

WATER RESERVOIR SYSTEM FOR COLLECTING WATER FLOW ENERGY FOR GENERATING ELECTRICITY

BACKGROUND OF THE INVENTION

The present invention relates to a water reservoir systems, and more particularly to such a water reservoir system which is comprised of a water reservoir unit and a water drawing unit, and adapted to utilize the kinetic energy of a flow of water for generating electricity.

Thermo power, hydro power and nuclear power are intensively used nowadays for driving power generator means to generate electricity. Using hydro power for generating electricity is one of the most cost-effect ways. However, building a dam for keeping back the water of a river for use in generating electricity may damage the environment and destroy the relation of the living things to their environment. Using thermo power to boil water for generating electricity consumes a big volume of fuel oil, and produces toxic gas that pollutes the air. Using nuclear power for generating electricity is expensive. Besides, it is difficult to properly dispose of waste water and material from a nuclear power plant. Therefore, these conventional power generating methods are not satisfactory in function. Further, the supply of natural flow power, for example the kinetic energy of the

wind, the tide of the sea, etc., is inexhaustible. There are scientists trying hard to utilize natural flow power for generating electricity without damaging the environment.

SUMMARY OF THE INVENTION

The present invention has been accomplished under the circumstances in view. It is one object of the present invention to provide a water reservoir system which utilizes natural flow power to draw water from a water source to a high place for providing a kinetic energy for generating electricity. It is another object of the present invention to provide a water reservoir system which is practical for use in fish farms, fresh water processing plants, water preservation and irrigation works. To achieve these and other objects of the present invention, there is provided a water reservoir system which is comprised of a water drawing unit adapted to pump water from a water source for example the sea to a high place, and a water reservoir unit adapted to collect water from the water drawing unit for generating electricity or other purposes. The water drawing unit comprises a plurality of pumps driven by natural flow power for example the force of the wind or the tide of the sea, to pump water from the sea to the water reservoir unit. The water reservoir unit comprises a plurality of filter tanks adapted to receive water from the pumps of the water drawing unit and to remove solid

matters from water, a plurality of check valves respectively mounted between the filter tanks and the pumps to prevent a reverse flow of water, and a water accumulator adapted to receive filtered water from the filter tanks.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front plain view of a water reservoir system according to a first embodiment of the present invention;

Fig. 2 is a side view of the water reservoir system shown in Figure 1;

Fig. 3 is a side plain view of a water reservoir system according to a second embodiment of the present invention;

Fig. 4 is a sectional view of the water reservoir system of the second embodiment of the present invention;

Fig. 5 is a front plain view in an enlarged scale of the water drawing unit of the water reservoir system of the second embodiment of the present invention;

Fig. 6 is a side plain view of a water reservoir system according to a third embodiment of the present invention;

Fig. 7 is a front plain view in an enlarged scale of the water drawing unit of the water

reservoir system of the third embodiment of the present invention;

Fig. 8 is a side plain view in an enlarged scale of a vane wheel for a power machine for the third embodiment of the present invention;

Fig. 9 is a side plain view of a water reservoir system according to a fourth embodiment of the present invention;

Fig. 10 is a top view of a power machine for a water reservoir system according to a fifth embodiment of the present invention;

Fig. 11 is a side plain view of a water reservoir system according to a sixth embodiment of the present invention; and

Fig. 12 shows another alternate arrangement of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figures 1 and 2, a water reservoir system 1 in accordance with a first embodiment of the present invention comprises broadly a water drawing unit 11, and a water reservoir unit 2 for collecting water drawn from the water drawing unit 11. The water drawing unit 11 comprises a plurality of power machines 3 adapted to receive natural flow power, and a plurality of pumps 32 disposed in communication with a water source

and respectively driven by the power machines 3. The water reservoir unit 2 comprises a plurality of filter tanks 21 respectively connected to the pumps 32 to receive water from the water source, a plurality of check valves 323 respectively mounted between the filter tanks 21 and the pumps 32 to prohibit a reverse flow of water, a water accumulator 22 connected to the filter tanks 21 by a pipe 20 to collect filtered water, a water tank 23 disposed in communication with the water accumulator 22. The filter tanks 21, the water accumulator 22 and the water tank 23 are arranged in a certain altitude. The filter tanks 21 are arranged one higher than another, and the filter tank which is spaced farther from the water accumulator 22 is disposed higher. A plurality of drain pipes 211 are respectively mounted on the filter tanks 21, the water accumulator 22 and the water tank 23 at a bottom side for carrying off sands from the filter tanks 21, or water from the water accumulator 22 to a hydraulic power generator 221 or from the water tank 23 to other places for utilization. Branch pipes 231 are connected between the drain pipes 211 of the water accumulator 22 and the water tank 23. Control valves 232 are respectively mounted on the drain pipes 211 and the branch pipes 231 to control the flow rate of water and its flowing direction. The power machines 3 are driven to

work by the kinetic energy of a natural flow source (for example, the kinetic energy of water waves, wind, the tide of the sea, etc.). When the power machines 3 are started, the pumps 32 are reciprocated to pump water from the water source to the filter tanks 21 through the check valves 323. At the filter tanks 21, solid matter is removed from intake water and then carried away from the filter tanks 21 through the respective drain pipes 211 by means of the control of the respective control valves 232. Filtered water is then delivered from the filter tanks 21 through the pipe 20 to the water accumulator 22 and the water tank 23 (water flows from the water accumulator 22 to the water tank 23 only when the water level of the water accumulator 22 surpasses the connecting point between the water accumulator 22 and the water tank 23). When a certain amount of water has been obtained in the water accumulator 22 and the water tank 23, the control valve 232 of the drain pipe 211 of the water accumulator 22 is opened to let water flow out of the water accumulator 22 to the hydraulic power generator 221, causing the hydraulic power generator 221 to be driven to generate electricity. Alternatively, the control valve 232 of the drain pipe 211 of the water tank 23 can be opened to let water flow out of the water tank 23 to the hydraulic power generator 221, or a fish farm or freshwater processing

plant. By means of the above arrangement, the system utilizes natural flow power to draw water from a natural water source to a high place, permitting it to be discharged further to power generator means at a low place so that the kinetic energy of the discharged flow of water can be converted into electric energy.

Referring to Figure 3, the power machine 3 is a windmill 31 coupled to the corresponding pump 32 by a reduction gear 33. The windmill 31 comprises a tower 34, a transmission mechanism 35 mounted on said tower 34, a plurality of vanes 352 adapted to receive the kinetic energy of the wind and to turn the transmission mechanism 35, a rudder 36 adapted to adjust the direction of the vanes 352. The transmission mechanism 35 comprises a main shaft 351 coupled to the vanes 352, a link 353 having one end coupled to the main shaft 351 by a set of meshed bevel gears 354 and an opposite end coupled to the pump 32 through the reduction gear 33. The water input port of the pump 353 is connected to the sea by a water pipe 321. When the vanes 352 are turned by the wind, the rotary power of the vanes 352 are transmitted through the main shaft 351 to the link 353 and then to the pump 32 via the reduction gear 33, causing the pump 32 to pump water from the sea into the water pipe 321, permitting pumped

water to be further delivered through a water delivery pipe 322 to the corresponding filter tank 21 of the water reservoir unit 2.

Referring to Figures 4 and 5, a water reservoir system 12 in accordance with a second embodiment of the present invention comprises broadly a water drawing unit 121, and a water reservoir unit 49 for collecting water drawn from the water drawing unit 121. The water drawing unit 121 comprises a plurality of power machines 4 adapted to receive natural flow power, and a plurality of pumps 400 disposed in communication with a water source, for example, the sea, and respectively driven by the power machines 4 to pump water from the sea to the filter tanks 44 through a respective water delivery pipes 48 and a respective check valve 241 in the respective water delivery pipe 48. The water reservoir unit 49 comprises a plurality of filter tanks 44 respectively connected to the pumps 400 to receive water from the sea, a plurality of check valves 241 respectively mounted between the filter tanks 44 and the pumps 400 to prohibit a reverse flow of water, a water accumulator 492 connected to the filter tanks 44 to collect filtered water, and a water tank 493 connected to the water accumulator 492. The power machines 4 are reciprocating mechanisms 40 submerged in the sea. Each

reciprocating mechanism 40 comprises a casing 42 defining a receiving chamber 41 and a plurality of water inlets 43 in communication with the receiving chamber 41, a movable bumper 45 moved in the receiving chamber 41 and adapted to bear the wave pulse of the sea, and a plurality of spring elements 46 mounted inside the casing 42. Each pump 400 comprises a pressure chamber 421 mounted inside the casing 42 of the corresponding reciprocating mechanism 40 and disposed in communication with the corresponding filter tank 44, a water passage 422 disposed in communication with the pressure chamber 421 and the water inlets 43 of the corresponding reciprocating mechanism 40, an one-way valve 423 mounted in the water passage 422 to let water flow from the water inlets 43 to the pressure chamber 421 and to prohibit a reverse flow of water (see the dotted line shown in Figure 5), and a piston 424 connected to the movable bumper 45 and moved with it in the pressure chamber 421. The receiving chamber 41 of the casing 42 has a plurality of sliding grooves 425. The movable bumper 45 is supported on the spring elements 46 and mounted with a plurality of rollers 451 adapted to move in the sliding grooves 425. The spring elements 46 impart an outward pressure to the movable bumper 45, causing the movable bumper 45 to be forced against the tide of the

sea. Further, a meshed guard 47 is covered around each power machine 4 to prevent fishes and other objects from passing to the inside of each power machine 4.

Referring to Figures 4 and 5 again, when the water of the sea enters the receiving chamber 41 through the water inlets 43, it flows into the pressure chamber 421 through the water passage 422, causing the pressure chamber 421 to be filled up with water, at the same time the movable bumper 45 is pushed to the front side of the receiving chamber 41 by the spring force of the spring elements 46. When the tide of the sea beats the movable bumper 45 (see the imaginary lines shown in Figure 4), the movable bumper 45 is moved backwards to compress the spring elements 46 and to force water out of the water inlets 43, and at the same time the piston 424 is moved backwards into the pressure chamber 421 to force water out of the pressure chamber 421 into the corresponding water delivery pipe 48. When water is forced into each water delivery pipe 48, it is accumulated therein and stopped from flowing backwards by the respective check valve 241. When the tide of the sea falls, the movable bumper 45 is immediately pushed the front side of the receiving chamber 41 by the spring elements 46 (see the real line shown in Figure 4), permitting water to flow to the inside of the receiving

chamber 41 through the water inlets 43. Therefore, when the tide of the sea rises and falls, water is continuously pumped to the filter tanks 44 through the water delivery pipes 48 by the pumps 400 of the power machines 4.

Referring to Figures 6 and 7, a water reservoir system 13 in accordance with a third embodiment of the present invention comprises broadly a water drawing unit 131, and a water reservoir unit 25 for collecting water drawn from the water drawing unit 131. The water drawing unit 131 comprises a plurality of power machines 5 adapted to receive natural flow power, and a plurality of pumps 52 disposed in communication with a water source, for example, the sea, and respectively driven by the power machines 5 to pump water from the sea to the filter tanks 51 of the water reservoir unit 25 through a respective water delivery pipes 13 and a respective check valve 251 in the respective water delivery pipe 13. The water reservoir unit 25 comprises a plurality of filter tanks 51 respectively connected to the pumps 52 to receive water from the sea, a plurality of check valves 251 respectively mounted between the filter tanks 51 and the pumps 52 to prohibit a reverse flow of water, a water accumulator 252 connected to the filter tanks 51 to collect filtered water, and a water tank 253 connected to the water accumulator 252. The power

machines 5 are submerged in the sea. Each power machine 5 comprises a vane wheel 53 coupled to one pump 52, and a reduction gear 54 coupled between the vane wheel 53 and the pump 52. The vane wheel 53 comprises a flywheel 531 and a plurality of vanes 532 raised around the flywheel 531. The pump 52 and the reduction gear 54 of each power machine 5 are mounted on a base 55 under the sea. A meshed guard 56 is covered around each power machine 5 for protection.

Referring to Figure 8 and Figures 6 and 7 again, the vanes 532 are pivoted to the flywheel 531. When the tide of the sea rises and beats the vanes 532, the vanes 532 at the upper part of the flywheel 531 are turned from a sloping position (see the dotted line shown in Figure 8) to a vertical position (see the real line shown in Figure 8) perpendicular to the periphery of the flywheel 531, and the vanes 532 at the lower part of the flywheel 531 are turned from a vertical position to a sloping position, therefore the vane wheels 53 of the power machines 5 are forced by the tide of the sea to turn counter-clockwise, and the rotary power of the power machines 5 is transmitted to the respective pumps 52 through the respective reduction gears 54, causing the pumps 52 to pump water from the sea to the filter tanks 51 for filtration, permitted filtered water to be further

delivered to a power generator unit 58 for generating electricity.

Referring to Figures 9 and 11, a water reservoir system 14 in accordance with a fourth embodiment of the present invention comprises broadly a water drawing unit 141, and a water reservoir unit for collecting water drawn from the water drawing unit 141. The water drawing unit 141 comprises a plurality of power machines 6 adapted to receive natural flow power, and a plurality of pumps 62 disposed in communication with a water source, for example, the sea, and respectively driven by the power machines 6 to pump water from the sea to the filter tanks 81 of the water reservoir unit. Check valves 261 are respectively mounted in the water delivery pipes between the filter tanks 81 and the pumps 62 to prevent a reverse flow of water. The power machines 6 are submerged in the sea. Each power machine 6 comprises a plurality of a vane wheel unit 63, and a reduction gear 60 coupled between the vane wheel unit 63 and the corresponding pump 62. The vane wheel unit 63 comprises a plurality of vane wheels 631 of different diameters arranged in proper order, and is disposed axially against the tide of the sea. The vane wheel 631 which has the biggest diameter is disposed adjacent to the reduction gear 60, and the vane wheel 631 which has the

smallest diameter is disposed at the front side far from the reduction gear 60. When the tide of the sea rises and falls, the vane wheels 631 are simultaneously turned, and the rotary power of the vane wheels 631 are transmitted to the corresponding pump 62 through the reduction gear 60, causing the corresponding pump 62 to pump water from the sea to the corresponding filter tank 81. Further, a meshed guard 66 is covered around each power machine 6 for protection.

Referring to Figure 10, a water reservoir system in accordance with a fifth embodiment of the present invention is shown substantially similar to the aforesaid fourth embodiment with the exception of the power machines. According to this embodiment, the power machine, referenced by 7, is protected by a meshed guard 74, comprising a plurality of vane wheels 71 connected in parallel by bevel gears 73, and the vanes 72 of the vane wheels 71 are disposed at different axial positions.

Referring to Figure 11, a water reservoir system 15 in accordance with a six embodiment of the present invention comprises broadly a water drawing unit 151, and a water reservoir unit 84 for collecting water drawn from the water drawing unit 151. The water drawing unit 151 comprises a plurality of power machines 8 adapted to receive natural flow power, and a

plurality of pumps 82 disposed in communication with a water source, for example, the sea, and respectively driven by the power machines 8 to pump water from the sea to the filter tanks 81 of the water reservoir unit 84. The water reservoir unit 84 comprises a plurality of filter tanks 81 respectively connected to the pumps 82 to receive water from the sea, a plurality of check valves 86 respectively mounted between the filter tanks 81 and the pumps 82 to prohibit a reverse flow of water, a water accumulator 841 connected to the filter tanks 81 to collect filtered water, and a water tank 842 connected to the water accumulator 841. The power machines 8 are submerged in the sea. Each power machine 8 comprises a turbine 83, and a reduction gear 80 coupled between the turbine 83 and the corresponding pump 82. A meshed guard 87 is covered around each power machine 8 for protection. When the power machines 8 are operated, water is pumped from the sea to the filter tanks 81 and then delivered to the water accumulator 841 and the water tank 842, and accumulated water can be discharged from the water accumulator 841 to a power generator unit 85 for generating electricity.

The aforesaid first embodiment of the present invention is adapted to be installed in the seaside, river side to receive the kinetic energy of the wind; the

aforesaid third, fourth, fifth and sixth embodiments of the present invention are adapted to be installed deeply in the river or the sea to receive the kinetic energy of the flow of river water or sea water; the aforesaid second embodiment of the present invention is adapted to be installed in the seaside or river side to receive the kinetic energy of the tide of the sea or river. Further, different types of power machines may be combined into a water drawing unit to achieve a high performance (see Figure 12).

It is to be understood that the drawings are designed for purposes of illustration only, and are not intended as a definition of the limits and scope of the invention disclosed.



I claim:

1. A water reservoir system comprising:

a water drawing unit comprising a plurality of pumps driven by natural flow power to pump water from a water source to a water reservoir unit; and

a water reservoir unit adapted to collect water from said water drawing unit, said water reservoir unit comprising a plurality of filter tanks adapted to receive water from said pumps of said water drawing unit, a plurality of check valves respectively mounted between said filter tanks and said pumps to prevent a reverse flow of water, and a water accumulator adapted to receive filtered water from said filter tanks, said filter tanks and said water accumulator being disposed in a predetermined altitude above the elevation of said water drawing unit, said filter tanks having a respective drain pipe at a bottom side, said water accumulator having a drain pipe at a bottom side connected to a hydraulic power generator unit.

2. The water reservoir system of claim 1, wherein each of said power machines are windmills turned by the force of the wind to drive said pumps, each of said windmill comprising a transmission mechanism coupled to one pump, a plurality of vanes adapted to receive the kinetic energy of the wind and to turn said



transmission mechanism, and a rudder coupled to said transmission mechanism adapted to adjust the direction of said transmission mechanism and said vanes against the wind.

3. The water reservoir system of claim 1, wherein said power machines are reciprocating mechanisms submerged in a water, each of said reciprocating mechanisms comprising a casing defining a receiving chamber and a plurality of water inlets in communication with said receiving chamber, a movable bumper moved in said receiving chamber and adapted to bear wave pulses of said water source, and a plurality of spring elements mounted inside said casing to impart an outward pressure to said movable bumper against wave pulses of said water source; each of said pumps of said water drawing unit comprises a pressure chamber mounted inside the casing of one reciprocating mechanism and disposed in communication with one filter tank of said water reservoir unit, a water passage disposed in communication with said pressure chamber and the water inlets of the corresponding reciprocating mechanism, an one-way valve mounted in said water passage to let water flow from said water inlets to said pressure chamber and to prohibit a reverse flow of water, and a piston connected to the movable bumper of the corresponding reciprocating mechanism and moved with it in said pressure chamber.



4. The water reservoir system of claim 1, wherein said power machines are submerged in a water source, each of said power machines comprising a vane wheel coupled to one pump of said water drawing unit, and a reduction gear coupled between said vane wheel and the corresponding pump, said vane wheel comprising a flywheel and a plurality of vanes pivoted to said flywheel.

5. The water reservoir system of claim 1, wherein said power machines are submerged in a water source, each of said power machines comprising a plurality of vane wheels of different diameters connected in series and coupled to one pump of said water drawing unit by a reduction gear, said vane wheels being arranged in such an order that the bigger the diameter is the shorter the distance from said reduction gear.

6. The water reservoir system of claim 1, wherein said power machines are submerged in a water source, each of said power machines comprising a plurality of vane wheels connected in parallel by transmission gears and coupled to one pump of said water drawing unit by a reduction gear.

7. The water reservoir system of claim 1, wherein said power machines are turbines submerged in a water source and respectively coupled to the pumps of said water drawing unit by a respective reduction gear.

8. The water reservoir system of claim



1, wherein said water reservoir unit comprises a water tank adapted to receive water from said water accumulator, said water tank having a drain pipe at a bottom side, and a control valve mounted in the drain pipe of said water tank for controlling its passage.

9. The water reservoir system of claim 1, wherein said power machines of said water drawing unit are connected with one another to said water reservoir unit by a water delivery pipe in a staggered manner.