of fluid in an assembly in which the control system 380 is installed. And, various relays 392 are provided to control different operations of the pump 332 (*e.g.*, a low speed relay 392b for controlling operation of the pump 332 at the low operating condition, a high speed relay 392d for controlling operation of the pump 332 at the high operating condition, a low temperature protection relay 392c for use in terminating operation of the pump 332 if a temperature of washing fluid falls below a specified level, etc.). Further, visual indicators 382a, 382b are provided to indicate different states (*e.g.*, warning states, etc.) in the assembly (*e.g.*, low temperature warning states of the washing fluid, etc.). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 13), and are self-explanatory in nature such that they are not further discussed herein.

[00123] To activate the control system 380, the toggle 386 is moved from the “off” position to the “low” position. This initiates operation of the pump 332 at a generally low operating speed (*e.g.*, in an idle mode, etc.) which provides a generally low level of washing fluid turbulence in a tank of the assembly. This low speed operation of the pump 332 continues, as desired, until the toggle 386 is activated either back to the “off” position or to the “high” position, or until a temperature of the washing fluid in the tank falls below a specified temperature.

[00124] To increase the level of turbulence of the washing fluid in the tank (*e.g.*, to clean kitchenware in the tank, etc.), the toggle 386 is activated to the “high” position which cycles operation of the pump 332 from the generally low operating speed to a higher operating speed. At this higher operating speed, the pump 332 provides an increased level of turbulence of the washing fluid in the tank. This higher speed operation of the pump 332 continues, as desired, until the toggle 386 is activated either back to the “low” position or to the “off” position, or until a temperature of the washing fluid in the tank falls below a specified temperature. Thus, the toggle 386 can be activated back and forth between the “off” position, the “low” position, and the “high” position as desired (*e.g.*, to provided desired levels of turbulence of the washing fluid in the tank, etc.).

[00125] As the control system 380 is active (and as the pump 332 is operating), the control system 380 receives temperature readings from the

thermocouple 352. If a temperature reading received from the thermocouple 352 is below a first specified temperature, the control system 380 activates an amber visual signal 382a indicating that the temperature of the washing fluid is low. If a temperature reading received from the thermocouple 352 is below a second, lower specified temperature, the control system 380 activates a red visual signal 382b indicating that the temperature of the washing fluid is below a minimum acceptable temperature. Here, the control system 380 also activates the low temperature protection relay 392c and immediately deactivates operation of the pump 332. The control system 380 then prevents further operation of the pump 332 until the temperature signal indicates that the temperature of the washing fluid is acceptable.

[00126] FIG. 14 is a schematic illustrating a wiring configuration according to another example embodiment of the present disclosure for use with or as a control system 480 of a kitchenware washing assembly. The control system 480 (including the example wiring configuration) could be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00127] The illustrated configuration generally includes a toggle 486 configured to turn the control system 480 on and off, a push actuator 488 configured to cycle operation of a pump 432 (*e.g.*, a single phase pump, a three-phase pump, etc.) between at least one low speed operating mode (*e.g.*, an idle operating mode, etc.) and at least one higher speed operating mode, and a timer 490 configured to control a duration of operation of the pump 432 at the higher speed operating mode. The configuration also generally includes a power coupling 495 and a wired controller 498 for use in operation.

[00128] A thermocouple 452 is provided for monitoring temperature of fluid in an assembly in which the control system 480 is installed. A fluid level sensor 494 (*e.g.*, a float, a float switch, etc.) is provided for monitoring fluid level in the assembly. And, various relays 492 are provided to control different operations of the pump 432 (*e.g.*, a hold relay 492a for holding operation of the pump 432 at a higher speed for a desired period of time as determined by the timer 490, a speed relay 492b for use in controlling changes of the pump motor speeds, a low temperature protection relay 492c for use in terminating operation of the pump 432 if a temperature of washing fluid falls below a specified level, etc.). Further, visual indicators 482a-d as well as an

audible indicator 482e are provided to indicate different operating states in the assembly (e.g., a system “off” condition, a system “on” condition, a low temperature warning state of the washing fluid, a critical low temperature warning state of the washing fluid, etc.). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 14), and are self-explanatory in nature such that they are not further discussed herein.

[00129] In addition in this embodiment, an override 496 (e.g., a unique keyed lock, a digital lock, a pin-code lock, etc.) is included to manually restore operation to the assembly (e.g., to allow for reactivation of the pump 432, etc.) if operation has been terminated due to low fluid level or low temperature (and the low fluid level or low temperature is not rectified). The override 496 is typically open (e.g., an override switch is typically open, etc.) during normal operation of the control system 480. However, the override 496 is configured to close if, as noted above, operation has been terminated due to low fluid level or low temperature (and the low fluid level or low temperature is not rectified).

[00130] Operation of the control system 480 of this embodiment (including the example wiring configuration) to control operation of a kitchenware washing assembly in which the control system 480 is installed is substantially similar to the operation described for the control system 280 previously described and illustrated in FIG. 12. In this embodiment, however, the visual indicators 482c and 482d for the “off” and “on” positions of the toggle 486 are provided, and operation of the assembly can be stopped, further, if the fluid level sensor 494 indicates a fluid level in the tank is below a specified level. For example, if a fluid level reading received from the fluid level sensor 494 is below a specified fluid level, the control system 480 activates a signal indicating that the fluid level is low and deactivates operation of the pump 432. The control system 480 then prevents further operation of the pump 432 until the fluid level sensor 494 indicates that the level of the washing fluid in the tank is acceptable.

[00131] FIG. 15 is a schematic illustrating a wiring configuration according to one example embodiment of the present disclosure for use with or as a control system 580 of a kitchenware washing assembly. The control system 580 (including the example wiring configuration) could be used in connection with the assembly previously described and illustrated in FIGS. 1-11, or in connection with any other

example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00132] The illustrated configuration generally includes a toggle 586 configured to turn the control system 580 on and off, a push actuator 588 configured to cycle operation between a pair of pumps 532a, 532b (*e.g.*, three-phase, single speed pumps, etc.), and a timer 590 configured to control a duration of operation of the pumps 532a, 532b. For example, the push actuator 588 can cycle operation between a first pump 532a operable at one or more low speed operating modes (*e.g.*, an idle operating mode, etc.) and a second pump 532b operable at one or more higher speed operating modes. And, the timer 590 can control a duration of operation of the second pump 532b at a higher speed operating mode and/or a duration of operation of the first pump 532a at a low speed operating mode. The configuration also generally includes a power coupling 595 and a wired controller 598 for use in operation.

[00133] A thermocouple 552 is provided for monitoring temperature of fluid in an assembly in which the control system 580 is installed. A fluid level sensor 594 is provided for monitoring fluid level in the assembly. And, various relays 592 and controllers 598 are provided to control different operations of the pumps 532a, 532b (*e.g.*, a hold relay 592a for holding operation of the second pump 532b at a higher speed for a desired period of time as determined by the timer 590, a low temperature protection relay 592c for use in terminating operation of the pumps 532a, 532b if a temperature of washing fluid falls below a specified level, a pair of motor controls 598a, 598b for selectively controlling operation (and possibly switching between operation) of the first and second pumps 532a, 532b, etc.). Further, visual indicators 582a-d as well as an audible indicator 582e are provided to indicate different operating states in the assembly (*e.g.*, a system “off” condition, a system “on” condition, a low temperature warning state of the washing fluid, a critical low temperature warning state of the washing fluid, etc.). And, an override 592 (*e.g.*, a unique keyed lock, etc.) is included to manually restore operation to the assembly if operation has been terminated due to low temperature and/or low fluid level, but not rectified. Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 15), and are self-explanatory in nature such that they are not further discussed herein.

[00134] To activate the control system 580, the toggle 586 is moved from the “off” position to the “on” position (changing the “off” visual indicator 582c to the “on” visual indicator 582d). This initiates operation of the first pump 532a in a low speed operating mode (*e.g.*, the idle mode, etc.) which provides a generally low level of washing fluid turbulence in a tank of the assembly. This low speed operation of the first pump 532a continues, as desired, until either the toggle 586 is activated back to the “off” position or a temperature of the washing fluid in the tank falls below a specified temperature or the fluid level sensor 594 indicates a fluid level in the tank is below a specified level.

[00135] To increase the level of turbulence of the washing fluid in the tank (*e.g.*, to clean kitchenware in the tank, etc.), the push actuator 588 is depressed which cycles operation to the second pump 532b at a higher speed operating mode. At this higher speed operating mode, the second pump 532b provides an increased level of turbulence of the washing fluid in the tank. At about the same time, the timer 590 also activates and begins counting down a specified period of time for which the second pump 532b will operate at the higher speed operating mode. If a temperature of the washing fluid in the tank falls below a specified temperature or the fluid level sensor 594 indicates a fluid level in the tank is below a specified level, the control system 580 will activate the appropriate signals (including terminating operation of the second pump 532b if needed). Following completion of the specified time, the control system 580 cycles operation back to only the first pump 532a at the low speed operating mode (which provides a generally low level of washing fluid turbulence in a tank of the assembly). When desired to again increase the level of turbulence of the washing fluid in the tank, the push actuator 588 is depressed to cycle operation to the second pump 532b again at the higher speed operating mode (thereby increasing the level of washing fluid turbulence in the tank). This again activates the timer 590 to begin counting down the specified period of time at which the second pump 532b will operate at the higher speed operating mode. And, following completion of the specified time, the control system 580 cycles operation back to the first pump 532a only.

[00136] As the control system 580 is active (and as the first and/or second pumps 532a, 532b are operating), the control system 580 receives temperature readings from the thermocouple 552 and fluid level readings from the fluid level sensor 594. If a temperature reading received from the thermocouple 552 is below a

first specified temperature, the control system 580 activates an amber visual signal 582a indicating that the temperature of the washing fluid is low. If a temperature reading received from the thermocouple 552 is below a second, lower specified temperature, the control system 580 activates both a red visual signal 582b and an audible signal 582e indicating that the temperature of the washing fluid is below a minimum acceptable temperature. Here, the control system 580 also activates the low temperature protection relay 592c and deactivates operation of the pumps 532a, 532b. The control system 580 then prevents further operation until the temperature signal indicates that the temperature of the washing fluid is acceptable or until the override 596 is activated. Similarly, if a fluid level reading received from the fluid level sensor 594 is below a specified fluid level, the control system 580 activates a signal indicating that the fluid level is low and similarly deactivates operation of the pumps 532a, 532b. The control system 580 then prevents further operation of the pump until the fluid level sensor 594 indicates that the level of the washing fluid in the tank is acceptable or until the override 596 is activated.

[00137] FIG. 16 is a schematic illustrating a wiring configuration according to another example embodiment of the present disclosure for use with or as a control system 680 of a kitchenware washing assembly. The control system 680 (including the example wiring configuration) could be used in connection with the assembly previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00138] The control system 680 is similar to the control system 480 shown in FIG. 14. For example, the illustrated configuration in FIG. 16 generally includes a toggle 686 configured to turn the control system 680 on and off, a push actuator 688 configured to cycle operation of a pump 632 (*e.g.*, a single phase pump, a three-phase pump, etc.) between at least one low speed operating mode (*e.g.*, an idle operating mode, etc.) and at least one higher speed operating mode, and a timer 690 configured to control a duration of operation of the pump 632 at the higher speed operating mode. The configuration also generally includes a power coupling 695 and a wired controller 698 for use in operation.

[00139] A thermocouple 652 is provided for monitoring temperature of fluid in an assembly in which the control system 680 is installed. A fluid level sensor 694 (*e.g.*, a float switch, etc.) is provided for monitoring fluid level in the assembly. And,

various relays 692 are provided to control different operations of the pump 632 (*e.g.*, a hold relay 692a for holding operation of the pump 632 at a higher speed for a desired period of time as determined by the timer 690, a speed relay 692b for use in controlling changes of the pump motor speeds, a low temperature protection relay 692c for use in terminating operation of the pump 632 if a temperature of washing fluid falls below a specified level, etc.). Further, visual indicators 682a-d as well as an audible indicator 682e are provided to indicate different operating states in the assembly (*e.g.*, a system “off” condition, a system “on” condition, a low temperature warning state of the washing fluid, a critical low temperature warning state of the washing fluid, etc.). And, an override 696 (*e.g.*, a unique keyed lock, a digital lock, etc.) is included to manually restore operation to the assembly (*e.g.*, to allow for reactivation of the pump 632, etc.) if operation has been terminated due to low fluid level or low temperature (and the low fluid level or low temperature is not rectified). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 16), and are self-explanatory in nature such that they are not further discussed herein.

[00140] In this embodiment, the illustrated configuration further includes a load relay 692e coupled to various components of the control system 680. The load relay 692e is configured to accommodate higher electrical loads than other components included in this embodiment (*e.g.*, relay 692a, relay 692b, relay 692c, fluid level sensor 694, etc.). As such, the other components included in this embodiment can have lower ratings (*e.g.*, can be configured to accommodate lower electrical loads, etc.) than corresponding components of the control system 480 illustrated in FIG. 14. Such a configuration can provide cost savings in constructing the control system 680 while providing comparable operation to the control system 480 illustrated in FIG. 14.

[00141] With that said, general operation of the control system 680 of this embodiment (including the example wiring configuration) to control operation of a kitchenware washing assembly in which the control system 680 is installed is substantially similar to the operation described for the control system 480 previously described and illustrated in FIG. 14 (and thus will not be further described).

[00142] FIG. 17 is a schematic illustrating a wiring configuration according to still another example embodiment of the present disclosure for use with or as a control system 780 of a kitchenware washing assembly 700. With that said, it should

be appreciated that the control system 780 (including the example wiring configuration) could also be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00143] The illustrated configuration in FIG. 17 generally includes a power switch 786 (broadly, a toggle) configured to turn the control system 780 on and off and to select a desired operating speed of pump 732, a momentary switch 788 (broadly, an actuator) configured to cycle operation of the pump 732 (*e.g.*, a single phase pump, a three-phase pump, etc.) between a low speed operating mode (*e.g.*, an idle operating mode, etc.) and a selected higher speed operating mode, and a timer 790 configured to control a duration of operation of the pump 732 at the low speed operating mode and/or at the higher speed operating mode (*e.g.*, a duration of 10 minutes, greater than 10 minutes, less than 10 minutes, etc.). The configuration also generally includes a power coupling 795 and a wired controller 798 for use in operation.

[00144] A thermocouple 752 is provided for monitoring temperature of fluid in an assembly 700 to which the control system 780 is coupled. A fluid level sensor 794 (*e.g.*, a float switch, etc.) is provided for monitoring fluid level in the assembly. And, various relays 792 are provided to control different operations of the pump 732 (*e.g.*, a temperature fault relay 792c for use in terminating operation of the pump 732 if a temperature of washing fluid falls below a specified level, a speed relay 792b for use in controlling operation of the pump 732 at the low and higher speed operating modes and for use in controlling changes of the pump motor speeds, a float relay 792f for use in deactivating operation of the pump 732 if the fluid level is below a specific fluid level, etc.). Further, visual indicators 782a, 782b are provided to indicate that the temperature of the washing fluid is low or to indicate that the temperature of the washing fluid is below a minimum acceptable temperature, respectively. And, an override 796 (*e.g.*, a unique keyed lock, a digital lock, etc.) is included to manually restore operation to the assembly (*e.g.*, to allow for reactivation of the pump 732, etc.) if operation has been terminated due to low fluid level or low temperature but not rectified (and the low fluid level or low temperature is not rectified). Various additional features are also included in the illustrated configuration

(as indicated by the additional wiring symbols/nomenclature in FIG. 17), and are self-explanatory in nature such that they are not further discussed herein.

[00145] To activate the control system 780, a power switch 786 is activated. This initiates operation of the pump 732 in the low speed operating mode (*e.g.*, the idle mode, etc.) which provides a generally low level of washing fluid turbulence in a tank of the assembly 700. This low speed operation of the pump 732 continues, as desired, until either the power switch 786 is deactivated or a temperature of the washing fluid in the tank falls below a minimum acceptable temperature or the fluid level sensor 794 indicates a fluid level in the tank is below a specified level.

[00146] To increase the level of turbulence of the washing fluid in the tank (*e.g.*, to clean kitchenware in the tank, etc.), the momentary switch 788 is activated (*e.g.*, manually, automatically, etc.) which cycles operation of the pump 732 from the low speed operating mode to the higher speed operating mode. At this higher speed operating mode, the pump 732 provides an increased level of turbulence of the washing fluid in the tank (*e.g.*, for washing kitchenware, etc.). At about the same time, the timer 790 also activates and begins counting down a specified period of time for which the pump 732 will operate at the higher speed operating mode. Following completion of the specified time, the control system 780 cycles operation of the pump 732 back to the low speed operating mode (which provides a generally low level of washing fluid turbulence in a tank of the assembly). When desired to again increase the level of turbulence of the washing fluid in the tank, the momentary switch 788 is activated to cycle operation of the pump 732 back to a higher speed operating mode (thereby increasing the level of washing fluid turbulence in the tank). This again activates the timer 790 to begin counting down the specified period of time at which the pump 732 will operate at the higher speed operating mode. And, following completion of the specified time, the control system 780 cycles operation of the pump 732 back to the low speed operating mode.

[00147] As the control system 780 is active (and as the pump 732 is operating), the control system 780 receives temperature readings from the thermocouple 752 and fluid level readings from the fluid level sensor 794. If a temperature reading received from the thermocouple 752 is below the specified low temperature, the control system 780 activates the low temperature visual signal 782a indicating that the temperature of the washing fluid is low. If a temperature reading received from the thermocouple 752 is below the minimum acceptable temperature,

the control system 780 activates the temperature fault visual signal 782b indicating that the temperature of the washing fluid is below the minimum acceptable temperature. Here, the control system 780 also activates the low temperature fault relay 792a and deactivates operation of the pump 732. The control system 780 then prevents further operation of the pump 732 until the temperature signal indicates that the temperature of the washing fluid is acceptable or until the override 796 is activated. Similarly, if a fluid level reading received from the fluid level sensor 794 is below a specified fluid level, the control system 780 activates a signal indicating that the fluid level is low and deactivates operation of the pump 732. Here, the control system 780 may also activate the float relay 792f and deactivate operation of the pump 732. The control system 780 then prevents further operation of the pump 732 until the fluid level signal (e.g., via the fluid level sensor 794, etc.) indicates that the fluid level of the washing fluid in the tank is acceptable or until the override 796 is activated.

[00148] FIG. 18 is a schematic illustrating a wiring configuration according to still another example embodiment of the present disclosure for use with or as a control system 880 of a kitchenware washing assembly 800. With that said, it should be appreciated that the control system 880 (including the example wiring configuration) could also be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00149] The illustrated configuration generally includes a power switch 886 (broadly, a toggle) configured to turn the control system 880 on and off and to select a desired operating speed of pump 832, a momentary switch 888 (broadly, an actuator) configured to cycle operation of the pump 832 (e.g., a single phase pump, a three-phase pump, etc.) between a low speed operating mode (e.g., an idle operating mode, etc.) and a selected higher speed operating mode, and a timer 890 configured to control a duration of operation of the pump 832 at the low speed operating mode and/or at the higher speed operating mode. The configuration also generally includes a power coupling 895 and a wired controller 898 for use in operation.

[00150] A thermocouple 852 is provided for monitoring temperature of fluid in an assembly 800 to which the control system 880 is coupled. A fluid level sensor

894 (*e.g.*, a float switch, etc.) is provided for monitoring fluid level in the assembly 800. And, various relays 892 are provided to control different operations of the pump 832 (*e.g.*, a temperature fault relay 892c for use in terminating operation of the pump 832 if a temperature of washing fluid falls below a specified level, a speed relay 892b for use in controlling operation of the pump 832 at the low and higher speed operating modes and for use in controlling changes of the pump motor speeds, a float relay 892f for use in deactivating operation of the pump 832 if the fluid level is below a specific fluid level, etc.). Further, visual indicators 882a, 882b are provided to indicate that the temperature of the washing fluid is low or to indicate that the temperature of the washing fluid is below a minimum acceptable temperature, respectively. And, an override 896 (*e.g.*, a unique keyed lock, a digital lock, etc.) is included to manually restore operation to the assembly (*e.g.*, to allow for reactivation of the pump 832, etc.) if operation has been terminated due to low fluid level or low temperature but not rectified (and the low fluid level or low temperature is not rectified). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 18), and are self-explanatory in nature such that they are not further discussed herein.

[00151] With that said, general operation of the control system 880 of this embodiment (including the example wiring configuration) to control operation of kitchenware washing assembly 800 in which the control system 880 is installed is substantially similar to the operation described for the control system 780 previously described and illustrated in FIG. 17 (and thus will not be further described).

[00152] FIG. 19 is a schematic illustrating a wiring configuration according to still another example embodiment of the present disclosure for use with or as a control system 980 of a kitchenware washing assembly 900. With that said, it should be appreciated that the control system 980 (including the example wiring configuration) could also be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00153] The wiring configuration (and control system 980) of this embodiment is substantially similar to the wiring configuration (and control system 880) previously described and illustrated in FIG. 18. For example, the illustrated configuration generally includes a power switch 986 configured to turn the control

system 980 on and off and to select a desired operating speed of pump 932, a momentary switch 988 configured to cycle operation of the pump 932 between a low speed operating mode and a selected higher speed operating mode, and a timer 990 configured to control a duration of operation of the pump 932 at the low speed operating mode and/or at the higher speed operating mode. The configuration also generally includes a power coupling 995 and a wired controller 998 for use in operation.

[00154] A thermocouple 952 is also provided for monitoring temperature of fluid in an assembly 900 to which the control system 980 is coupled. A fluid level sensor 994 is provided for monitoring fluid level in the assembly 900. And, various relays 992 are provided to control different operations of the pump 932 (*e.g.*, a temperature fault relay 992c for use in terminating operation of the pump 932 if a temperature of washing fluid falls below a specified level, a speed relay 992b for use in controlling operation of the pump 932 at the low and higher speed operating modes and for use in controlling changes of the pump motor speeds, a float relay 992f for use in deactivating operation of the pump 932 if the fluid level is below a specific fluid level, etc.). Further, visual indicators 982a, 982b are provided to indicate that the temperature of the washing fluid is low or to indicate that the temperature of the washing fluid is below a minimum acceptable temperature, respectively. And, an override 996 is included to manually restore operation to the assembly if operation has been terminated due to low fluid level or low temperature but not rectified (and the low fluid level or low temperature is not rectified). Various additional features are also included in the illustrated configuration (as indicated by the additional wiring symbols/nomenclature in FIG. 19), and are self-explanatory in nature such that they are not further discussed herein.

[00155] In this embodiment, however, a transformer 981 is provided for stepping down power. For example, the illustrated transformer 981 is configured to convert 230 volts to 120 volts.

[00156] General operation of the control system 980 of this embodiment (including the example wiring configuration) to control operation of kitchenware washing assembly 900 in which the control system 980 is installed is substantially similar to the operation described for the control system 880 previously described and illustrated in FIG. 18 (and thus will not be further described).

[00157] In some example embodiments, means for activating a pump of a kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly may include, for example, mechanical means, automated means, toggles, switches, adjusters, actuators, dials, knobs, tuners, relays, selectors, electronic switches, input/output devices, devices capable of switching circuit loads, rotary selector switches, etc. And in some example embodiments, means for terminating operation of the pump if a temperature of washing fluid in the kitchenware washing assembly falls below a specified temperature as measured by a temperature sensor of the kitchenware washing assembly may include automated means, manual means, relays (*e.g.*, solid-state relays, etc.), electronic switches, definite purpose relays, etc.

[00158] FIGS. 20 and 21 illustrate an intake cover 1042 and screen 1047 according to an example embodiment of the present disclosure. The intake cover 1042 and screen 1047 could be used in connection with the assembly 100 previously described and illustrated in FIGS. 1-11, or in connection with any other example embodiment disclosed herein, or in connection with any other kitchenware washing assembly.

[00159] The intake cover 1042 is configured to be positioned over an intake chamber of a kitchenware washing assembly, where the intake chamber is entirely open to a tank of the assembly. And, the intake cover 1042 can be coupled to the tank of the assembly through keyed openings 1063 using suitable fasteners (*e.g.*, mechanical fasteners, etc.). Multiple inlets 1044 are uniformly and evenly spaced across a right portion (as viewed in FIG. 20) of the intake cover 1042. The inlets 1044 allow fluid to pass through the intake cover 1042, but restrict food debris and other items (*e.g.*, kitchenware items like silverware, etc.).

[00160] Further, a projection 1046 is positioned along a length of the intake cover 1042. The projection 1046 helps keep kitchenware (*e.g.*, plates, pans, dishware, trays, etc.) from being drawn up flush against the intake cover 1042 and blocking fluid movement through the inlets 1044. In the illustrated embodiment, the projection 1046 defines a generally V-shaped rib that extends longitudinally across the intake cover 1042. And, handles 1065 are provided for use in handling the intake cover 1042 and coupling/removing the intake cover 1042 to/from a tank of a kitchenware washing assembly (only one handle 1065 is shown in FIG. 20, on a left portion of the intake cover 1042, with it to be understood that a similar handle could

be employed in the openings 1065a on the right portion of the intake cover 1042). The handles 1065 are configured to retract through the intake cover 1042 when not in use so as to not interfere with washing operations.

[00161] The screen 1047 is configured to be positioned through opening 1067 of the intake cover 1042 and, when the intake cover 1042 is coupled over an intake chamber of a tank, positioned over an opening in the intake chamber leading to a pump. More particularly, a perforated portion 1047a of the screen 1047 (having openings 1069) is configured to fit through the opening 1067 of the intake cover 1042. In doing so, a user can grasp handle portion 1071 to help manipulate the screen 1047. When fully inserted through the opening 1067, the handle portion 1071 then aligns generally flush with a forward facing surface (as viewed in FIG. 20) of the intake cover 1042 around the opening 1067. The screen 1047 is configured to allow fluid to flow from the intake chamber to the pump, while at the same time inhibiting movement of any kitchenware and/or food particles that enter the intake chamber from further traveling to the pump (which could then inadvertently affect operation of the pump). As such, the screen 1047 provides a second line of protection to the pump (in addition to the intake cover 1042).

[00162] In other example embodiments, kitchenware washing assemblies may include intake covers and screens where the intake covers do not include openings for receiving the screens through the intake covers. As with the intake cover 1042 illustrated in FIG. 20, such intake covers of these other example embodiments may be configured to cover entire intake chambers (e.g., the intake covers are configured to be positioned over the intake chambers where the intake chambers are entirely open to tanks of kitchenware washing assemblies when not covered by the intake covers, etc.). However, in these other example embodiments, the intake covers must be removed from the intake chambers to access the screens (e.g., to install the screens, remove the screens, etc.).

[00163] Specific dimensions and/or numeric values included herein are exemplary in nature and do not limit the scope of the present disclosure. For example, fluid temperatures identified herein are provided as examples and may vary depending on desired washing operations (e.g., amount of turbulence, etc.), applications (e.g., type of kitchenware, degree of cleaning required, etc.), conditions (e.g., type of washing fluid, etc.), etc. Similarly, washing times identified herein are provided as examples and may vary depending on desired washing operations (e.g.,

amount of turbulence, etc.), applications (e.g., type of kitchenware, degree of cleaning required, etc.), conditions (e.g., type of washing fluid, etc.), etc. Further, label nomenclature used in the drawings is exemplary in nature and does not limit the scope of the present disclosure.

[00164] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms "a," "an," and "the" may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms "comprises," "comprising," "including," and "having," are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

[00165] When an element or layer is referred to as being "on," "engaged to," "connected to," or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). As used herein, the term "and/or" includes any and all combinations of one or more of the associated listed items.

[00166] Although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element,

component, region, layer or section without departing from the teachings of the example embodiments.

[00167] Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used herein for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

[00168] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

Claims

What is claimed is:

1. A control system for a kitchenware washing assembly, the control system configured to be coupled to a pump and a temperature sensor of the kitchenware washing assembly, the control system comprising:

a toggle configured to activate a pump of a kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly; and

a temperature protection relay configured to terminate operation of the pump if a temperature of washing fluid in the kitchenware washing assembly falls below a specified temperature as measured by a temperature sensor of the kitchenware washing assembly.

2. The control system of claim 1, further comprising a float relay configured to deactivate operation of the pump if a fluid level in the kitchenware washing assembly is below a specific fluid level.

3. The control system of claim 1, wherein the pump is a first pump, the toggle configured to activate the first pump and a second pump of the kitchenware washing assembly for circulating washing fluid in the kitchenware washing assembly, the control system further comprising an actuator configured to cycle operation between the first pump and the second pump.

4. The control system of claim 1, further comprising an override configured to allow reactivation of the operation of the pump, after termination by the temperature protection relay, while the temperature of the washing fluid in the kitchenware washing assembly remains below the specified temperature.

5. The control system of claim 1, further comprising a pump protection relay configured to terminate operation of the pump if at least one operational parameter of the pump deviates from a specified value as measured by a pump sensor of the kitchenware washing assembly.

6. The control system of any one of claims 1-5, further comprising at least one indicator configured to activate if the temperature of washing fluid in the kitchenware washing assembly falls below the specified temperature.

7. The control system of claim 6, wherein the indicator is selected from the group consisting of a visual indicator and an audible indicator.

8. The control system of claim 6, wherein the specified temperature is a first specified temperature, the control system further comprising at least one indicator configured to activate if the temperature of washing fluid in the kitchenware washing assembly falls below a second specified temperature.

9. A kitchenware washing assembly comprising:
a tank configured to hold fluid for washing kitchenware;
a pump in fluidic communication with the tank and configured to circulate fluid within the tank, the pump being operable at two or more different speeds to thereby create two or more different levels of fluid turbulence within the tank;
a sensor configured to measure and/or monitor temperature of the fluid held within the tank; and
a control system configured to control operation of the pump between the at least two or more different speeds, the control system configured to operate the pump at a first one of the two or more different speeds for a specified time period and then cycle operation of the pump to a second one of the two or more different speeds, the control system also being in communication with the sensor and configured to activate at least one indicator when the temperature of the fluid held within the tank falls below a specified temperature.

10. The assembly of claim 9, wherein the control system is further configured to deactivate the pump when the temperature of the fluid held within the tank falls below the specified temperature.

11. The assembly of claim 9, further comprising a pump sensor configured to monitor at least one operational parameter of the pump, the control system being in communication with the pump sensor and configured to activate the at least one

indicator when the at least one operational parameter of the pump deviates from a specified value.

12. The assembly of any one of claims 9-11, wherein the tank includes first and second opposing walls and third and fourth opposing walls defining at least part of the tank, the assembly further comprising:

an intake chamber associated with the first wall of the tank and configured to receive fluid from out of the tank; and

a discharge chamber associated with the third wall of the tank and configured to receive fluid for discharge into the tank;

wherein the second and fourth walls of the tank do not include either an intake chamber or a discharge chamber associated therewith.

13. An automated method for washing kitchenware using a commercial top-loading kitchenware washing assembly, the method comprising:

agitating washing fluid in a tank for a specified time period to thereby create a first level of turbulence in the tank for washing kitchenware in the tank;

after the specified time period, agitating the washing fluid in the tank to create a second level of turbulence in the tank, wherein the first level of turbulence in the tank is greater than the second level of turbulence in the tank;

measuring a temperature of the washing fluid used for washing the kitchenware in the tank; and

deactivating the pump if the measured temperature of the washing fluid is below a specified temperature.

14. The automated method of claim 13, wherein agitating the washing fluid in the tank to thereby create a first level of turbulence in the tank includes discharging fluid into the tank from a single side of the tank and at a generally downward angle to thereby promote generally vertical circulation of fluid within the tank to help create the first level of turbulence and/or discharging the fluid into the tank from the single side of the tank to thereby promote generally horizontal circulation of the fluid within the tank to help create the first level of turbulence.

15. The automated method of claims 13 or 14, further comprising activating an indicator if the temperature of the washing fluid falls below the specified temperature.

16. The automated method of claim 15, wherein the indicator is selected from the group consisting of a visual indicator and an audible indicator.

17. The automated method of claim 15, further comprising monitoring at least one operational parameter of the pump, and deactivating the pump if the at least one operational parameter of the pump deviates from a specified value.

18. The automated method of claims 13 or 14, wherein the specified temperature is a first specified temperature, the method further comprising activating an indicator if the temperature of the washing fluid falls below a second specified temperature, the first specified temperature being lower than the second specified temperature.

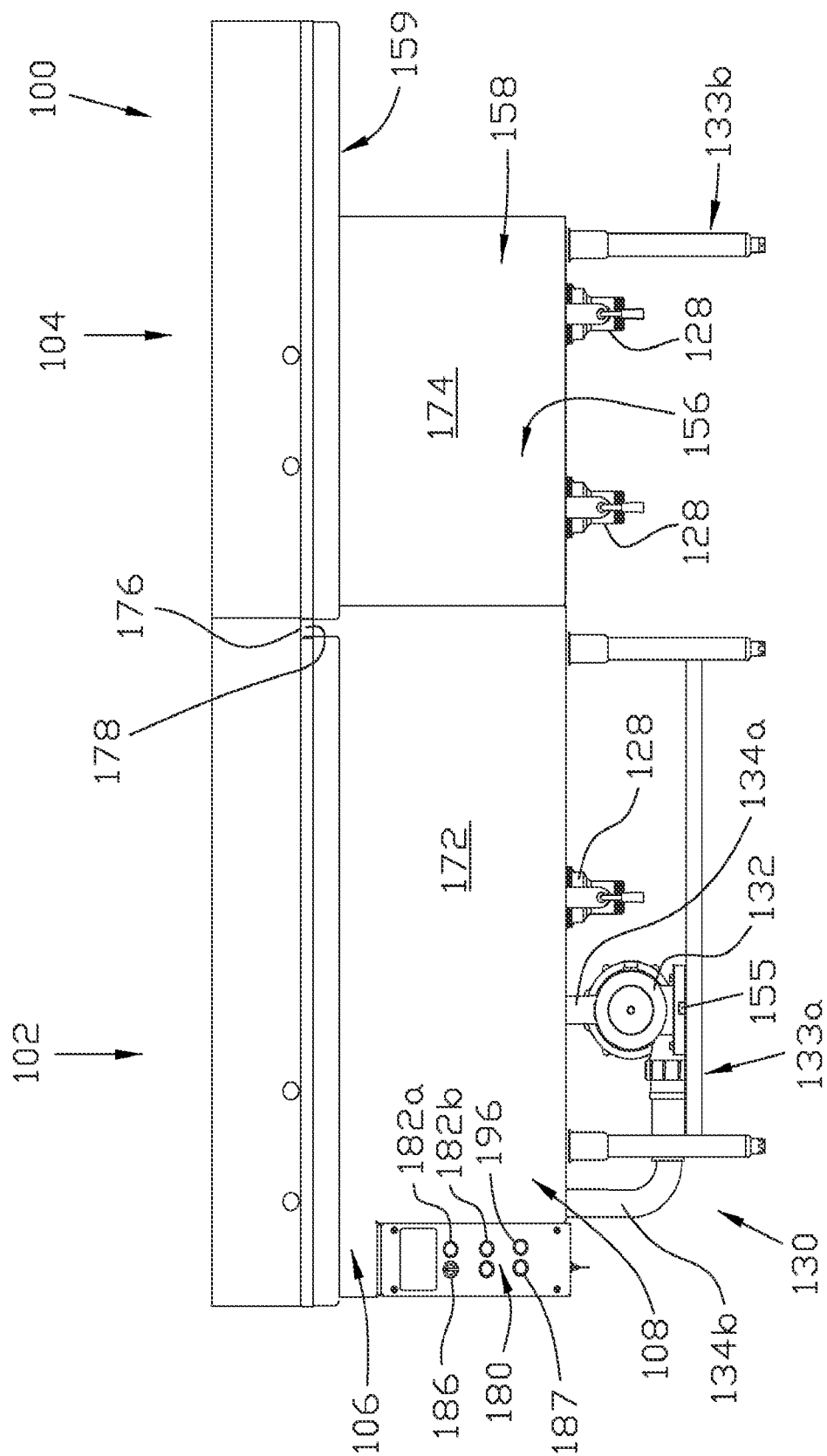


FIG. 1

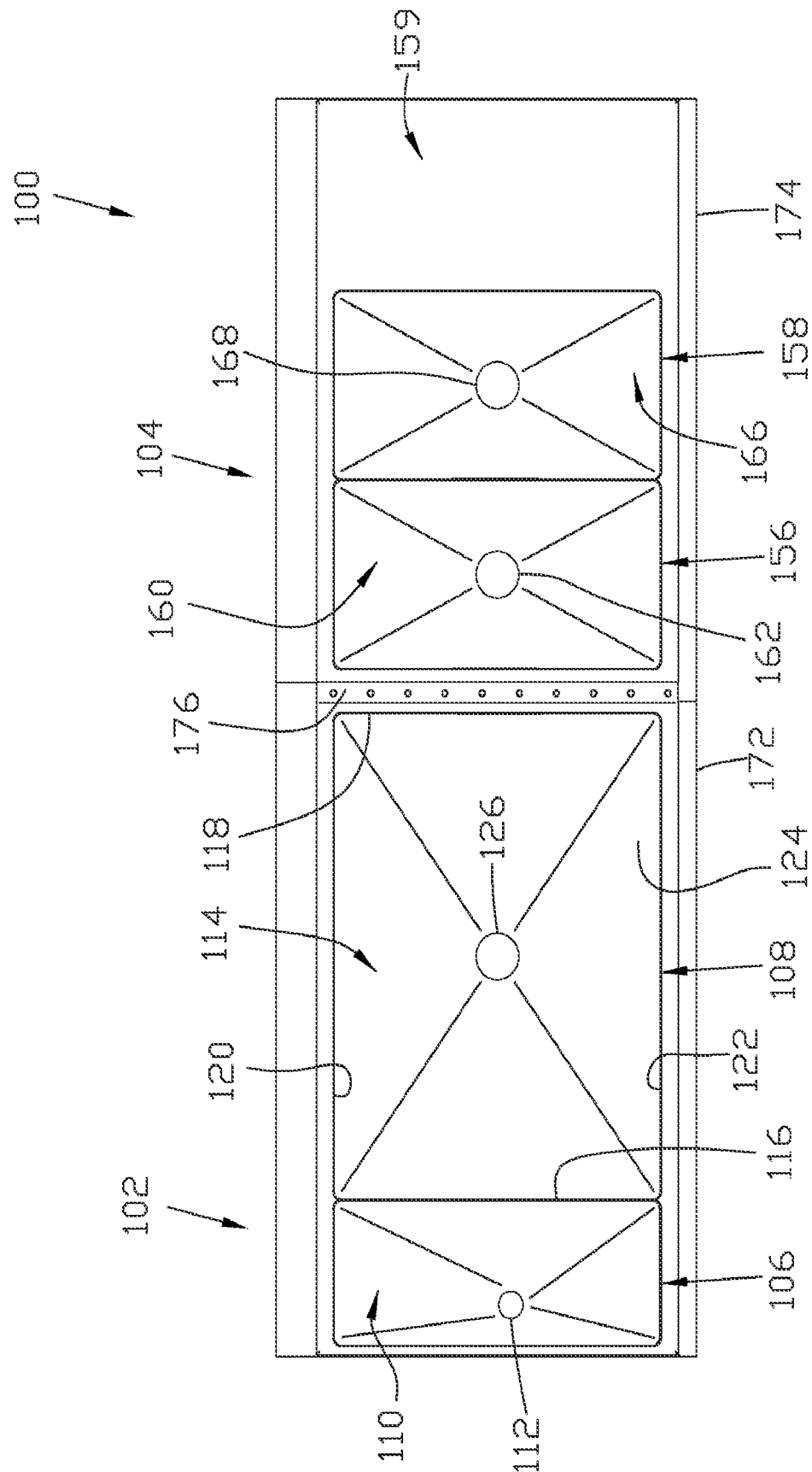


FIG. 2

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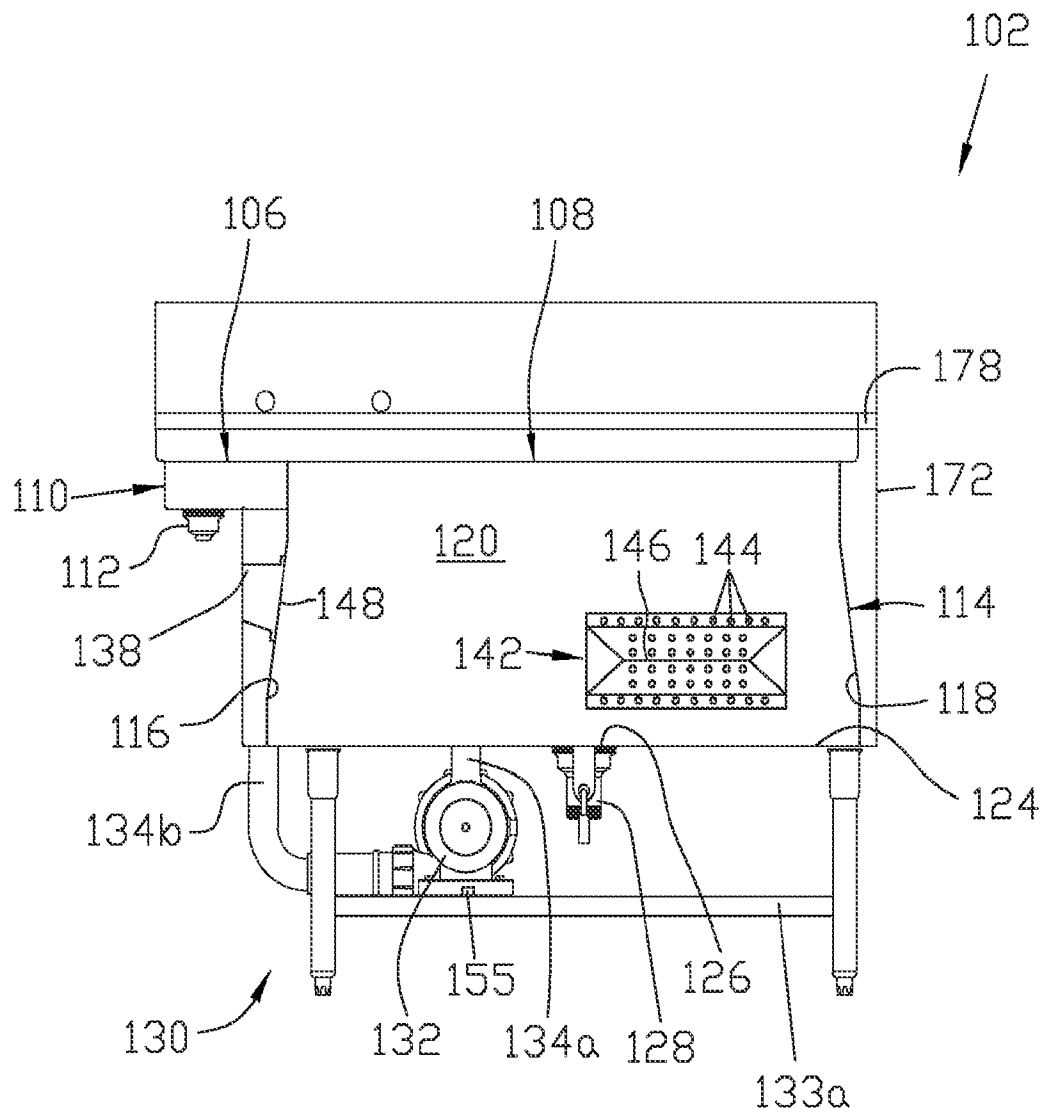


FIG. 3

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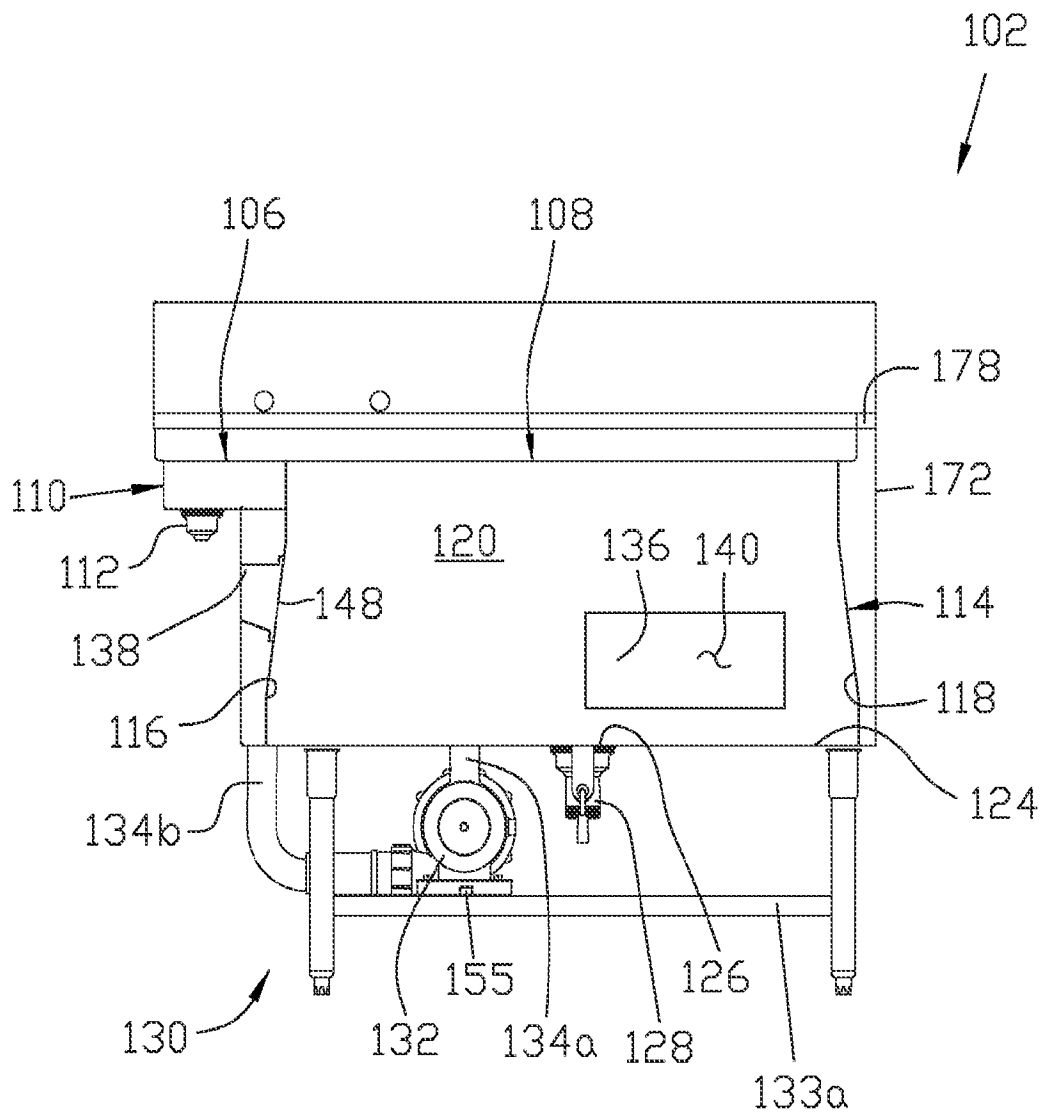


FIG. 4

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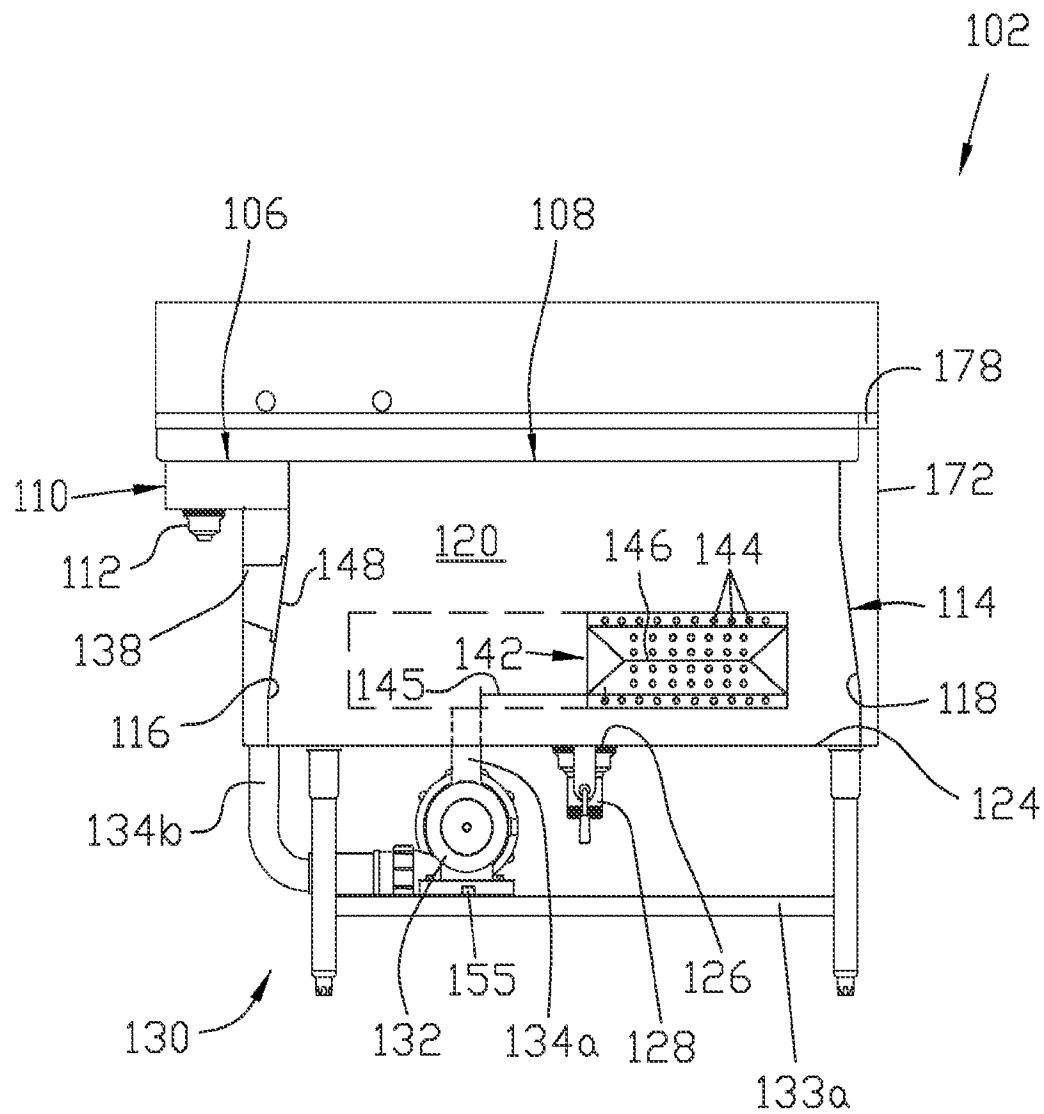


FIG. 5

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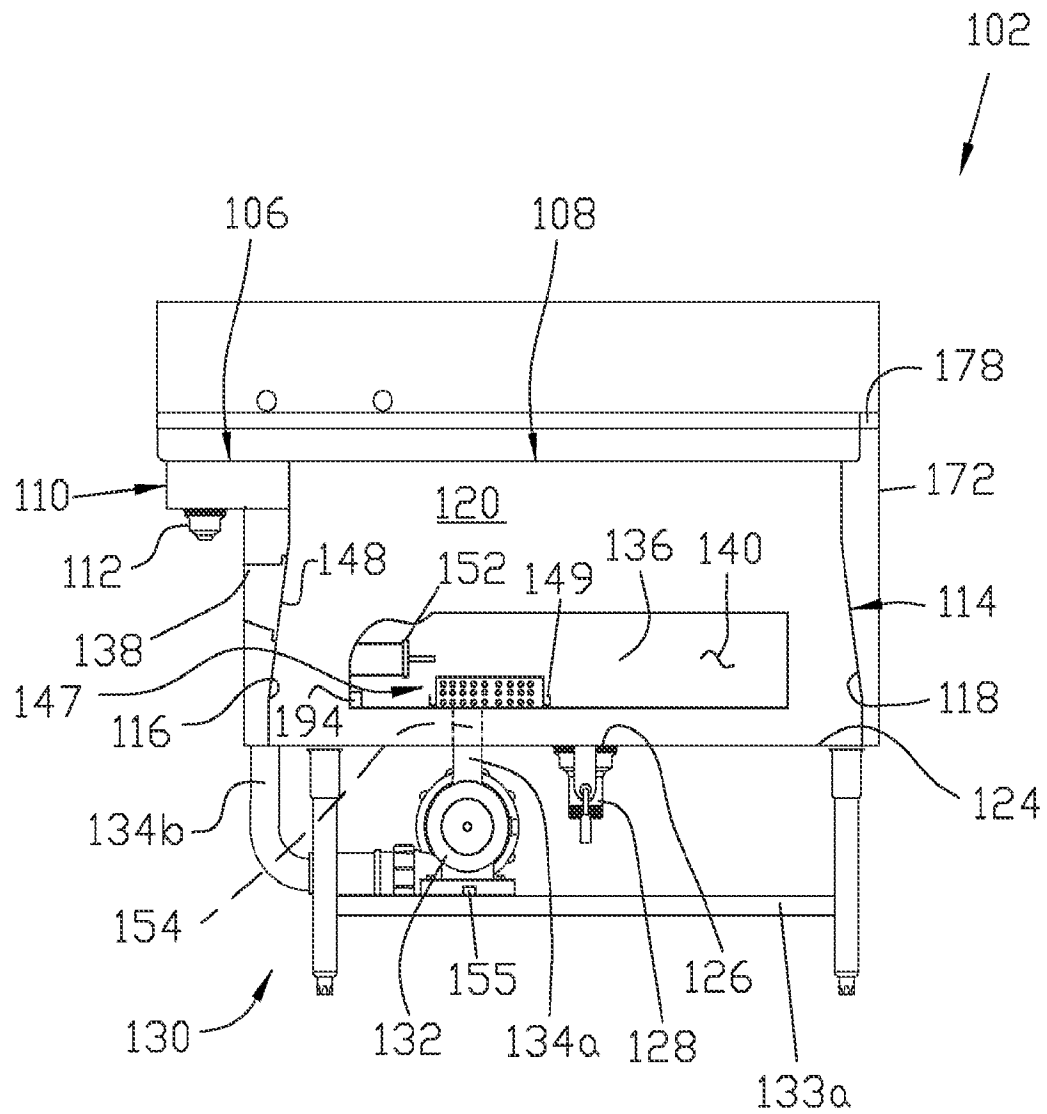


FIG. 6

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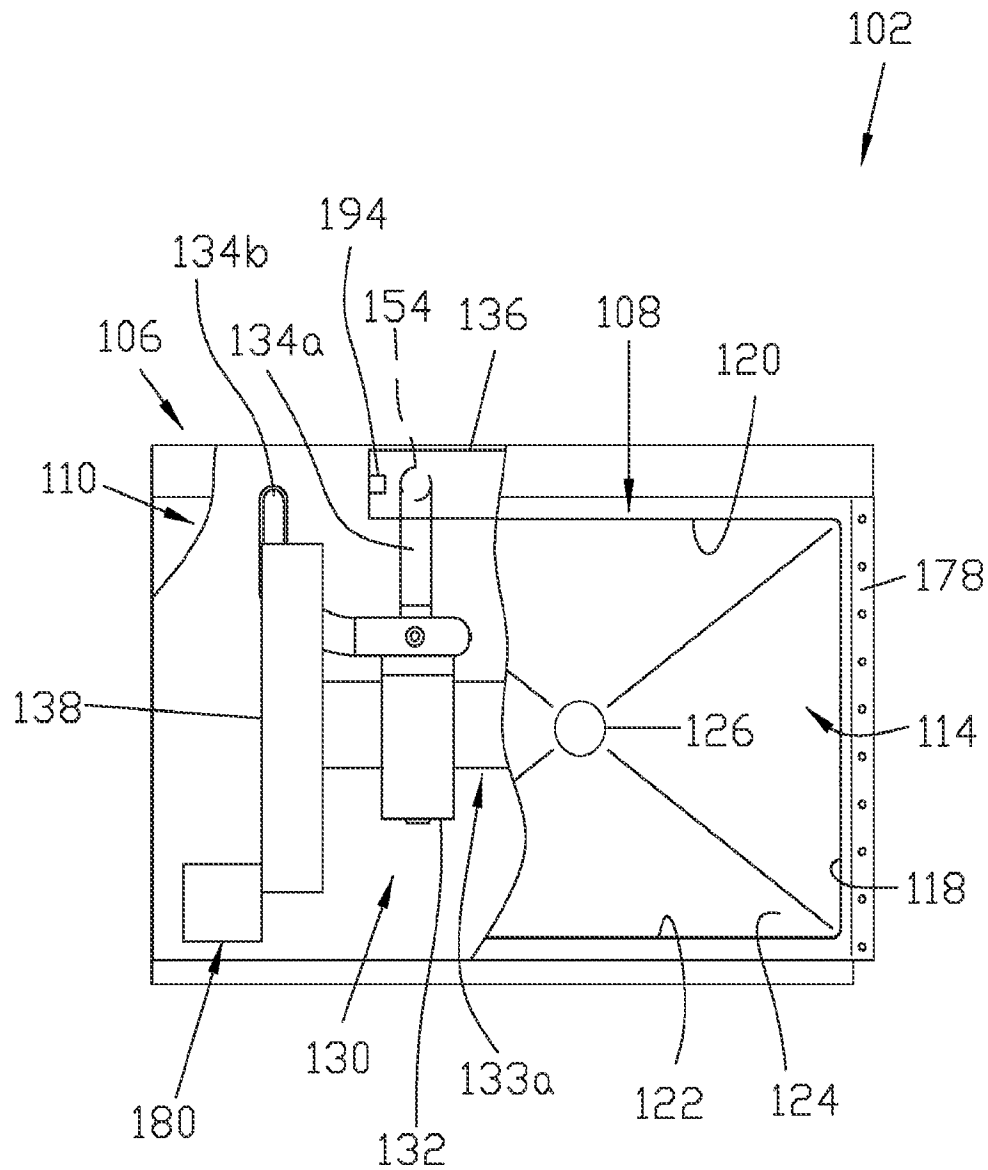


FIG. 7

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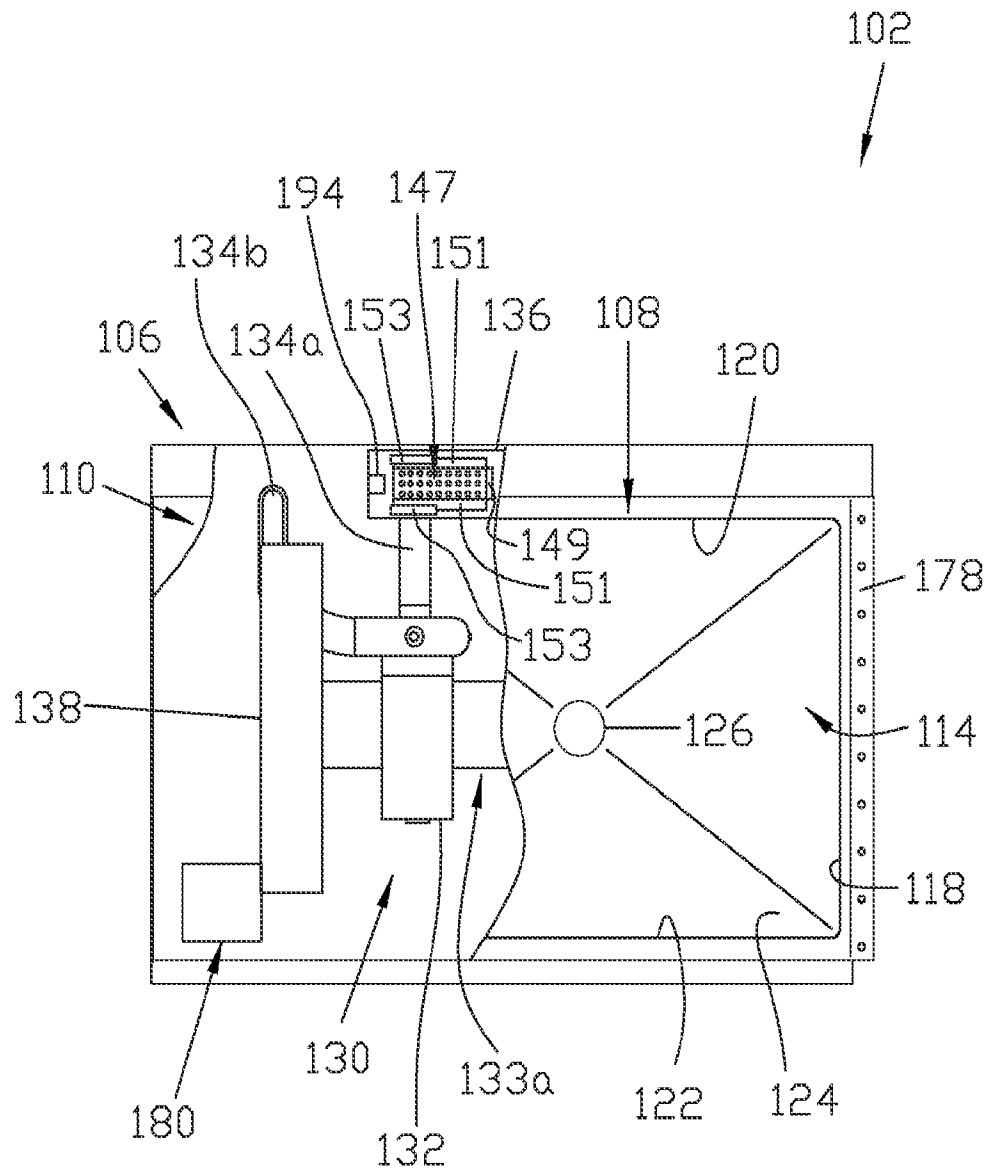


FIG. 8

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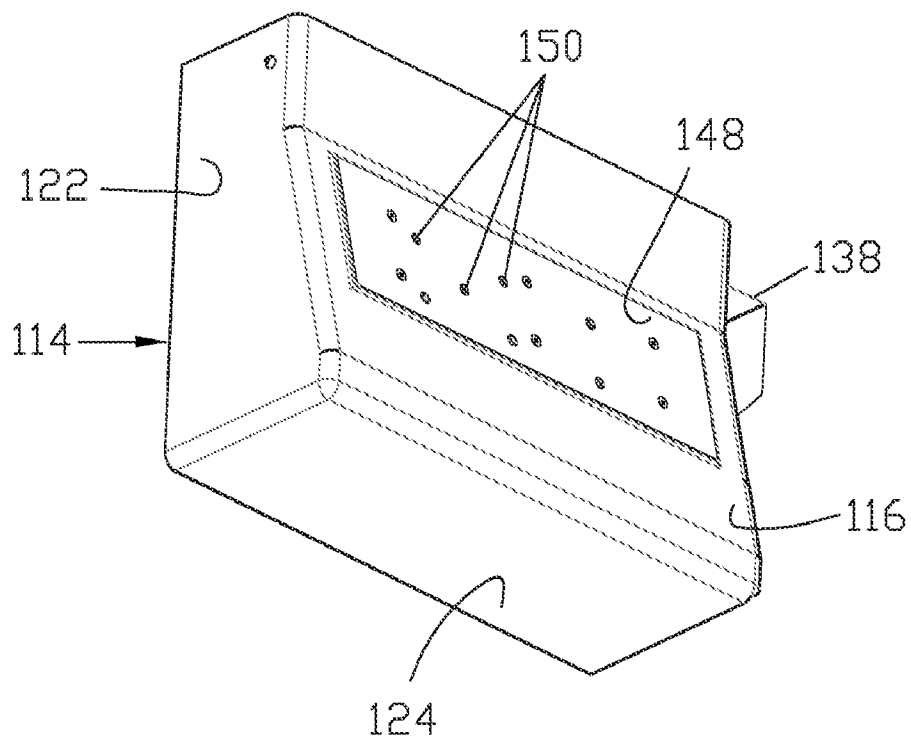


FIG. 9

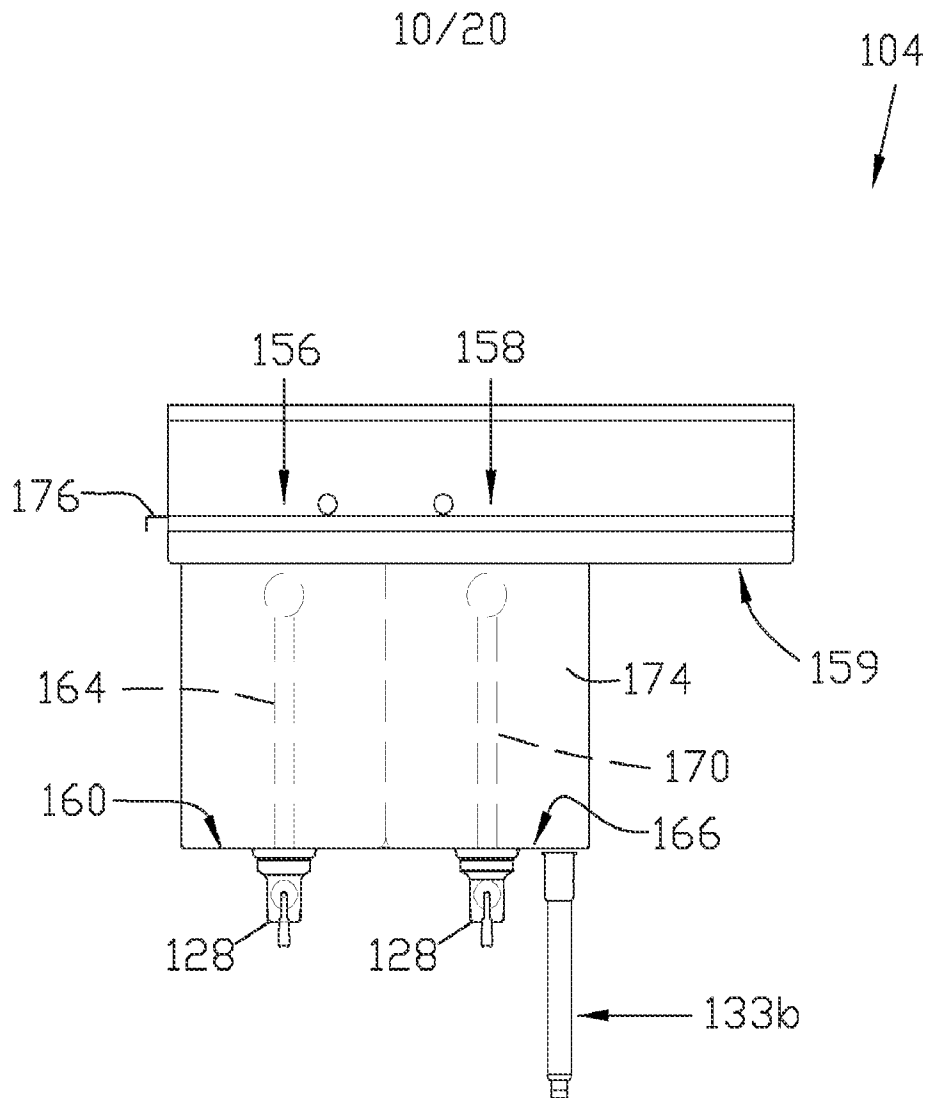


FIG. 10

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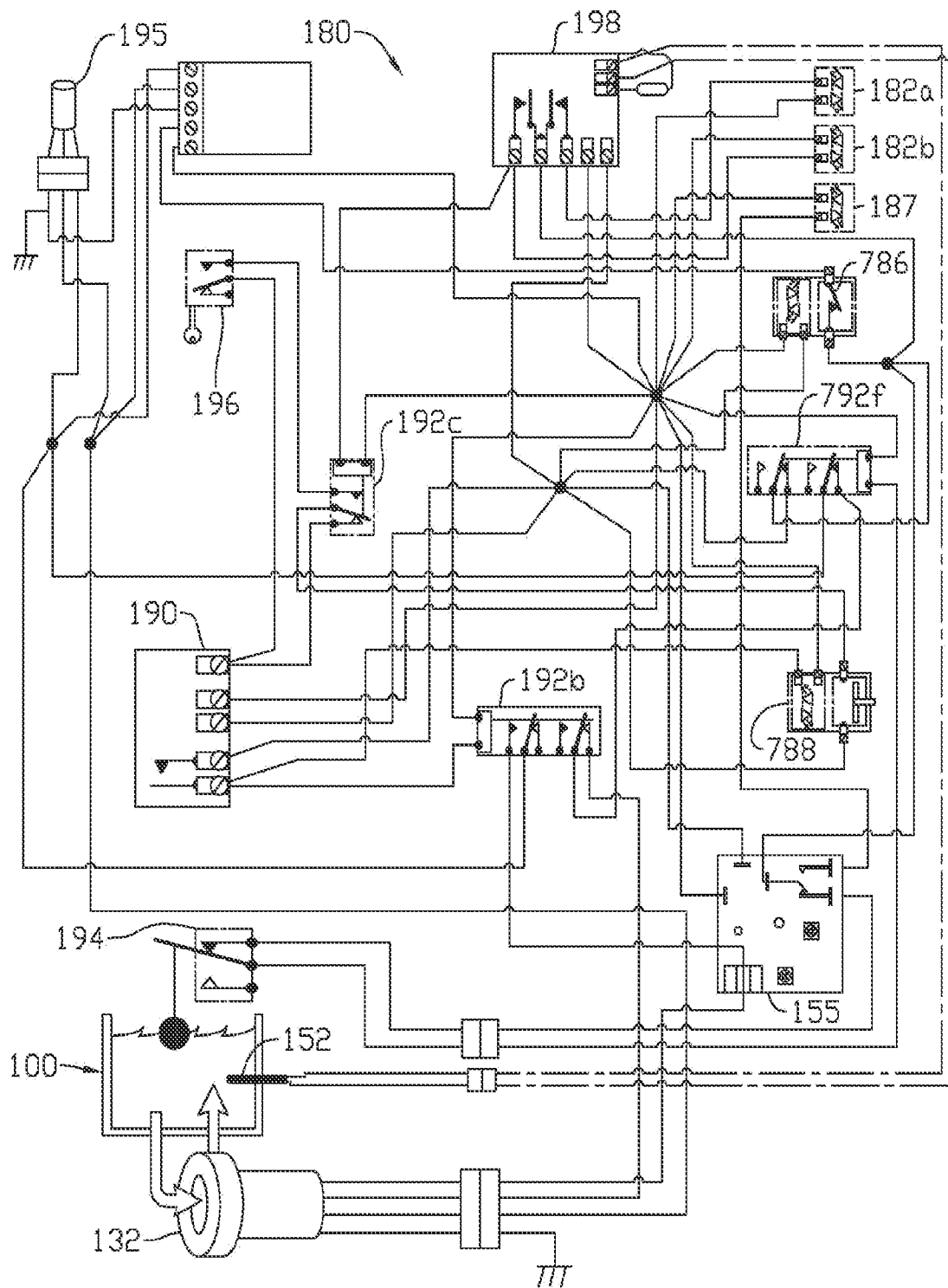


FIG. 11

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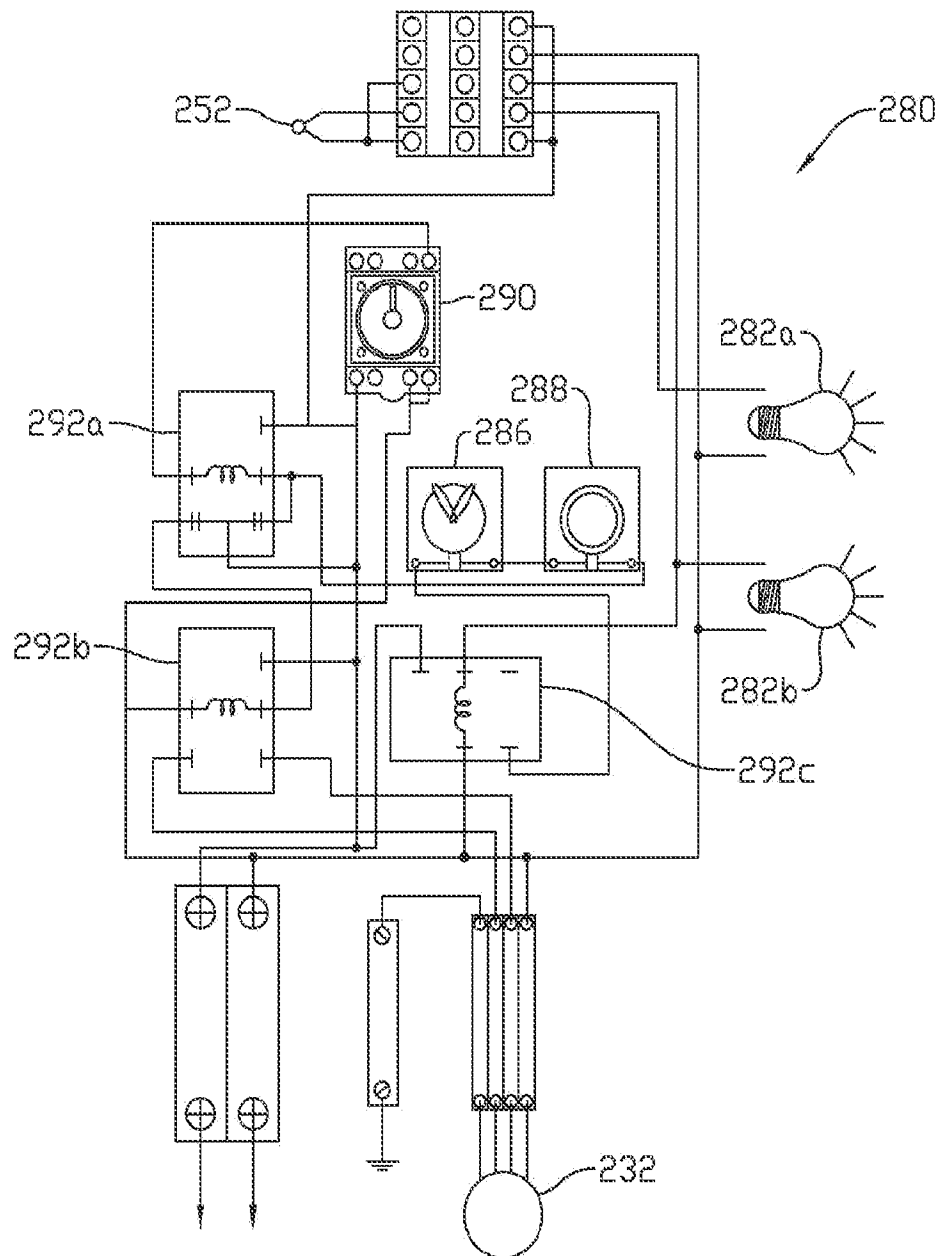


FIG. 12

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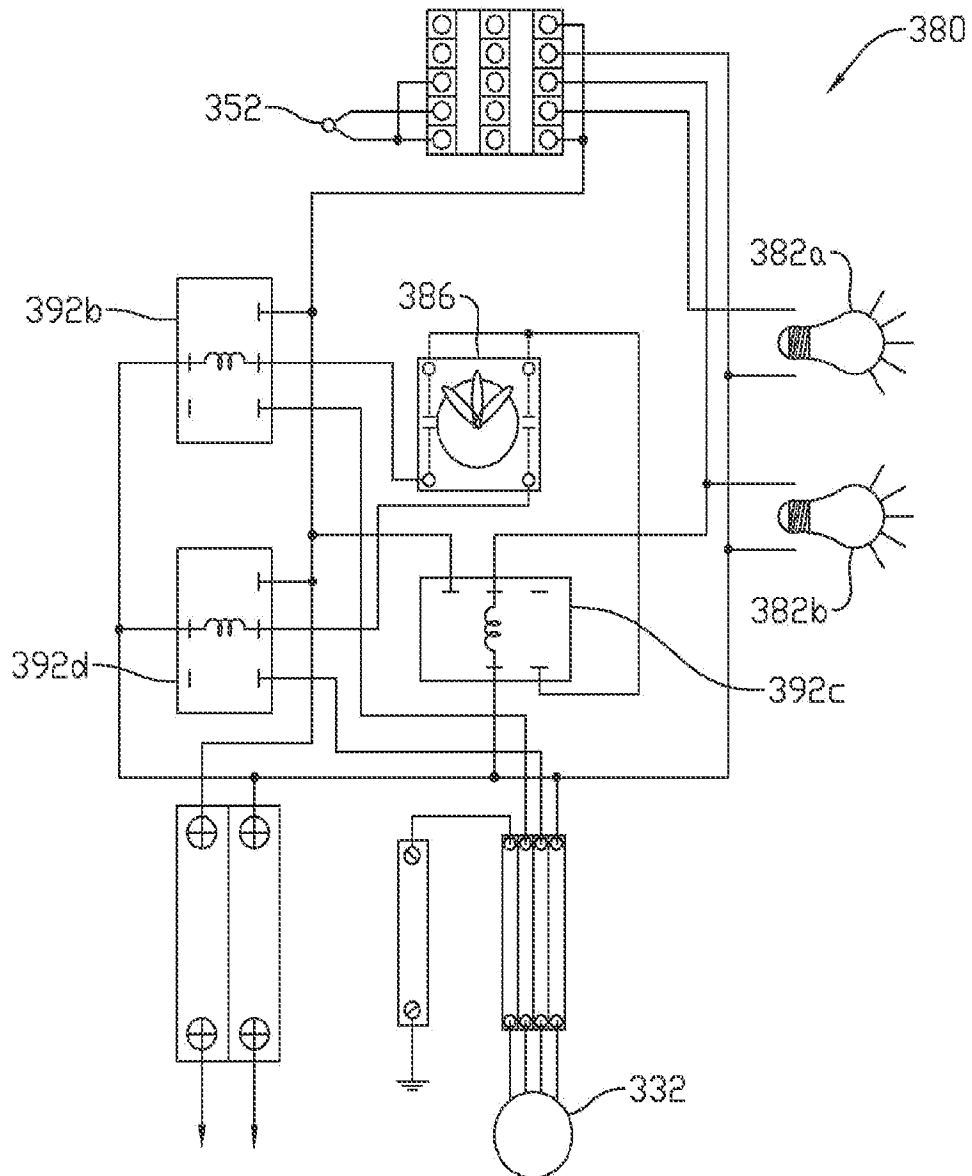


FIG. 13

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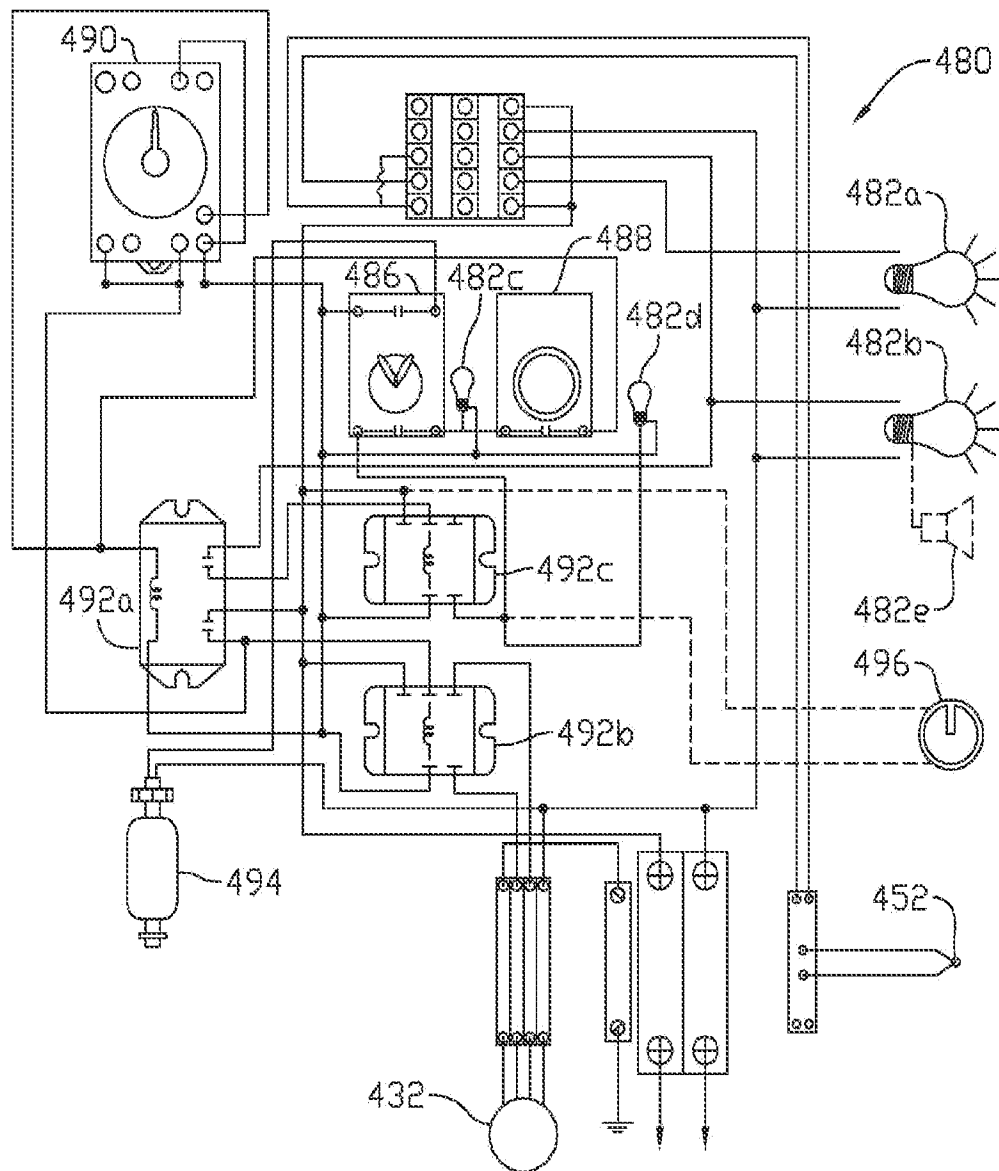


FIG. 14

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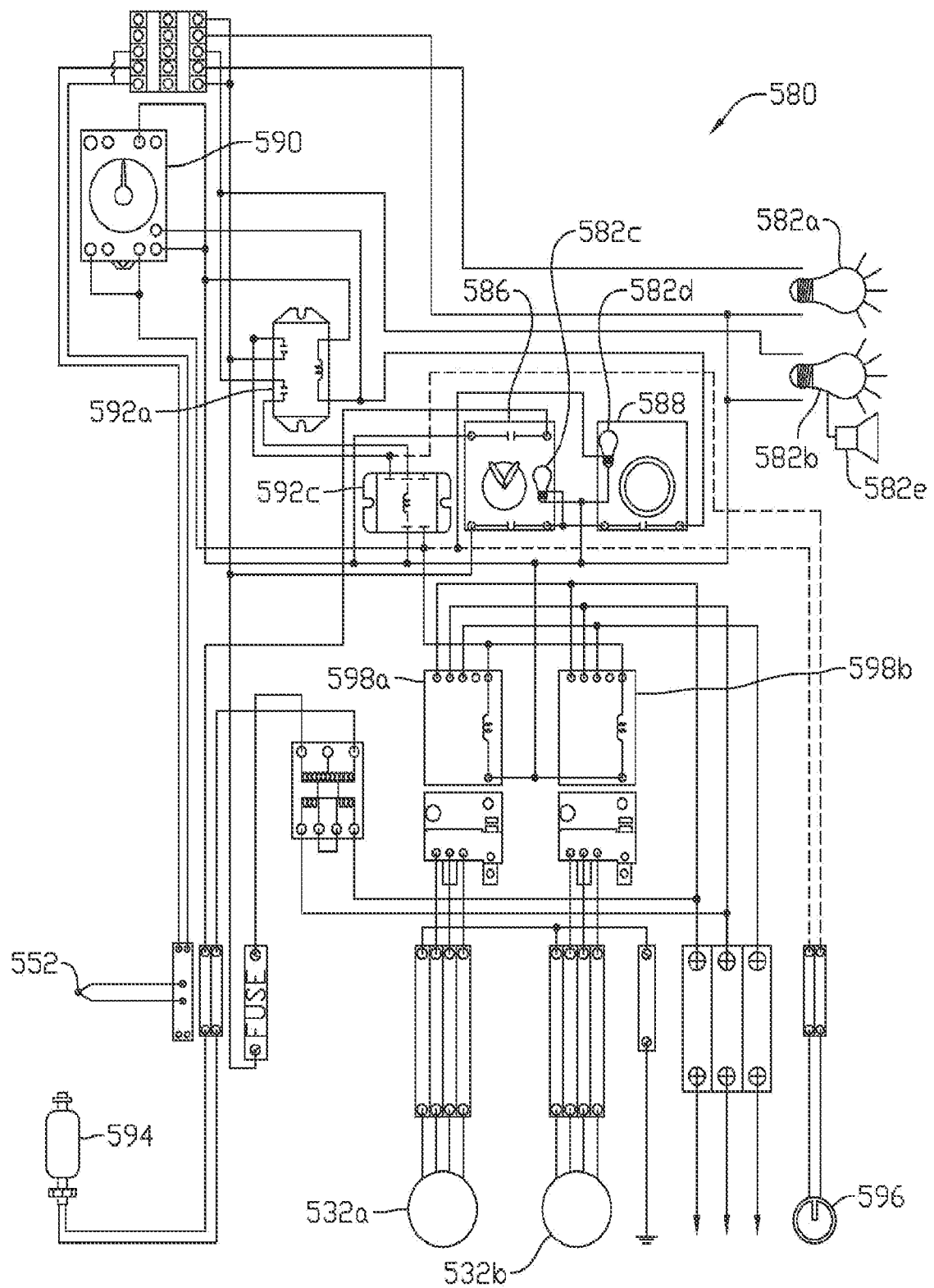


FIG. 15

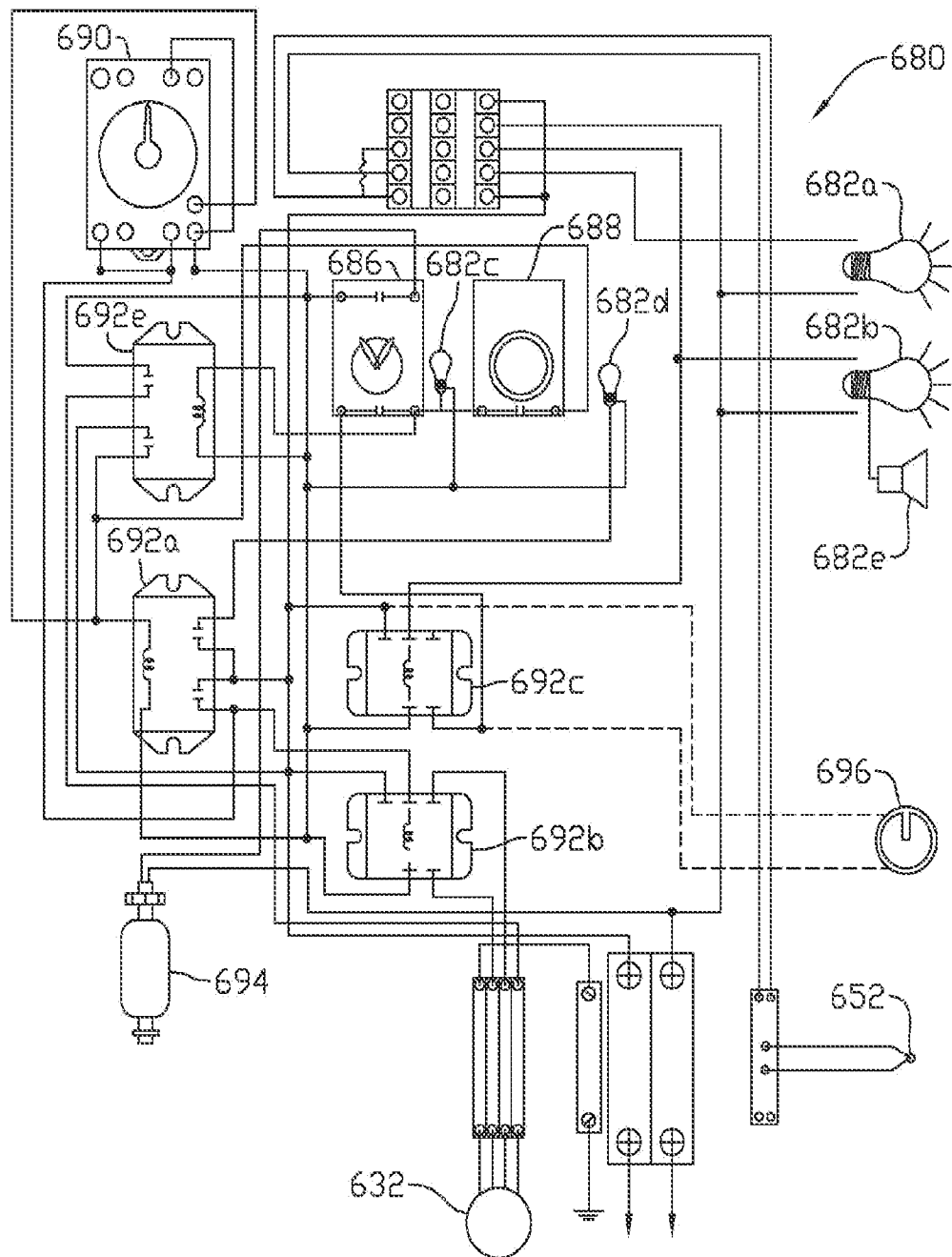


FIG. 16

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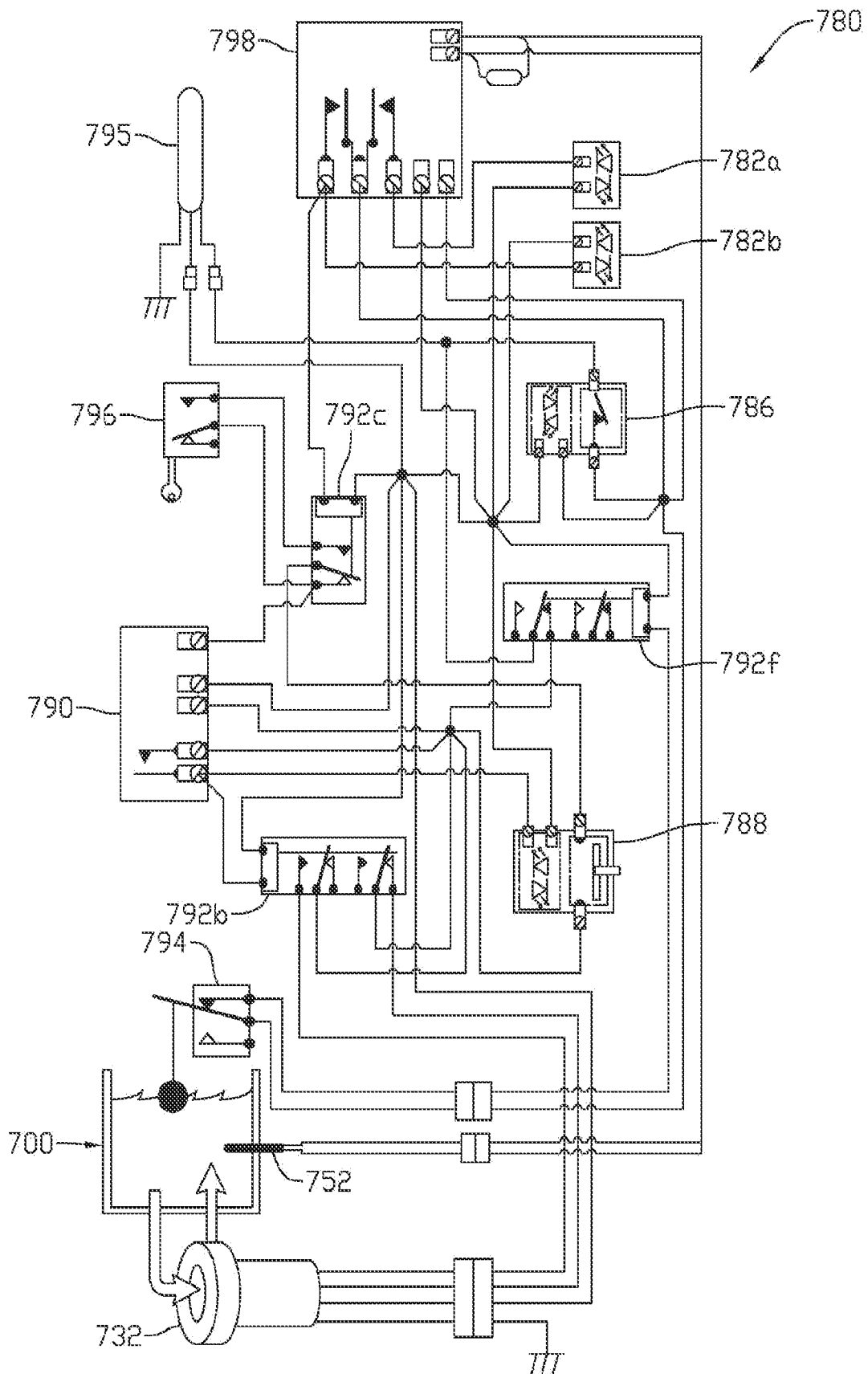


FIG. 17

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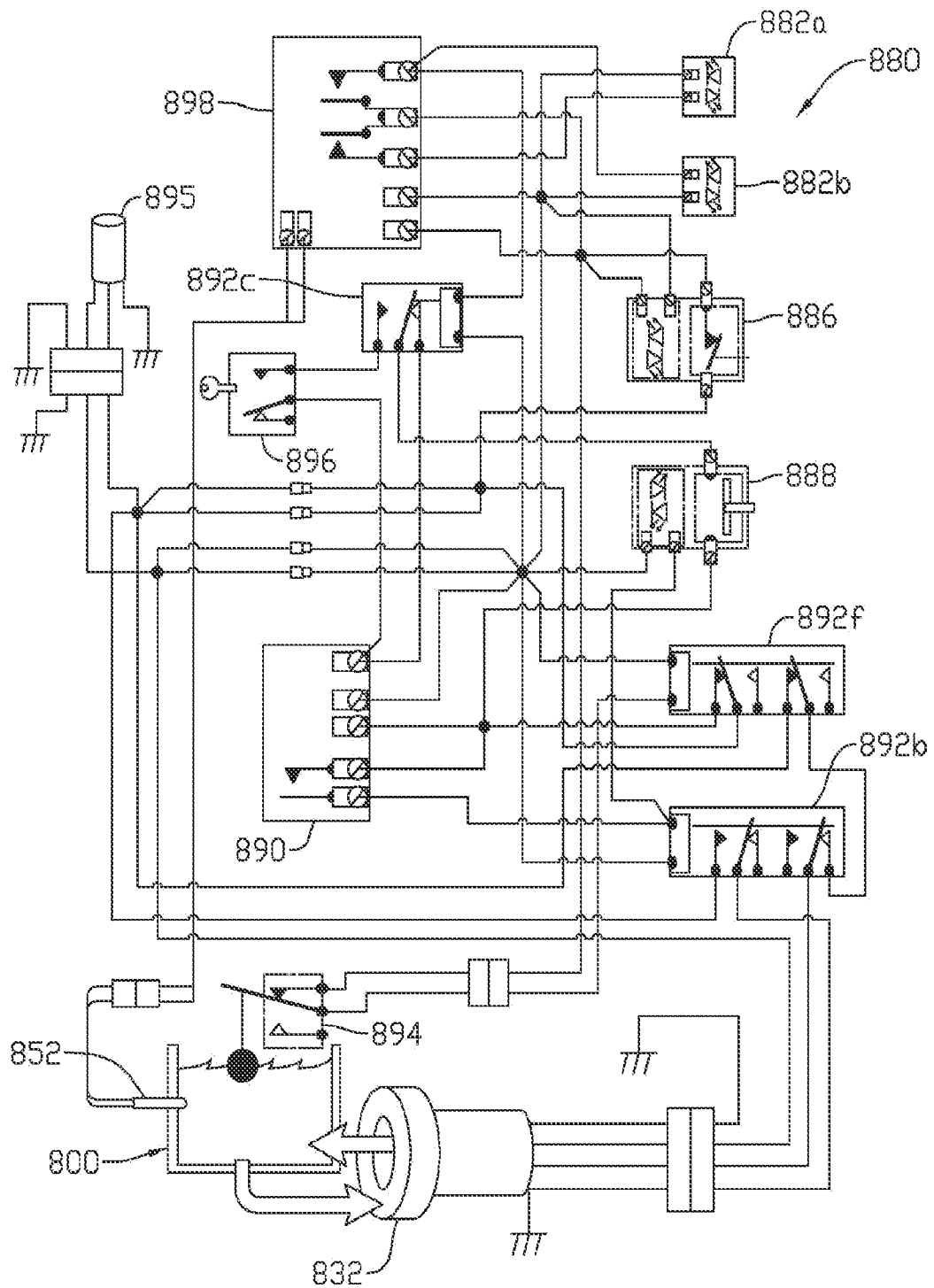


FIG. 18

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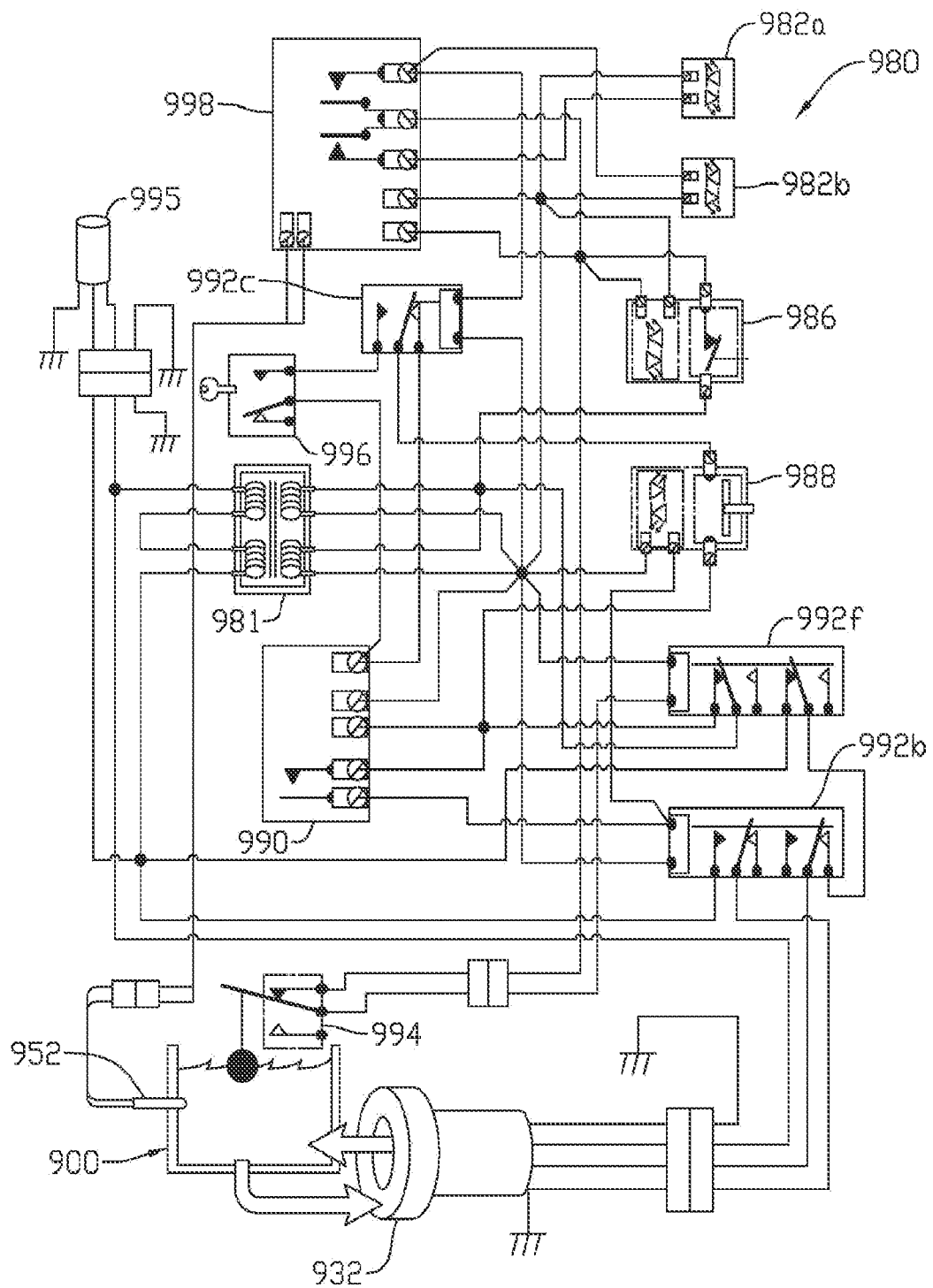


FIG. 19

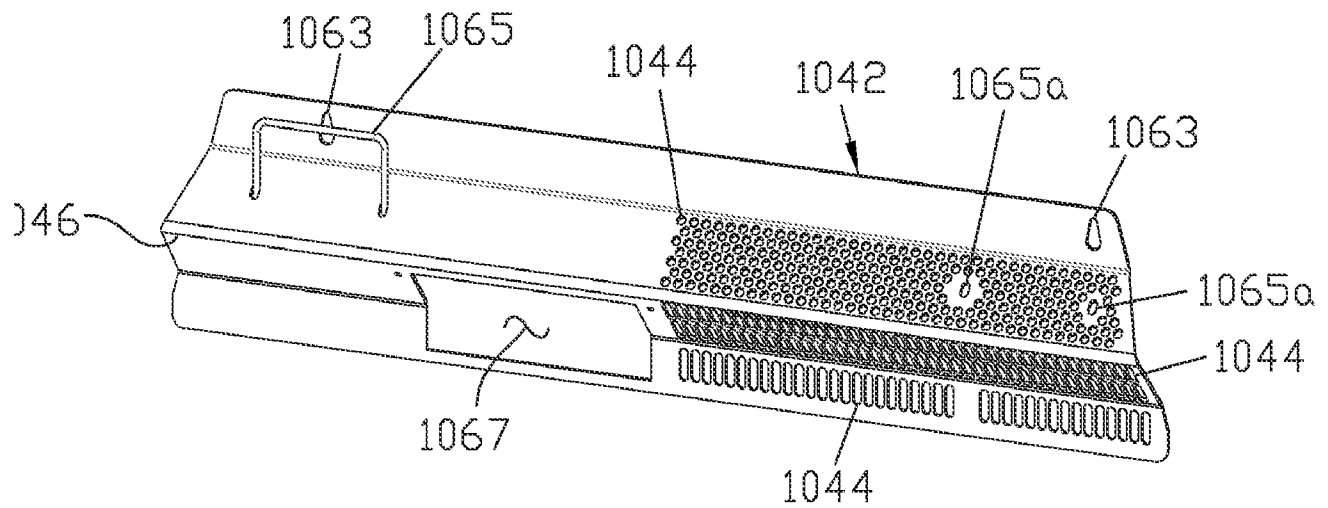


FIG. 20

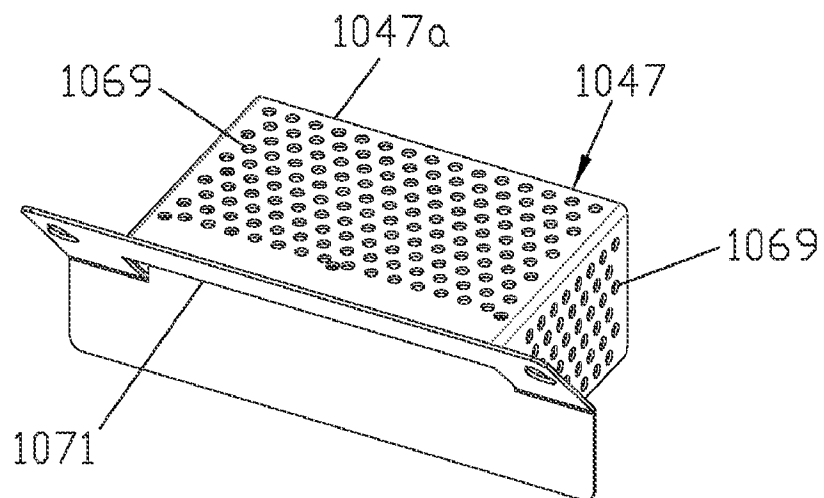


FIG. 21