

TANK FOR AQUATIC LIFE

This invention relates to a tank for keeping or fostering aquatic life such as freshwater fish, tropical fish, frogs and hyrophytes (hereinafter referred to as an "aquatic tank") mainly for display purpose in homes, shops, offices and aquaria and, particularly, to an aquatic tank which provides enhanced decorative or display effect.

A typical example of aquatic tank is the so-called aquarium tank. To enhance the decorative or display effect in the prior art aquarium tanks, imitations of hydrophytes, rocks, coral and so forth are placed in the tank, and water wheels rotated by bubbles rising from an air pump are also placed therein.

With the prior art aquatic tanks, the decorative or display effect is thus enhanced without changing the structure of the tank but by placing separate decorative things under water. For this reason, it is difficult to provide novel decorative effect.

In addition, such things which are merely added for the decorative purpose look somewhat out of place among aquarium fish.

An object of the invention is to provide an aquatic tank, which has novel decorative and/or display effect.

According to the present invention there is provided an aquatic tank for keeping or fostering aquatic life, comprising a tank body which in use contains water, a plurality of masses laid on the bottom of said tank body,

each said mass being small in comparison to the volume of the tank, said masses having a specific gravity larger than that of said water, a water supply pump having a water jet orifice for jetting water pumped out from said water supply pump, said water jet orifice being disposed under a layer of said small masses and directed upward so that in use said masses are caused to be propelled up by water jetted from said water jet orifice.

According to the invention, the small masses such as pebbles deposited on the bottom of the tank are propelled up locally. Thus, it is possible to obtain a decorative and/or display effect which has not been obtained with the prior art aquatic tanks.

The invention will now be described in detail in conjunction with an embodiment thereof illustrated in the appended drawings, in which:

Figure 1 is a perspective view showing an aquarium tank as an embodiment of the aquatic tank according to the invention;

Figure 2 is an exploded perspective view showing the tank shown in Figure 1;

Figure 3 is a sectional view showing the tank shown in Figure 1;

Figure 4 is a fragmentary sectional view showing the essential part of the tank shown in Figure 1;

Figure 5 is an explanatory view showing a fish detector for operating a water supply pump;

Figure 6 is an explanatory view showing a person detector for operating the water supply pump;

Figure 7 is an explanatory view showing a sound detector for operating the water supply pump;

Figures 1 to 4 show an aquarium tank as an embodiment of the aquatic tank according to the invention. It is to be understood that the embodiment described below is by no means limitative. The aquarium tank 1 comprises a tank body 2 open at the top, a vertical partitioning

member 5 dividing the interior of the tank body 2 into a display zone and a functional zone 4, a bottom member 6 disposed on the bottom of the display zone 3, and a lid member 7 fitted on the open top of the tank body 2. In the functional zone 4 there are provided a water supply pump 29 for jetting water upward through the bottom member 6 and a filter mechanism.

The tank body 2 comprises an outer frame 8 and a transparent inner frame 9. The outer frame 8 is made of a synthetic resin or the like material. It is partly open at the front and opposite sides and fully open at the top. The transparent inner frame 9 is made of glass or a transparent synthetic resin. It has a U-shaped sectional profile and is fitted in the outer frame 8 and watertightly closes the open front and opposite side portions of the outer frame 8. The tank body 2 has its opposite side inner wall surfaces formed with notches 10 in which the opposite side edges of the partitioning member 5 are fitted. The bottom inner surface of the tank body 2 is formed with a transversal groove or notch 11 in which the lower end of the partitioning member 5 is supported.

The lid member 7 which is fitted on the open top of the tank body 2 is made of a synthetic resin and has a shallow frame-like shape open at the bottom. It has a hinged lid 12 provided at its front part. It also has illumination lamps 13 provided behind the hinged lid 12. It further has a power plug receptacle 14 provided adjacent its rear for connection to a power source for a heater and a pump.

The partitioning member 5 which is fitted in the tank body 2 is a plate-like member made of a synthetic resin. It has a main partitioning plate 15, a horizontal partitioning plate 17 and first to fourth vertical partitioning plates 18a to 18d. The main partitioning

plate 15 constitutes the back of the display zone 3. It has thin slots 16 which permit passage of water but prevent fish from passing therethrough. The horizontal partitioning plate 17 is integral with a lower portion of the back side of the main partitioning plate 15. The first to fourth vertical partitioning plates 18a to 18d are integral with the upper side of the horizontal partitioning plate 17 and the back side of the main partitioning plate 15. To fit the partitioning member 5 in the tank body 2, the member 5 is lowered slowly from its state shown in Figure 2 while fitting its opposite side edges in the notches 10 of the tank body 2 to eventually fit its lower end in the groove or notch 11 formed in the bottom of the tank body 2. When the partitioning member 5 has thus been fitted in the tank body 2, the interior of the tank body 2 is divided into the display zone 3 on the front side and the functional zone 4 on the rear side of the partitioning member 5. In the functional zone 4 and under the horizontal partitioning plate 17, a heater chamber 20 is defined, in which a heater 19 with a thermostat is accommodated. A pump chamber 21 is defined between the first and second vertical partitioning plates 18a and 18b, a first filter chamber 22a is defined between the second and third vertical partitioning plates 18b and 18c, and a second filter chamber 22b is defined between the third and fourth vertical partitioning plates 18c and 18d.

The bottom member 6 is a plate-like member made of a synthetic resin. Its shape conforms to the shape of the bottom of the display zone 3. It has small slits 23 via which pebbles or the like will not fall and which are formed substantially over the entire bottom surface. In addition, the bottom member 6 has a jet hole or orifice 24. Further, it has a plurality of depending legs 25. Therefore, when the bottom member 6 is fitted in the

display zone 3 of the tank body 2, a gap 26 is defined between the bottom surface of the bottom member 6 and the bottom of the tank body 2. Pebbles or other such small masses 27, the specific gravity of which is larger than that of water, are laid to a suitable thickness on the bottom member 6. In the illustrated embodiment, the pebbles 27 or the like are laid on a net 28 which functions as part of the bottom member 6.

Now, a mechanism for propelling up the pebbles 27 and a filter mechanism for filtering water will be described particularly with reference to Figure 4.

In the pump chamber 21 in the functional zone 4 defined by the partitioning member 5, two underwater pumps 29 and 30 are provided. The pump 29 is a water supply pump and the other pump 30 is a filter pump. For mounting the water supply and filter pumps 29 and 30 in the pump chamber 21, the partitioning member 5 is desirably provided with holes or like supports (not shown), in which the pump housings or the like are fitted.

A water supply duct 31 is connected to the outlet of the water supply pump 29 such that it extends through a notch 32 formed in the partitioning member 5 and along the gap 26 formed under the bottom member 6. Its free end is provided with a nozzle 33 having an upwardly directed jet orifice 34 found in or in register with the hole 24 formed in the bottom member 6. While only a single nozzle 33 is shown, it is possible to provide two or more nozzles at the free end of branches of the water supply duct 31. Alternatively, a plurality of nozzles may be provided at the free end and an intermediate position or positions of the water supply duct 31.

As shown in Figure 3, another water supply duct 35 is connected to the outlet of the filter pump 30. The water supply duct 35 has downwardly directed openings above the first and second filter chambers 22a and 22b.

The first and second filter chambers 22a and 22b are filled with filter material 36.

The use of the aquarium tank having the above construction will now be described.

First, the partitioning member 5, bottom member 6 and pumps 29 and 30 are set in the tank body 2, then the power source plug is inserted in the receptacle 14, and subsequently a suitable amount of water is charged into the tank body 2. As a result, the space 26 under the bottom member 6 and the pump chamber 21 are filled with water. Afterward, pebbles or similar small masses 27 are laid to a uniform thickness on the bottom member 6.

When operating the filter pump 30 in this state, water in the pump chamber 21 is withdrawn into the pump 30 through the inlet thereof, and water discharged from the outlet of the pump 30 is supplied through the water supply duct 35 onto the filter material 36 in the first and second filter chambers 22a and 22b to be filtered through the filter material. The filtered water passes through a large number of small holes 37 formed in the horizontal partitioning plate 17 to flow through the heater chamber 20 into the display zone 3. In this way, water in the aquarium tank is circulated and filtered throughout the circulation.

When the water supply pump 29 is operated, water in the pump chamber 21 is withdrawn into the pump 29 through the inlet thereof, and water discharged from the outlet of the pump 29 is supplied through the water supply duct 31 to the display zone 3 to be jetted upward from the jet orifice 34 of the nozzle 33.

When water is jetted upward through the bottom member 6 in this way, pebbles 27 deposited on the bottom member 6 are propelled upward by the jetting water, as shown in Figure 4. When the levitated pebbles 27 lose their upward speed, they begin to gradually fall downward

in the water by their own weight. The smaller the size of the pebbles 27 or the lighter the weight thereof, the higher the position of the pebbles 27 reach.

If falling pebbles 27 enter the jetting water, they are propelled up again, while those not entering the jetting water fall onto the deposited pebbles 27, i.e., at positions slightly away from the hole 24 of the bottom member 6, from which water is jetted upward. It may be thought that with continuous upward jetting of water around the hole 24 of the bottom member 6, most of the pebbles 27 in the neighborhood of the hole 24 will be propelled up and dispersed so that thereafter only a small number of pebbles 27 will be propelled up. However, as the number of the pebbles 27 in the neighborhood of the hole 24 is reduced, surrounding deposited pebbles 27 tumble down toward the hole 24. In this way, pebbles 27 are progressively supplied at a certain rate to the neighborhood of the hole 24 at all times. The portion where the pebbles have tumbled down is made up for by pebbles 27 falling after being propelled up by the jetting water. Thus, once pebbles 27 are laid to a certain thickness on the bottom member 6, those in the neighborhood of the hole 24 are circulated, thus eliminating the reduction in number of pebbles 27 to be propelled up.

Pebbles 27 are by no means limitative as small masses to be propelled up, and any small masses may be used so long as their specific gravity is larger than that of water. For instance, it is possible to use fine sand particles such as coral sand or siliceous sand. In addition, it is possible to suitably select the color and grain size of the small masses 27. For instance, using a mixture of white and blue pebbles 27 may enhance the decorative effect.

Further, while in the above embodiment the water

supply and filter pumps 29 and 30 were provided as separate pumps, it is possible to provide a single pump concurrently serving as the two pumps and provide the water supply duct 31 connected to the outlet of the pump with two branch ducts, one leading water to the filter material 36 and the other leading water to the upward jet orifice 34 at the hole 24 of the bottom member 6. In this case, a change-over valve may be provided at the branching point and switched at a time interval set by a change-over timer to supply water alternately to the filter material and to the jet orifice for propelling up pebbles 27. It is possible to use a pump capable of flow rate control as the water supply pump 29.

In the above embodiment the pumps are continuously operated, and therefore pebbles 27 are propelled up at all times from the bottom of the display zone 3. Instead, a timer 38 may be provided in the lid member 7 or the like, and the water supply pump 29 may be operated at time intervals which are preset by the timer 38. In this case, the water supply pump 29 is operated intermittently to propel up pebbles 27 intermittently, thus obtaining enhanced decorative or display effect.

Figure 5 shows a case where the aquatic tank according to the invention is used in an aquarium or the like. In this instance, an optical sensor (or detector) 39 is disposed at a desired position in the display zone 3. The sensor 39 comprises a light-emitting element 39a and a light-receiving element 39b which are spaced apart a distance permitting fish to pass therethrough. The optical sensor 39 is connected to a controller 40 which is provided in the lid member 7 and controls the operation of the water supply pump 29. Thus, the water supply pump 29 may be operated for a predetermined period of time by the controller 40 only in response to a signal which is output from the optical sensor 39 when a fish passes between the

light-emitting and light-receiving elements 39a and 39b. In this case, pebbles 27 are propelled up in relation to the movement of fish and thus without any regularity. Thus, the decorative or display effect may be enhanced in a different sense.

The optical sensor as described above is by no means limitative, and it is possible to use a sensor of any structure so long as it can detect fish.

Figure 6 shows a different example of use of the aquatic tank according to the invention. In this instance, a sensor 41 capable of detecting a person is disposed at a position in front of or spaced apart from the aquatic tank 1 and is connected to a controller 42. Thus, the water supply pump 29 may be operated for a predetermined period of time when the detector 41 detects a person approaching the aquatic tank 1. In this case, the spectator and water supply pump 29 interact with each other, and it is possible to obtain a decorative or display effect with an unexpected property.

Figure 7 shows a further example of use of the aquatic tank according to the invention. In this instance, a sensor 42 capable of detecting sound is provided and connected to a controller 44. In this case, the water supply pump 29 may be operated by the controller 44 when an external sound reaches a predetermined level or when sound having a particular tone quality is detected by the sensor 43. For instance, this aquatic tank 1 may be installed in an aquarium, and the water supply pump 29 may be operated when a visitor's voice level exceeds a predetermined level or when a particular sound such as a child's voice is detected. Further, it is possible to detect the tones of music played in the aquarium and control the amount of water discharged from the water supply pump 29 according to the level or rhythm of the musical tones, thus synchronizing the rising of pebbles 27

with the tones.

Further, a temperature sensor may be provided and connected to a controller so as to operate the water supply pump 29 to propel up pebbles when the temperature increases beyond a predetermined temperature.

While the above embodiment relates to an ordinary size aquarium tank, this invention may be applied not only to small size aquatic tanks but also to large size ones such as those used in an aquarium. In addition, it is possible to keep or foster not only fish but also any other type of aquatic life, for instance frogs and hydrophytes.

Further, the arrangement of the water supply pump and so forth may be suitably selected. For example, since an aquarium permits installation of a large-scale water tank with pebbles or similar small masses laid comparatively thickly, it is possible to provide an underwater pump as the water supply pump in the small mass layer such that its outlet is directed upward and used as a water jet orifice for directly propelling up small masses. In such case, the separate pipe arrangement of the water supply duct may be dispensed with.

Further, a water supply pump may be provided in a decorative body, for instance, an imitation of a rock, and an upwardly directed water jet orifice may be disposed behind the decorative body. With this arrangement, the space utilization efficiency can be enhanced and a spectator or visitor in front of the decorative body can enjoy not only the decorative body but also the pebbles or the like rising from the water jet orifice. Thus, the decorative and display effects can be synergistically enhanced.

As has been described in the foregoing, according to the invention pebbles or other such small masses that are deposited on the bottom of the tank are

propelled up. Thus, the decorative or display effect can be enhanced in a unique way, which has heretofore not been provided by the prior art aquatic tanks. Besides, since the pebbles or the like on the bottom are propelled upward without placing any separate decorative object under water, there is no possibility of giving the spectator an unnatural impression, and it is possible to enhance the decorative effect in a way that appears natural.

Further, by permitting pebbles or the like to rise in response to the movement of fish or the position of a spectator or in reaction to sound, unexpected properties may be provided to further enhance the decorative or display effect.



CLAIMS:

1. An aquatic tank for keeping or fostering aquatic life, comprising a tank body which in use contains water,
5 a plurality of masses laid on the bottom of said tank body, each said mass being small in comparison to the volume of the tank, said masses having a specific gravity larger than that of said water, a water supply pump having a water jet orifice for jetting water pumped out
10 from said water supply pump, said water jet orifice being disposed under a layer of said small masses and directed upward so that in use said masses are caused to be propelled up by water jetted from said water jet orifice.
- 15 2. An aquatic tank according to claim 1, wherein said water supply pump is provided with a timer for intermittently operating said water supply pump at predetermined time intervals.
- 20 3. An aquatic tank according to claim 1, which further comprises a detector for detecting fish at a predetermined position in said tank body and a controller for operating said water supply pump in response to a detection signal from said detector.
- 25 4. An aquatic tank according to claim 1, which further comprises a detector for detecting the approach of a



person and a controller for operating said water supply pump in response to a detection signal from said detector.

- 5 5. An aquatic tank according to claim 1, which further comprises a detector for detecting sound and a controller for operating said water supply pump in response to a detection signal from said detector.
- 10 6. An aquatic tank substantially as hereinbefore described with reference to and as shown in the accompanying drawings.