

Specification

Water Heater

Field of the Invention

The invention relates to a water heater, in particular to a water heater for washing device, e.g. dishwasher, comprising the device which uses internal pressure change of systematic water storage container to generate water flow, and double sealed wall or housing help to prevent or reduce heat loss.

Background of the Invention

Nowadays, there are a variety of dishwashers on the market, all require to heat up water inflow to a certain extent for running each washing program. The heating device usually adopts storage-type electrical water heater, uses the vat to store water, electric heating tube is adopted internally to heat up water inflow, so that to rinse and wash the dishes. As it requires long time to heat up water inflow, consumes energy and takes high cost, energy-saving control is required for long-term operation. Heat recovery system (e.g. CN 105615809 A) is often used on the market which utilizes afterheat of steam to preheat water inflow, or utilizes afterheat of sewage recycling vat to preheat water inflow (e.g. CN105748012A). The hygiene requirement being very strict, during the last washing program, it is required the water inflow cannot affect by any pollution, and temperature cannot be lower than 85°C.

Summary of the Invention

The invention disclosed a water heater, comprising:

Roughly long and/or tubular water inlet pipe extends to said water storage container, it preferably sets at the end of said water storage container, or adjoin

said end, or be parallel to/roughly parallel to the surface of said end. Said inlet pipe is preferably configured to extend roughly along the height direction of said water storage container, and set or install at least one rotatable device with fan blades; said device with fan blades should possess plural joinable internal blades and external blades, the surface of at least one said internal blade and/or external blade is configured to intersect obliquely at a preset angle with water flow of said inlet pipe; to convert and utilize the force of water flow from said inlet pipe to rotate around the axis and make the water near periphery of said inlet pipe to flow along the first preset direction; said first preset direction is preferably roughly parallel to said height direction.

And/or water pressure reuse and diversion device, comprises movable and lockable connecting or installing elastic component, and configure to utilize the change of water temperature, water flow and/or water pressure to convert between energy storage status and diversion status; wherein in energy storage status, said water pressure reuse and diversion device will drive or compress and lock the elastic component to the position by water pressure or flow in order to store kinetic energy which converted by water pressure or flow; in diversion status, said water pressure reuse and diversion device will release elastic component, through resilience of said elastic component or stored kinetic energy to drive the water flow to second preset direction, in order to quickly mix the water in different temperatures in said water storage container, thus help to reach thermal equilibrium; said second preset direction is preferably parallel to the length or width or thickness direction of water storage container; and/or said second preset direction is preferably perpendicular to said first preset direction, so that expedite the mixing of water in different temperatures by water flow in different directions, thus help to reach thermal equilibrium.

In some embodiment, the free end of said water pressure reuse and diversion device comprises rotatable guiding component/steering component and/or said device with fan blades, which correspond to convert said second preset

direction in preset working status, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.

In some embodiment, said first preset direction is roughly inverse to water inflow direction of said water inlet pipe, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium; and/or working direction of said elastic component and/or said second preset direction is preferably perpendicular to water inflow direction of inlet pipe, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.

In some other embodiment, said water pressure reuse and diversion device comprises built-in thermal sensor, which corresponds to preset temperature in conversion between energy storage status and diversion status of said water pressure reuse and diversion device.

In some embodiment, said water storage container is configured as possessing double sealed wall or housing, comprising internal wall or internal housing for holding water, and external wall or external housing for covering said internal wall or internal housing, and thermal insulation and insulating layer or intermediary between two parties; it is preferably air or gas interlayer or vacuum in order to increase effect of insulation and reduce heat loss of water.

In some embodiment, said water storage container comprises the exhaust valve which is joinable with said water pressure reuse and diversion device, it will open and close accordingly in energy storage status and diversion status of said water pressure reuse and diversion device, said exhaust valve preferably extends parallel or roughly parallel to said inlet pipe.

In some embodiment, said water storage container comprises water outlet pipe, said outlet pipe preferably extends parallel or roughly parallel to said inlet pipe.

In some embodiment, said water storage container comprises at least one high power electric heating tube, said electric heating tube is configured to firmly connect with said water pressure reuse and diversion device or install in the same end of said water storage container; said electric heating tube preferably extends parallel or roughly parallel to said water pressure reuse and diversion device, and occupies roughly same working space.

In some embodiment, said water pressure reuse and diversion device adopts cylindrical shape and preferably possesses same size and configuration with electric heating tube of water heater; and configure to possess open end and closed end; and set or install elastic component and matched fixing component in said closed end, said elastic component comprises joinable spring, cover and connected main body which is separably coupled with said fixing component, and configure to convert between the first position and the second position; wherein

When in the first position, said elastic component or main body meshes with said fixing component and adjoin with said closed end, in order to store own resilience of said elastic component, or resilience or kinetic energy of elastic component converted and stored by water pressure or water flow, and configure to separate with said fixing component accordingly at preset temperature or working status, so that use stored resilience or kinetic energy to move to said second position which adjoins with said open end, drive and lead the water to flow towards the second preset direction during moving it, thus help to mix water and reach thermal equilibrium; and

When in the second position, said elastic component is configured to drive through water pressure or water flow, so that move to and mesh with said fixing component until fasten in or convert to said first position, to convert and store the kinetic energy driven by water pressure or water flow, and can convert from said first position to said second position by said kinetic energy accordingly at preset water temperature or working status; keep driving and leading the water during conversion, so that quickly mix the water in different

temperatures in said water storage container, thus help to reach thermal equilibrium.

In some embodiment, cover and main body of said elastic component preferably have T-type section, and said main body has plural separated concave along the edge, in order to separably meshed with corresponding movable hook or convex of said fixing component.

The invention disclosed an improved water heater, preferably uses as electrical water heater of dishwasher, it can reduce heat loss and use water flow and mixing to improve thermal cycle of water in the vat, reach thermal equilibrium and directly reduce the time needed for heating, thus reduce energy consumption of electrical water heater. Therefore, the device proposed in the invention can effectively save energy for example in the last washing program of dishwasher, then improve dishwasher's overall energy efficiency.

Brief Description of the Drawings

Below refer to drawings to explain the invention through embodiment, wherein the drawings:

Fig.1 is diagram of prior art of industrial dishwasher;

Fig.2 is diagram of prior art of electrical water heater;

Fig.3 is diagram of washing part of dishwasher provided in the invention;

Fig.4 is diagram of water heater possessing water storage container provided in the invention;

Fig.5 is diagram of water inlet pipe provided in the invention;

Fig.6 is diagram of water pressure reuse and diversion device provided in the invention; and

Fig.7a-7c is diagram of working process of water pressure reuse and diversion device provided in the invention.

Detailed Description of the Invention

Below describe some embodiment of the invention combining with drawings, in

order to explain the art in more details.

Fig.1-2 respectively show the diagrams of prior art of industrial dishwasher and its electrical water heater, wherein the dishwasher comprises two parts dealing with the dishes, they are rinsing and washing. Each part has its own electrical water heater to heat up water inflow. Fig.2 shows the previous design of electrical water heater, its housing is made of single layer metal. There are water inlet port, water outlet port, diversion port (for maintenance), exhaust valve, thermal sensor port and etc on the housing, also install multiple groups of high power electric heating tubes on one end, and wrap heat-insulated material (e.g. heat-insulated cotton) on external layer in order to prevent heat loss.

When using dishwasher, related electrical water heater is on the bottom of dishwasher (as Fig.3) and is under each sewage plate, the dishwasher is usually placed in factory or kitchen where is wet and has high temperature. Existing heat-insulated material (e.g. heat-insulated cotton) will become wet and damaged after long-term using, thus influence the effect of heat insulation and make the heat and energy lost. It also increases the temperature of working environment that influence staffs. Therefore, the ideal is to change existing insulation structure so that improve heat loss and working environment in the factory.

On the other hand, for the business of current restaurants, they may stop running dishwasher for several hours then restart again in order to reduce operating cost. However, the temperature of hot water stored in the vat will decrease slowly after dishwasher is turned off. The electrical water heater needs to heat up the water in the vat again to required temperature after restarting. Therefore, reduce heat loss in the vat after stopping the program can reduce energy consumption of electric heating tube while heating up water in the vat after restarting. Consequently, improve heat insulation structure can effectively improve energy loss.

Fig.3-7c show different diagrams of water heater provided in the invention.

Fig.4-5 show the water heater comprises: roughly long and/or tubular water inlet pipe extends to said water storage container, it preferably sets at the end of said water storage container, or adjoin said end, or be parallel to/roughly parallel to the surface of said end; said inlet pipe is preferably configured to extend roughly along the height direction of said water storage container, and set or install at least one rotatable device with fan blades; said device with fan blades should possess plural joinable internal blades and external blades, the surface of at least one said internal blade and/or external blade is configured to intersect obliquely at a preset angle with water flow of said inlet pipe; to convert and utilize the force of water flow from said inlet pipe to rotate around the axis and make the water near periphery of said inlet pipe to flow along the first preset direction; said first preset direction is preferably roughly parallel to said height direction.

In the prior art, water inlet pipe only leads the water to the top of vat, but it is modified to long shape pipe which extends from inlet on the top to almost the bottom of vat, the overall length of pipe can preferably separate into three parts, wherein set two connecting positions to connect the devices with fan blades. The device with fan blades comprises internal blades in the pipe and joint external blades outside the pipe. Utilize 1 Bar water pressure and potential energy during water inflow to drive internal blades inside the pipe. Related internal blades will lead external blades to move and make static water around the inlet pipe in the vat to flow. This flow can make the water around electric heating tube to flow, and expedite the mixing of water which is heating up and the one hasn't been heated in the vat, it is particularly good for water convective circulation and reaching thermal equilibrium.

In some embodiment, as shown in Fig.4, the water reuse and diversion device comprises movable and lockable connecting or installing elastic component, and configure to utilize the change of water temperature, water flow and/or water pressure to convert between energy storage status and diversion status; wherein in energy storage status, said water pressure reuse and diversion

device will drive or compress and lock the elastic component to the position by water pressure or flow in order to store kinetic energy which converted by water pressure or flow; in diversion status, said water pressure reuse and diversion device will release elastic component, through resilience of said elastic component or stored kinetic energy to drive the water flow to second preset direction, in order to quickly mix the water in different temperatures in said water storage container, thus help to reach thermal equilibrium; said second preset direction is preferably parallel to the length or width or thickness direction of water storage container; and/or said second preset direction is preferably perpendicular to said first preset direction, so that expedite the mixing of water in different temperatures by water flow in different directions, thus help to reach thermal equilibrium.

In some embodiment, as shown in Fig.6, said water pressure reuse and diversion device adopts cylindrical shape and preferably possesses same size and configuration with electric heating tube of water heater; and configure to possess open end and closed end; and set or install elastic component and matched fixing component in said closed end, said elastic component comprises joinable spring, cover and connected main body which is separably coupled with said fixing component, and configure to convert between the first position and the second position.

In some embodiment, as shown in Fig.7a-7c, when in the first position, said elastic component or main body meshes with said fixing component and adjoin with said closed end, in order to store own resilience of said elastic component, or resilience or kinetic energy of elastic component converted and stored by water pressure or water flow, and configure to separate with said fixing component accordingly at preset temperature or working status, so that use stored resilience or kinetic energy to move to said second position which adjoins with said open end, drive and lead the water to flow towards the second preset direction during moving it, thus help to mix water and reach thermal equilibrium.

When in the second position, said elastic component is configured to drive through water pressure or water flow, so that move to and mesh with said fixing component until fasten in or convert to said first position, to convert and store the kinetic energy driven by water pressure or water flow, and can convert from said first position to said second position by said kinetic energy accordingly at preset water temperature or working status; keep driving and leading the water during conversion, so that quickly mix the water in different temperatures in said water storage container, thus help to reach thermal equilibrium.

In general, the water pressure reuse and diversion device of the invention utilizes heating and the change of water pressure in vat/water storage container, related water pressure drive related components/elastic component, and store related energies in spring/elastic component, spring/elastic component is finally locked by the hook at the bottom/end. It will exhaust and release the hook, release the energies stored in spring in order to generate water flow, make the water in the vat to flow, thus expedite the mixing of water which is heating up and the one hasn't been heated in the vat, to reach thermal equilibrium.

In some embodiment, as said above, the water pressure reuse and diversion device of the invention is designed as the one can put into high power electric heating tube, replace existing electric heating tube or install on the position reserved for extra electric heating tube. The design of related device should be based on the tube type, open end is open structure, there should be sealed cover inside and connecting with spring behind it. There should connect with sealed device bottom part on the other end of spring, install spring hook and thermal sensor, and can control the switch of joinable exhaust valve.

In some embodiment, springs with different stiffness coefficients can be placed into the vat/water storage containers with different capacities. By using the springs with different stiffness coefficients, make corresponding adjustment and coordination according to different capacities of vat/water storage

container, change of pressure and temperature.

When putting the water pressure reuse and diversion device of the invention to the position of replaceable high power electric heating tube, open end of device can touch with the water in the vat. When water is heating up by electric heating tube, water temperature increases, but capacity of vat/water storage container remains unchanged, the water pressure will increase, related water pressure will push sealed cover inside to the bottom thus compress the spring. This motion makes the water pouring into the pipe flow and mix the temperature of water around the open end of device.

When further pushing the sealed cover to the bottom/end of device, it will be locked by hook. Related bottom/end of device preferably has thermal sensor, and can control the exhaust valve and spring hook to release or change water pressure and store energy in the spring. At the same time, push out the water in the pipe and generate flow, quickly mix the water in the vat to reach thermal equilibrium. The piston motion of related device should be controlled by coordination of stiffness coefficient of spring, temperature inspection and exhaust valve, preferably take multiple piston motion during heating and make the water in the vat mix more quickly and better.

In some embodiment, as shown in Fig.6, 7a-7c, cover and main body of said elastic component preferably have T-type section, and said main body has plural separated concave along the edge, in order to separably meshed with corresponding movable hook or convex of said fixing component.

In some embodiment, the free end of said water pressure reuse and diversion device comprises rotatable guiding component/steering component (not shown) and/or the device with fan blades as shown in Fig.5, which correspond to convert said second preset direction in preset working status, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.

In some embodiment, said first preset direction is roughly inverse to water inflow direction of said water inlet pipe, so that expedite the mixing of water in

different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium; and/or working direction of said elastic component and/or said second preset direction is preferably perpendicular to water inflow direction of inlet pipe, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.

In some other embodiment, said water pressure reuse and diversion device comprises built-in thermal sensor, which corresponds to preset temperature in conversion between energy storage status and diversion status of said water pressure reuse and diversion device.

In some embodiment, said water storage container is configured as possessing double sealed wall or housing, comprising internal wall or internal housing for holding water, and external wall or external housing for covering said internal wall or internal housing, and thermal insulation and insulating layer or intermediary between two parties; it is preferably air or gas interlayer or vacuum in order to increase effect of insulation and reduce heat loss of water.

Therefore, heat-insulated material such as heat-insulated cotton is not required through the invention. The double sealed wall or housing can be heat-insulated and more durable, thus has better effect of thermal insulation, let the temperature of hot water in electrical water heater keep longer time.

Use infrared thermometer to measure single housing temperature of existing electrical water heater: head 94℃, middle 93℃ and tail 92℃; the temperature of double sealed housing of the invention is: head 34℃, middle 33℃ and tail 32℃ (roughly equals to room temperature).

In some embodiment, said water storage container comprises the exhaust valve which is joinable with said water pressure reuse and diversion device, it will open and close accordingly in energy storage status and diversion status of said water pressure reuse and diversion device, said exhaust valve preferably extends parallel or roughly parallel to said inlet pipe.

In some embodiment, said water storage container comprises water outlet pipe, said outlet pipe preferably extends parallel or roughly parallel to said inlet pipe.

In some embodiment, said water storage container comprises at least one high power electric heating tube, said electric heating tube is configured to firmly connect with said water pressure reuse and diversion device or install in the same end of said water storage container; said electric heating tube preferably extends parallel or roughly parallel to said water pressure reuse and diversion device, and occupies roughly same working space.

The said characteristics of claims (collectively and can be individually in appropriate case) compose a part of the invention, and introduce as reference.

Different examples or embodiment are described above, it should be aware that, they are only explanations but not used to limit the scope of protection. For example, the embodiment provided in the invention that the water heater is driven by electrical energy, but it can also use fuel gas or other energies according to actual contents of the invention under circumstance of not losing generality. It should be aware that, different parts or components of embodiment can be combined and/or mixed each other where appropriate, in order to become the other forms but not lose generality.

Claims

1. Water heater, comprises:

Roughly long and/or tubular water inlet pipe extends to said water storage container, it preferably sets at the end of said water storage container, or adjoin said end, or be parallel to/roughly parallel to the surface of said end. Said inlet pipe is preferably configured to extend roughly along the height direction of said water storage container, and set or install at least one rotatable device with fan blades; said device with fan blades should possess plural joinable internal blades and external blades, the surface of at least one said internal blade and/or external blade is configured to intersect obliquely at a preset angle with water flow of said inlet pipe; to convert and utilize the force of water flow from said inlet pipe to rotate around the axis and make the water near periphery of said inlet pipe to flow along the first preset direction; said first preset direction is preferably roughly parallel to said height direction.

And/or water pressure reuse and diversion device, comprises movable and lockable connecting or installing elastic component, and configure to utilize the change of water temperature, water flow and/or water pressure to convert between energy storage status and diversion status; wherein in energy storage status, said water pressure reuse and diversion device will drive or compress and lock the elastic component to the position by water pressure or flow in order to store kinetic energy which converted by water pressure or flow; in diversion status, said water pressure reuse and diversion device will release elastic component, through resilience of said elastic component or stored kinetic energy to drive the water flow to second preset direction, in order to quickly mix the water in different temperatures in said water storage container, thus help to reach thermal equilibrium; said second preset direction is preferably parallel to the length

or width or thickness direction of water storage container; and/or said second preset direction is preferably perpendicular to said first preset direction, so that expedite the mixing of water in different temperatures by water flow in different directions, thus help to reach thermal equilibrium.

2. The water heater of Claim 1, wherein: the free end of said water pressure reuse and diversion device comprises rotatable guiding component/steering component and/or said device with fan blades, which correspond to convert said second preset direction in preset working status, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.
3. The water heater of Claim 1, wherein: said first preset direction is roughly inverse to water inflow direction of said water inlet pipe, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium; and/or working direction of said elastic component and/or said second preset direction is preferably perpendicular to water inflow direction of inlet pipe, so that expedite the mixing of water in different temperatures by generating water flow in different directions, thus help to reach thermal equilibrium.
4. The water heater of Claim 1, wherein: said water pressure reuse and diversion device comprises built-in thermal sensor, which corresponds to preset temperature in conversion between energy storage status and diversion status of said water pressure reuse and diversion device.
5. The water heater of Claim 1, wherein: said water storage container is configured as possessing double sealed wall or housing, comprising internal wall or internal housing for holding water, and external wall or external housing for covering said internal wall or internal housing, and thermal insulation and insulating layer or intermediary between two parties; it is preferably air or gas interlayer or vacuum in order to increase effect of insulation and reduce heat loss of water.

6. The water heater of Claim 1, wherein: said water storage container comprises the exhaust valve which is joinable with said water pressure reuse and diversion device, it will open and close accordingly in energy storage status and diversion status of said water pressure reuse and diversion device, said exhaust valve preferably extends parallel or roughly parallel to said inlet pipe.
7. The water heater of Claim 1, wherein: said water storage container comprises water outlet pipe, said outlet pipe preferably extends parallel or roughly parallel to said inlet pipe.
8. The water heater of Claim 1, wherein: said water storage container comprises at least one high power electric heating tube, said electric heating tube is configured to firmly connect with said water pressure reuse and diversion device or install in the same end of said water storage container; said electric heating tube preferably extends parallel or roughly parallel to said water pressure reuse and diversion device, and occupies roughly same working space.
9. The water heater of Claim 1, wherein: said water pressure reuse and diversion device adopts cylindrical shape and preferably possesses same size and configuration with electric heating tube of water heater; and configure to possess open end and closed end; and set or install elastic component and matched fixing component in said closed end, said elastic component comprises joinable spring, cover and connected main body which is separably coupled with said fixing component, and configure to convert between the first position and the second position; wherein
When in the first position, said elastic component or main body meshes with said fixing component and adjoin with said closed end, in order to store own resilience of said elastic component, or resilience or kinetic energy of elastic component converted and stored by water pressure or water flow, and configure to separate with said fixing component accordingly at preset temperature or working status, so that use stored

resilience or kinetic energy to move to said second position which adjoins with said open end, drive and lead the water to flow towards the second preset direction during moving it, thus help to mix water and reach thermal equilibrium; and

When in the second position, said elastic component is configured to drive through water pressure or water flow, so that move to and mesh with said fixing component until fasten in or convert to said first position, to convert and store the kinetic energy driven by water pressure or water flow, and can convert from said first position to said second position by said kinetic energy accordingly at preset water temperature or working status; keep driving and leading the water during conversion, so that quickly mix the water in different temperatures in said water storage container, thus help to reach thermal equilibrium.

10. The water heater of Claim 9, wherein: cover and main body of said elastic component preferably have T-type section, and said main body has plural separated concave along the edge, in order to separably meshed with corresponding movable hook or convex of said fixing component.