CLAIMS

1. A seawater desalting apparatus using solar energy for continuously supplying heat, the apparatus comprising: a seawater purifying system, and a seawater desalting system; **characterized in that**

the seawater desalting system comprises: a solar thermal apparatus for concentrating solar energy and collecting heat, a solar energy heat storage tank, a purified seawater heater, and at least one stage of seawater flash evaporator;

the seawater flash evaporator comprises: a flash evaporator body and a seawater cooler;

a heat transfer medium chamber of the solar thermal apparatus, the solar energy heat storage tank, a first heat exchanger of the purified seawater heater utilizing a heat transfer medium as a heat source are connected in sequence to form a sealed route for circulating the heat transfer medium;

a purified seawater output main pipe of a purified seawater transporting pump in the seawater purifying system communicates with an inlet of the purified seawater heater and the seawater cooler; a seawater outlet of the purified seawater heater communicates with an inlet of a throttling device of the first-stage flash evaporator body via a heated seawater pump;

the flash evaporator body comprises: a concentrated brine outlet, a freshwater outlet, and a vapor outlet; vapor discharged from the vapor outlet passes through a second heat exchanger of the seawater cooler using vapor as a heat source and is accumulated with a freshwater in a freshwater main pipe; a sealed freshwater storage tank disposed at an end of the freshwater main pipe communicates with a vacuum pump; the concentrated brine outlet communicates with a pipe of a salt plant via a concentrated brine pump;

a seawater outlet of the seawater cooler communicates with an inlet main pipe of the purified seawater heater via a condenser body of the flash evaporator body; when at least two stage seawater flash evaporators are employed, the purified seawater output main pipe of the purified seawater pump in the seawater purifying system communicates with the seawater outlets of the condenser bodies of each stage seawater flash evaporator;

the concentrated brine outlet of a former stage flash evaporator body communicates with an inlet of the throttling device of a next stage flash evaporator body, and the concentrated brine outlet of a last stage flash evaporator body communicates with the pipe of the salt plant via the concentrated brine pump; and pressures in the flash evaporator bodies of each stage are gradually decreased whereby forming negative pressures;

the seawater purifying system is a multi-stage purifying system comprising a seawater extraction well for coarse filtration, a seawater sterilizing clarifier, a multi-stage ultra-filter provided with an active carbon filter layer and a multi-fiber filter core layer, and a deoxygenating-decarbonizing tower for deoxygenation and decarbonization arranged in sequence;

a purified seawater tank is disposed between the multi-stage ultra-filter and the deoxygenating-decarbonizing tower; the deoxygenating-decarbonizing tower communicates with a purified seawater main outlet;

the seawater extraction well communicates with the seawater sterilizing clarifier via a seawater lifting pump; the seawater sterilizing clarifier communicates with the multi-stage ultra-filter via a first seawater transporting pump; the multi-stage ultra-filter communicates with the purified seawater tank via a second seawater transporting pump; the purified seawater tank communicates with the deoxygenating-decarbonizing tower via a third seawater transporting pump; the

deoxygenating-decarbonizing tower communicates with the purified seawater main outlet via a purified seawater pump; and

the seawater sterilizing clarifier is added with a microbicide and a flocculant.

2. The apparatus of claim 1, **characterized in that**

a heated seawater pump having adjustable rotational speed is disposed between the seawater outlet of the purified seawater heater and the flash evaporator body; the seawater outlet of the purified seawater heater communicates with the throttling device disposed on the flash evaporator body via the heated seawater pump, and the throttling device is disposed above a seawater surface in the flash evaporator body; in the flash evaporator body, a foam breaker is disposed above the throttling device, a freshwater collecting disc is disposed above the foam breaker, and the condenser body is disposed on the freshwater collecting disc; and the vapor outlet is disposed at a top of the flash evaporator body, and the freshwater outlet is disposed above the freshwater collecting disc, and the concentrated brine outlet is disposed beneath the throttling device.

3. The apparatus of claim 1 or 2, **characterized in that** a seawater temperature sensor and a spare heat exchanger are disposed in the purified seawater heater; and the spare heat exchanger adopts a thermal oil furnace, an electric heating furnace, exhaust heat of flue gas from a boiler, or exhaust heat of waste heat from a turbine as a heat source.

4. The apparatus of claim 1, **characterized in that** a heat transfer medium pump is

disposed between the solar energy heat storage tank and the first heat exchanger of the purified seawater heater.

5. The apparatus of claim 1 or 4, **characterized in that** the solar power filed is a tower type solar thermal collector, a parabolic trough type evacuated tubular collector, a glass type evacuated tubular collector, or a heat pipe type evacuated tubular collector.

~~6. The apparatus of claim 1, **characterized in that**~~

~~the seawater purifying system is a multi-stage purifying system comprising a seawater extraction well for coarse filtration, a seawater sterilizing clarifier, a multi-stage ultra-filter provided with an active carbon filter layer and a multi-fiber filter core layer, and a deoxygenating-decarbonizing tower for deoxygenation and decarbonization arranged in sequence;~~

~~a purified seawater tank is disposed between the multi-stage ultra-filter and the deoxygenating-decarbonizing tower; the deoxygenating-decarbonizing tower communicates with a purified seawater main outlet;~~

~~the seawater extraction well communicates with the seawater sterilizing clarifier via a seawater lifting pump; the seawater sterilizing clarifier communicates with the multi-stage ultra-filter via a first seawater transporting pump; the multi-stage ultra-filter communicates with the purified seawater tank via a second seawater transporting pump; the purified seawater tank communicates with the deoxygenating-decarbonizing tower via a third seawater transporting pump; the deoxygenating-decarbonizing tower communicates with the purified seawater main outlet via a purified seawater pump; and~~

~~the seawater sterilizing clarifier is added with a microbicide and a~~

~~flocculant.~~

~~7.~~6. The apparatus of claim 1 or ~~6~~5, **characterized in that** the seawater extraction well is constructed at a sea beach; a well opening is disposed above a sea level at the highest tide, and a well bottom is disposed multiple meters beneath a sea level at low tides; a well wall adopts a porous concrete structure, rubbles are arranged outside the well wall, and sands are filled in the periphery of the rubbles.

~~8.~~7. A method for desalting seawater using the seawater desalting apparatus of any of claims 1-~~7~~6, the method comprising: multi-stage purifying the seawater to produce a purified seawater; collecting solar energy by the solar thermal apparatus to heat the heat transfer medium whereby converting the solar energy into heat energy of the heat transfer medium; continuously heating the purified seawater to a preset temperature by the heat energy of the heat transfer medium, and transporting the heated purified seawater to at least one-stage flash evaporator for flash evaporation; allowing pressures in the flash evaporator bodies of each stage to gradually decrease to form a negative pressure during the flash evaporation; condensing a vapor after the flash evaporation to separate the freshwater, and converting remaining vapor into the freshwater by the seawater cooler; and transporting a non-vaporized concentrated brine from a bottom of the flash evaporator to the salt plant;

**characterized in that**

when multi-stage flash evaporators are employed, the concentrated brine at the bottom of the former stage flash evaporator successively flow into a next stage flash evaporator, and the freshwater is gradually condensed and separated out during the multi-stage evaporation process, and the non-vaporized concentrated brine is

transported to the salt plant; and

at the same time the heat energy of the sunlight is collected by the solar thermal apparatus and the heat transfer medium is utilized to heat the purified seawater, the heat energy of the heat transfer medium is stored in the solar energy heat storage tank so as to continuously heat the purified seawater using the stored heat transfer medium during nocturnal periods or cloudy days.

~~9.~~8. The method of claim ~~8~~7, **characterized in that** the preset temperature of the purified seawater heated by the heat transfer medium is 55°C-70°C or 70°C-120°C, and the heat transfer medium is heated to a temperature of 178°C-600°C by the solar thermal apparatus.

~~10.~~9. The method of claim ~~8~~7, **characterized in that** the preset temperature of the purified seawater heated by the heat transfer medium is ±70°C, and the heat transfer medium is heated to the temperature of 275°C-395°C by the solar thermal apparatus.