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<tr>
<td>(71) Applicant(s)</td>
<td>Fountainhead Technologies, Inc.</td>
</tr>
<tr>
<td>(72) Inventor(s)</td>
<td>Raymond P. Denkewicz Jr.; John D. Rafter; Mark A. Bollinger</td>
</tr>
<tr>
<td>(74) Agent/Attorney</td>
<td>SPRUSON and FERGUSON, GPO Box 3898, SYDNEY NSW 2001</td>
</tr>
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Abstract

A water purifier includes a housing that contains purification material for purifying the water. The water purifier is placed at a flow of circulating water in the spa. The purification material preferably can be a silver-containing material.
WATER PURIFIER FOR A SPA

Technical Field

The present invention relates to water purifiers.

Background of the Invention

A spa is a small pool used for bathing or hydrotherapy in which water is heated and circulated. A typical spa has a volume of less than about 5678.118 litres. The spa can include hydrotherapy jet circulation, hot water/cold water mineral baths, air induction bubbles, or combinations thereof. Other common terminology for spas includes hydrotherapy pools, therapeutic pools, whirlpools, hot spas, hydrotherapy spas, or hot tubs. For the sake of clarity and in order to be succinct, the word “vessel” is used in this specification to refer collectively or individually to all of the examples just described, as well as any others which may fall within the scope of the word “spa”.

Generally, the water in such a vessel is not drained, cleaned or refilled for each individual bather. Thus, it is often desirable to have a reliable water purification system for the vessel. The water in the vessel can be purified, for example, by adding chlorine to kill micro-organisms that thrive in the warm water. The vessel water is typically filtered as it is circulated.

Summary of the Invention

In a first aspect the present invention consists in a method of purifying water in a vessel comprising:

providing a water purifier having a housing containing a water purification material and having openings that permit water to enter and exit said housing within a flow of water in said vessel;

circulating water from said vessel over said water purifier;

exposing said purification material contained in said housing to said circulated water; and

using an elongated stem attached to said housing, retaining and supporting said housing in the flow of said circulated water.

In a second aspect the present invention consists in a device for purifying circulated water contained in a vessel, the device comprising:
a. a water purifier having a housing containing a water purification material and having openings that permit water to enter and exit said housing within a flow of circulated water in a vessel; and

b. means, comprising an elongated stem attached to the housing, for retaining and supporting the housing in the flow of the circulated water.

In preferred embodiments, the water purifier includes a housing having a diameter of less than about 5.08 cm, an internal volume that is between about 0.03 and about 0.2 litres, and openings that permit water to enter and exit the housing. The water purifier contains a purification material within the internal volume of the housing that purifies water in contact with the material.

The preferred housing is cylindrical and has a length less than about 20.32 cm, more preferably less than about 17.78 cm. The internal volume of the housing is preferably between about 0.05 and about 0.15 litres.

The water purifier preferably includes a support attached to the housing that causes the housing to be retained in a flow of circulating water in the vessel. The housing can be supported within the vessel filter core or, for example, in a recessed area on the underside of the spa skimmer basket located in the circulation system of the vessel. The means for supporting can be a stem, umbrella, t-shaped apparatus, or other arrangement capable of retaining the housing within the vessel filter core, or a press fitting for attaching to the underside of the skimmer basket.

Preferably, the stem is less than about 30.48 cm long and is removable from the housing. The stem is preferably sectioned to facilitate adjusting the length of the stem (and overall length of the water purifier) for the particular vessel filter core. Most preferably, the stem is composed of an upper piece that is about 15.24 cm long and a lower piece that is about 12.7 cm long that fit together via a friction fitting to form a stem that is about 26.67 cm long.

The purification material preferably can be a silver-containing ceramic material, for example, a composition including silver, an aluminium oxide, and zinc.

The water purifier can provide one or more of the following advantages. Since the water purifier can be directly inserted into the core of the vessel filter or, for example, attached to the underside of the skimmer basket of the vessel, the water purifier can be used without modification of the plumbing system of the vessel. When installed properly in the core of the vessel filter, the preferred water purifier exerts little or no back-pressure
on the filter as water is circulated. The water purifier can be used in vessels regardless of water flow rate.

In addition, when the purification material is a silver-containing material, the water can be effectively purified using oxidizing agents other than chlorine alone (e.g., potassium peroxymonosulfate, ozone, or a combination thereof). The purification material and water purifier are not adversely affected by the heat of the water in the vessel.

The water purifier is suitable for purifying water in vessels having volumes of less than about 5678.118 litres. It is preferred that the water purifier receive filtered water.

The term "circulated", as used herein, means continuous flow of the water to expose the water to the water purifier, for example, as it is pumped through a filter. The circulated water passes through the skimmer of the vessel and the vessel filter core.

Other advantages and features of the invention will be apparent from the description of the preferred embodiment, and from the claims.

**Brief Description of the Drawings**

Figure 1 is a perspective view of a water purifier.
Figure 2 is a side plan view of the water purifier.
Figure 3 is a side plan view of the water purifier, perpendicular to that shown in Figure 2.
Figure 4 is a side plan view of a second water purifier.
Figure 5 is an end view of one end of the water purifier.
Figure 6 is an end view of the other end of the water purifier.
Figure 7 is a view of a vessel filter core including the water purifier.
Figure 8 is a view of a second vessel filter core including the water purifier.
Figure 9 is a view of a vessel filter core including a third water purifier.
Figure 10 is a view of a third vessel filter core including the water purifier.
Figure 11 is a view of a skimmer basket including the second water purifier.

**Detailed Description of the Preferred Embodiments**

Referring to Figures 1 to 4, water purifier 10 has a housing 12 that is cylindrical and has a diameter of 3.175cm and a length of 67.51cm. Housing 12 has an internal volume of about 0.07 litres for containing the purification material. Housing 12 has openings 30 that permit water to enter and exit the housing and the internal volume.

When water enters and exits the housing the water contacts the surface of the purification material. Support stem 14 is attached to one end of housing 12 which causes housing 12
to be retained within a vessel filter core once the water purifier is placed in the filter core. Water purifier 10 generally can be made of a plastic or other suitable mater, like PVC, polyethylene polyacetal, polypropylene, glass filled polypropylene, talc filled polypropylene, or other moldable plastics. Suitable plastics have good chemical resistance (e.g., toward oxidation), good heat resistance (e.g., up to about 43.33°C), and good bending strength. The preferred water purifier 10 can withstand flow rates of about 662.4471 litres per minute in a vessel filter core at about 43.33°C.

Referring to Figures 1 to 3, support stem 14 is composed of upper stem 16 and lower stem 18 which are removably attached by a friction fitting at the end of upper stem 16. Support stem 14 is 26.67 cm long, although the length of the stem can be adjusted. Lower stem 18 can be removed from the structure to adjust the position of water purifier 10 in the vessel filter core. Alternatively, the length of the support stem can be adjusted by cutting off a portion of the stem at a serrated section 19 along the length of support stem 14. It is preferred that the stem material be brittle enough to allow the length to be adjusted by breaking at the serrations.

Referring to Figure 4, an alternate water purifier 10 has a friction fitting 28 that attaches to the underside of a skimmer basket located on an end of housing 12.

Referring to Figures 1 to 6, housing 12 has top 20 which includes loop 22. Loop 22 simplifies retrieval of water purifier 10 from the core of the vessel filter by providing an accessible area to grasp or hook. Housing 12 also has bottom 24 which includes knob 26. Knob 26 provides a location for removably-attaching support stem 14 to housing 12 by way of a friction fitting. Removable-attachment of support stem 14 to housing 12 permits the housing containing the purification material alone to be placed in more confined locations of the vessel water to purify the water.

Referring to Figures 7 to 11, water purifier 10 is supported in a flow of circulating water in the vessel with vessel filter core 40 or, for example, on the underside of a skimmer basket 50. Water is circulated through filter core 40 or skimmer basket 50 and contacts water purifier 10. In contacting water purifier 10, the water is exposed to purification material contained within housing 12.

In open top vessel filter cores, as shown in Figures 7 to 9, water purifier 10 is installed by passing water purifier 10 through filter opening 42 in the top of filter core 40. Water purifier 10 is retained within filter core 40 by resting on support stem 14 which extends into pipe 44 at the base of filter core 40. The length of support stem 14 is sufficient to suspend the housing at least about 2.54 cm above the bottom of filter core 40. As mentioned above, the length of support stem 14 can be adjusted accordingly.
Referring to Figure 8, filter core 40 can contain stand pipe 46 running the length of filter core 40 and extending into pipe 44. Water purifier 10 can be placed within standpipe 46 in this filter configuration.

Referring to Figure 9, an alternate water purifier 10 has a support 50 attached to the top of water purifier 10 that retains the water purifier within filter core 40 by suspending it from the top of the filter core. The support 50 has an expanding section 52 that has a width that is greater than the diameter of filter opening 42. Support 50 can be attached at either end of housing 12 to loop 22 by, for example, a hook or knob 26 by, for example, a friction fitting.

Referring to Figure 10, water purifier 10 can be used in closed top vessel filter systems. In a closed top system, water purifier 10 is inserted from the bottom and is positioned to rest on a shelf on the inside of filter core 40. Since support stem 14 does not extend into pipe 44 in this filter system, stem 14 is shortened (e.g. upper section 16 is used alone) to retain water purifier 10 in the proper position in filter core 40.

Referring to Figure 11, an alternative water purifier 10 can be attached to skimmer basket 50 by inserting friction fitting 28 into recess 52 located on the underside of skimmer basket 50. Skimmer basket 50 and water purifier 10 are placed in the vessel skimmer where water purifier 10 is exposed to the flow of circulating water in the vessel.

The preferred purification materials are described, for example, in U.S. Pat. Nos. 5,352,369 and 5,772,896, which are incorporated herein by reference. Examples of these purification materials include silver metal on a support. The support can be a ceramic and can include an inorganic oxide, e.g., an aluminium oxide. The silver can be chemically deposited on the ceramic support or dispersed as a powder, shavings, or turnings with the ceramic support. The preferred silver content of the purification material is between about 0.1 and about 10 weight percent. The purification material can include a second metal, preferably zinc, copper, aluminium, iron, or manganese, most preferably, zinc.

The purification material is preferably formed into particles larger than the individual openings 30 in the water purifier, e.g., as pellets or as a monolithic foam, so that the material is adequately contained within housing 12. Alternatively, the purification material can be contained in a porous container, for example, a mesh bag.

It is preferred that the purification material be used in the presence of oxidizing agents dissolved in the water, such as, for example, ozone, low levels of chlorine (less
than about 1 ppm), or potassium peroxymonosulfate (less than about 30 ppm), or combinations thereof.

In addition to acting as an anti-microbial agent, the purification material can effectively remove metal ions, such as mercury, lead, cadmium, iron, manganese, copper, nickel, chromium, barium, and arsenate, particularly when the purification material includes silver, an inorganic oxide such as alumina, and zinc. When zinc is included in the purification material, zinc ions can be released into the water which enhance disinfection of the water and provide algaestatic properties.

Other embodiments are within the claims.
The claims defining the invention are as follows:

1. A method of purifying water in a vessel comprising:
   providing a water purifier having a housing containing a water purification material and having openings that permit water to enter and exit said housing within a flow of water in said vessel;
   circulating water from said vessel over said water purifier;
   exposing said purification material contained in said housing to said circulated water; and
   using an elongated stem attached to said housing, retaining and supporting said housing in the flow of said circulated water.

2. The method of claim 1, wherein said water purifier is supported in a manner causing said water purifier to be retained within a vessel filter core.

3. The method of claim 1, wherein said water purifier is attached to an underside of a skimmer basket contained in the vessel.

4. The method of any one of claims 1 to 3, further comprising the step of dissolving an oxidizing agent in said water, wherein said purification material includes silver and a ceramic.

5. The method of claim 4, wherein said oxidizing agent comprises ozone, a low level of chlorine, or potassium peroxymonosulfate.

6. The method of any one of claims 1, 2, 4 or 5 wherein a diameter of said housing is substantially equal to a diameter of said core.

7. The method of any one of the preceding claims wherein said purification material is formed into particles either larger than each of said openings or contained in a porous container within said housing.

8. The method of claim 1 or 2 in which (i) the purification material comprises zinc, and (ii) the step of exposing said purification material to said circulating water causes release of zinc ions.

9. The method of any one of the preceding claims wherein the purification material kills bacteria and/or removes heavy metals.

10. The method of purifying water, substantially as hereinbefore described.

11. A device for purifying circulated water contained in a vessel, the device comprising:
   a. a water purifier having a housing containing a water purification material and having openings that permit water to enter and exit said housing within a flow of circulated water in a vessel; and
b. means, comprising an elongated stem attached to the housing, for retaining and supporting the housing in the flow of the circulated water.

12. The device of claim 11 wherein said water purifier is supported in a manner causing said water purifier to be retained within a filter core of the vessel.

13. The device of claim 11 wherein said water purifier is attached to an underside of a skimmer basket contained in the vessel.

14. The device according to any one of claims 11 to 13 in which the housing has a first end and the stem extends therefrom.

15. The device according to any one of claims 11 to 14 in which the purification material kills bacteria in water and includes silver.

16. The device according to claim 15 in which the purification material further includes zinc.

17. The device according to claim 15 in which the purification material further includes a ceramic.

18. The device according to any one of claims 12 to 17 in which the stem is removable from the housing.

19. The device according to any one of claims 11 to 18 in which the stem has a length and a diameter which decreases along the length in a direction moving away from the end of the housing.

20. The device according to any one of claims 11 to 19 in which the housing further defines a recess into which the stem is fitted.

21. The device according to any one of claims 11 to 20 in which the stem comprises separate upper and lower portions attachable through a friction fitting.

22. The device according to claim 19 in which at least one of the upper and lower portions of the stem includes at least one serration and is sufficiently brittle to allow a user to adjust the length of the stem by breaking the serrated portion.

23. The device according to any one of claims 11 to 20 in which the stem has an adjustable length.

24. The device according to any one of claims 11 to 23 in which the housing has a second end having a loop extending therefrom.

25. The device according to claim 24 in which the loop is formed integrally with the second end.
26. The device according to any one of claims 11 to 25 in which the housing has a diameter and the stem has a length substantially greater than the diameter of the housing and a width substantially less than the diameter of the housing.

27. The device according to any one of claims 15 to 26 in which the purification material comprises a plurality of silver-containing pellets.

28. The device according to any one of claims 11 to 20 in which the stem includes at least one serration.

29. The device for purifying circulated water, substantially as hereinbefore described with reference to the accompanying drawings.

Dated 26 February, 2001
Fountainhead Technologies, Inc
Patent Attorneys for the Applicant/Nominated Person
SPRUSON & FERGUSON