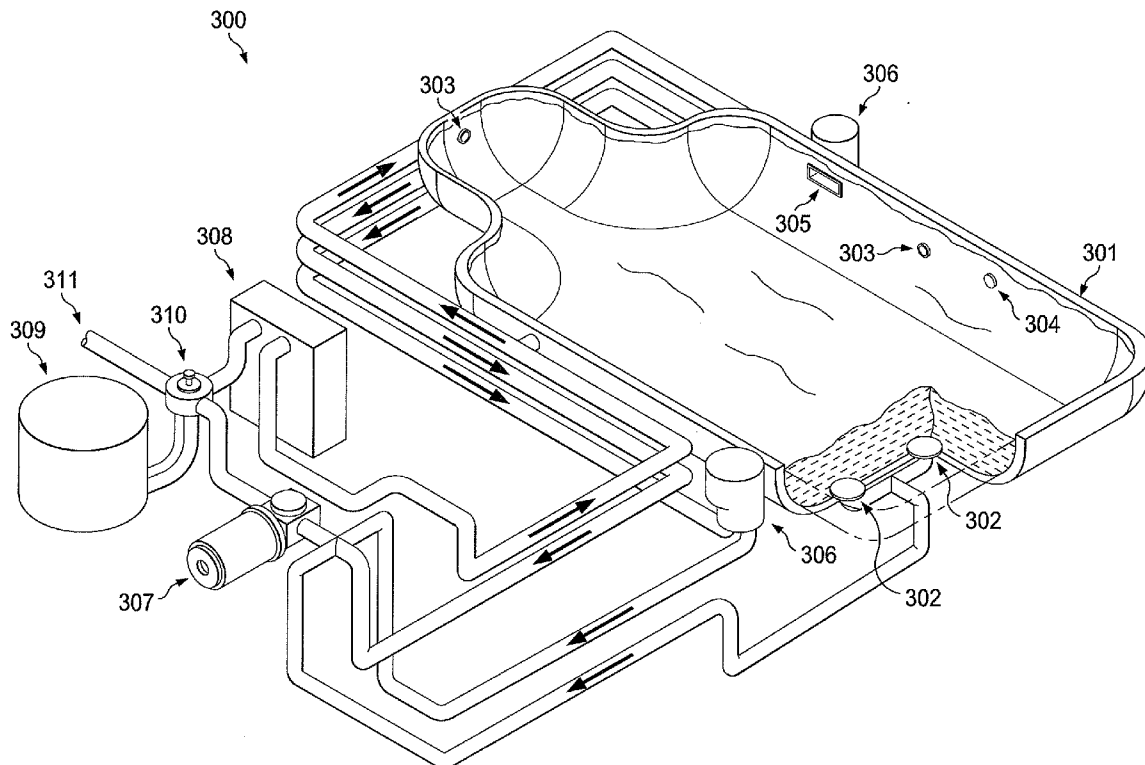




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A filter media component containing activated carbon, which undesirably filters chlorine from water in an aquatic reservoir in which a minimum level of chlorine is desired to be maintained, is inserted into a fluid pumping path for water from the reservoir to reduce levels of cyanuric acid without purging the reservoir. Once levels of cyanuric acid drop below a target reduced concentration, chlorine and other required chemicals may be added to the water to restore proper water balance and increase the chlorine concentration to at least the minimum level of chlorine desired to be maintained. The process, which can be completed in a short period of time with sufficient quantities of activated carbon, need only be performed seasonally or periodically and avoids waste and potential damage associated with purging and replacing the water within the aquatic reservoir to reduce cyanuric acid levels.



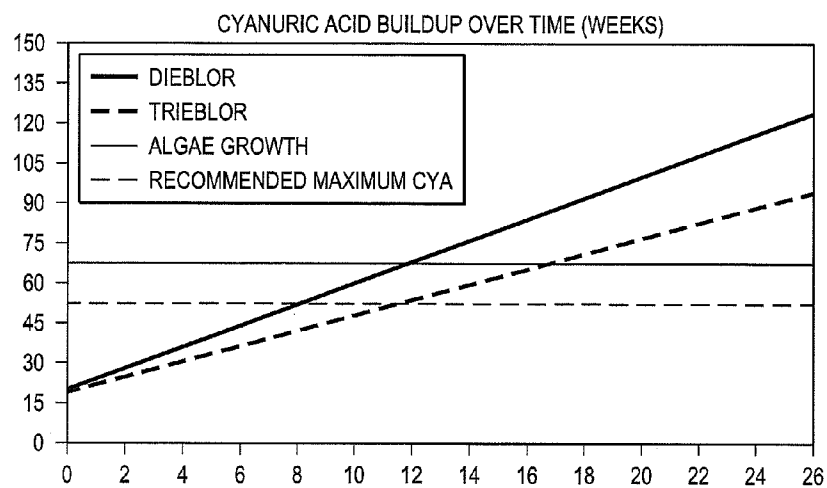


FIG. 1

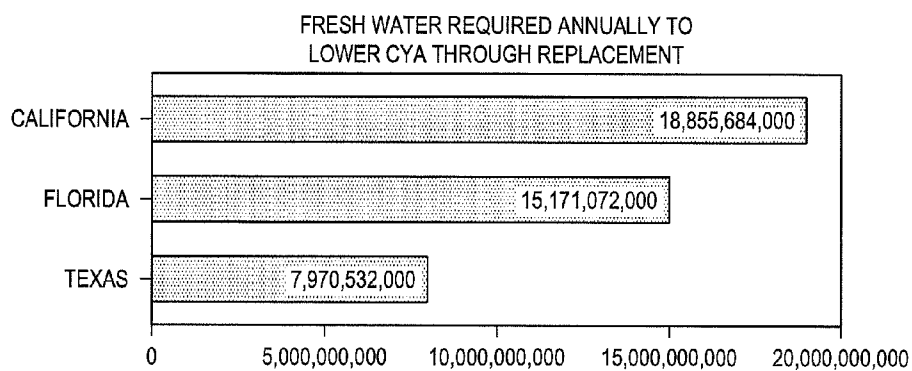
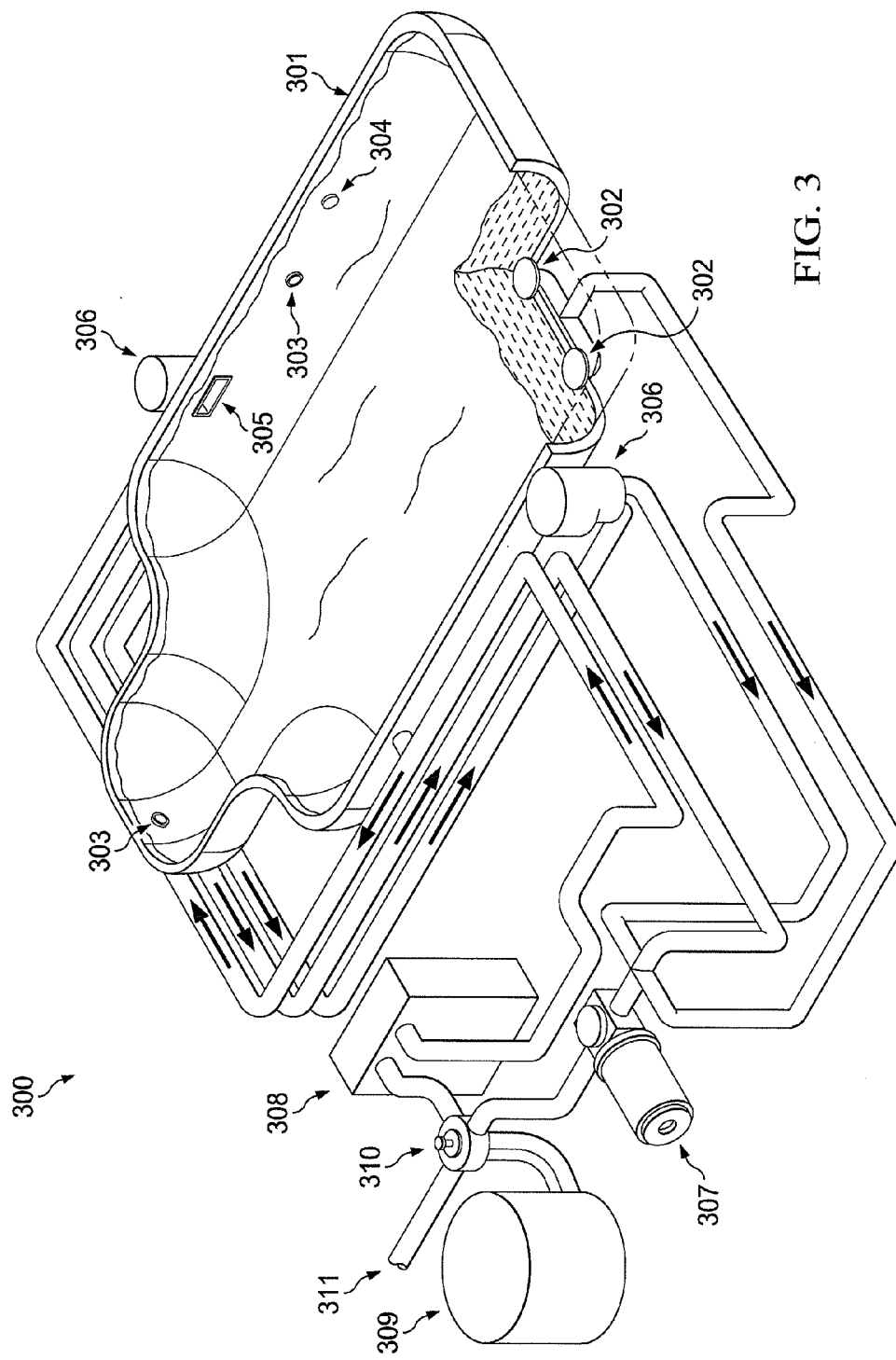


FIG. 2



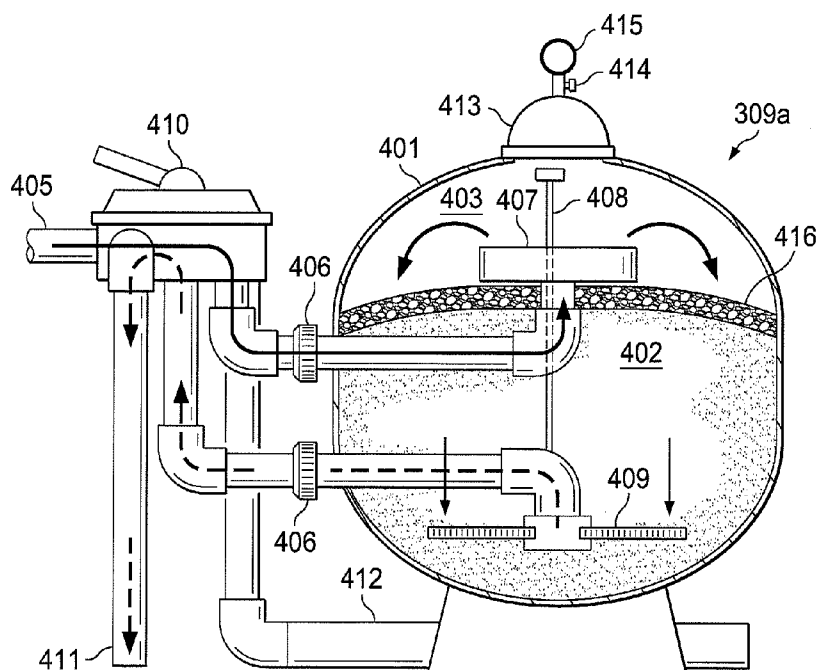


FIG. 4

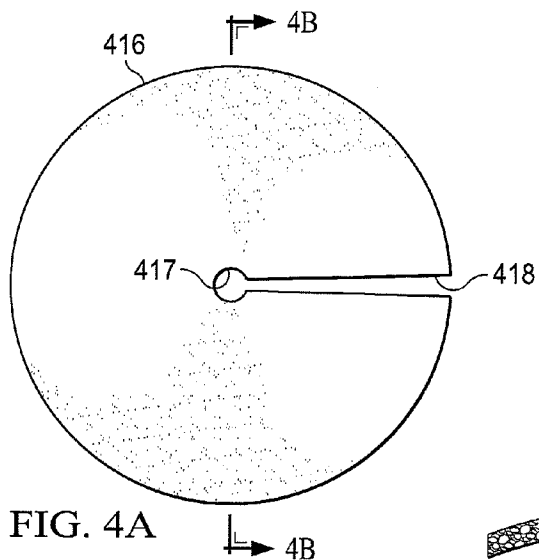


FIG. 4A

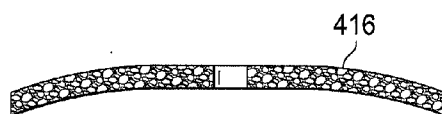
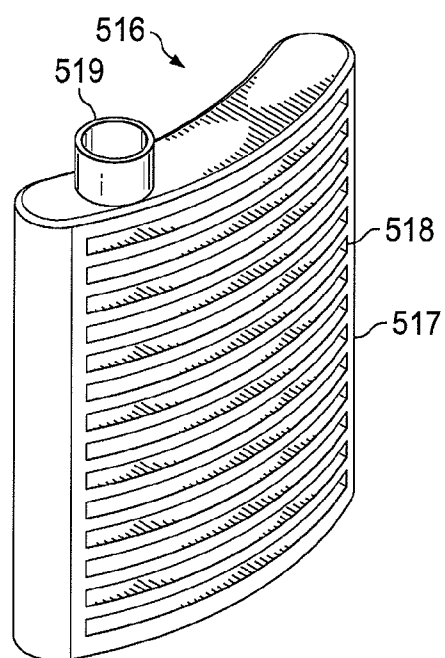
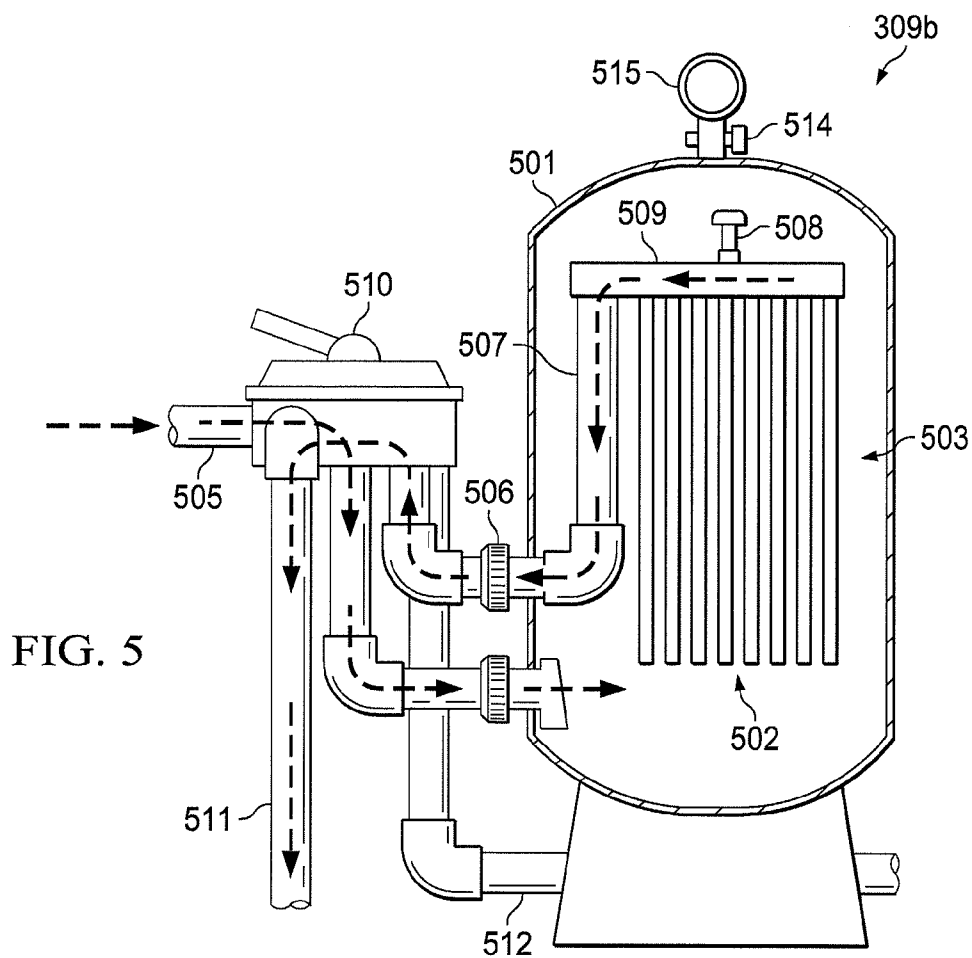
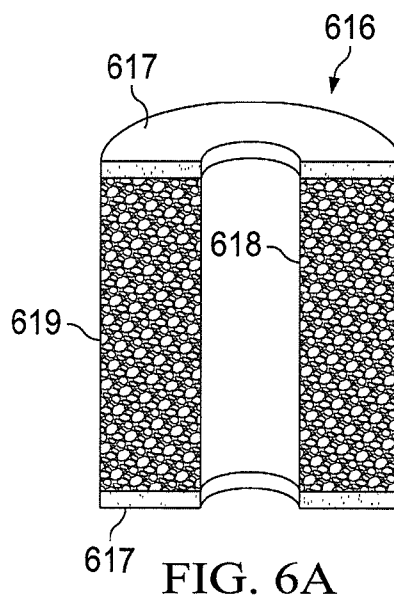
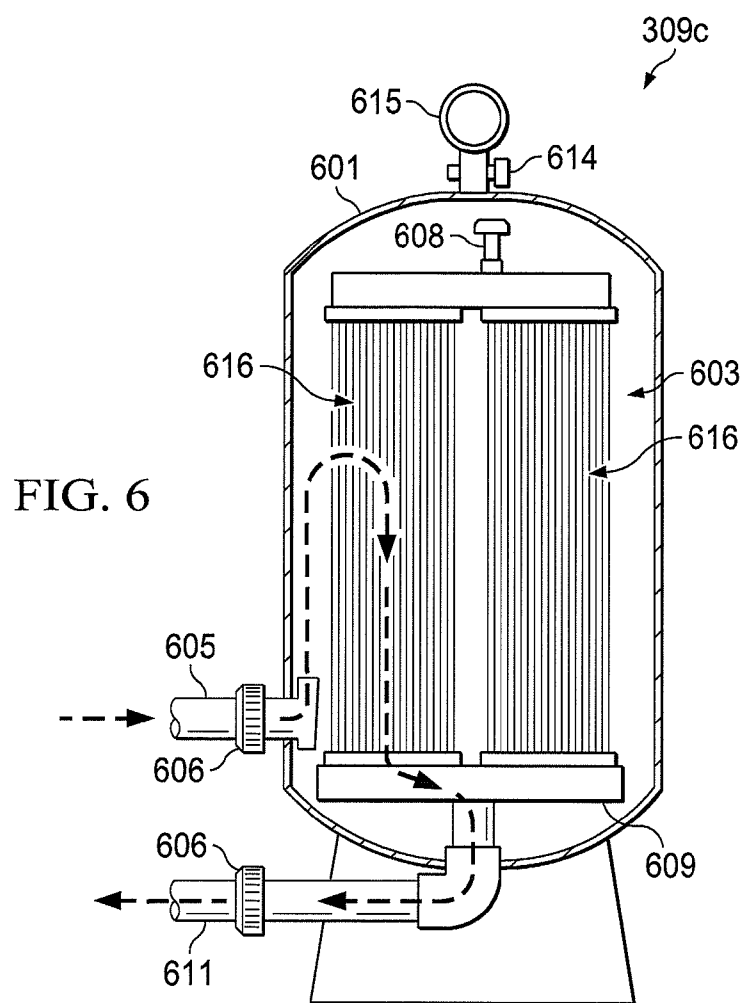


FIG. 4B





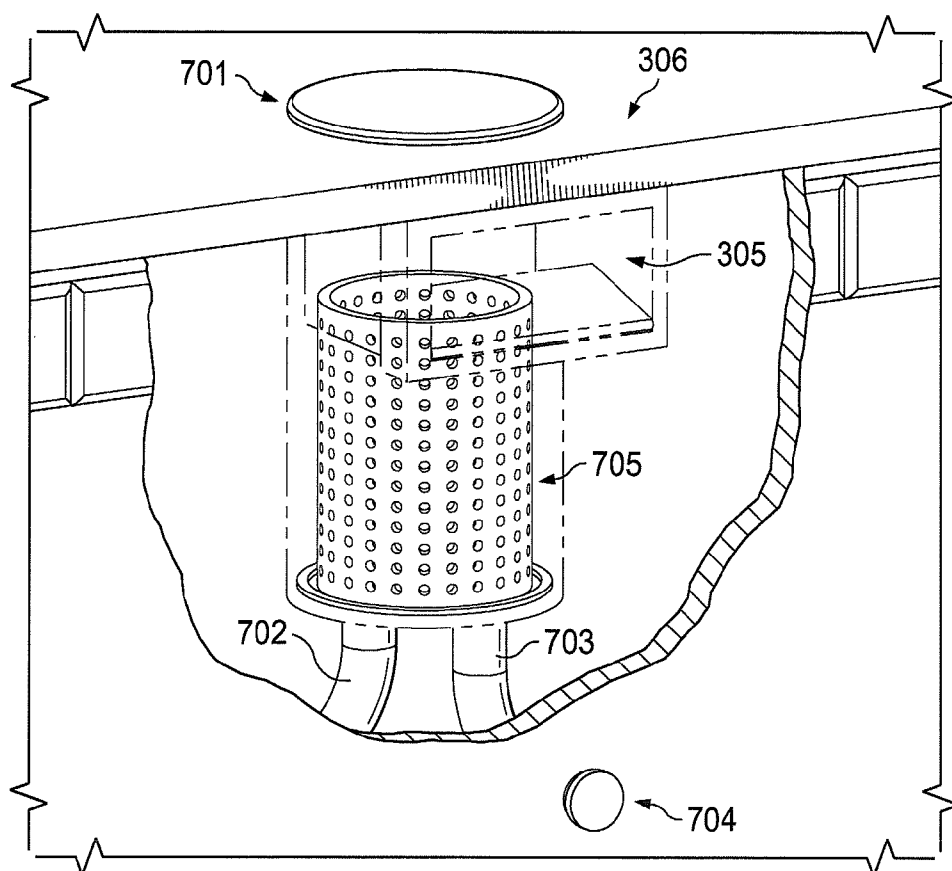


FIG. 7

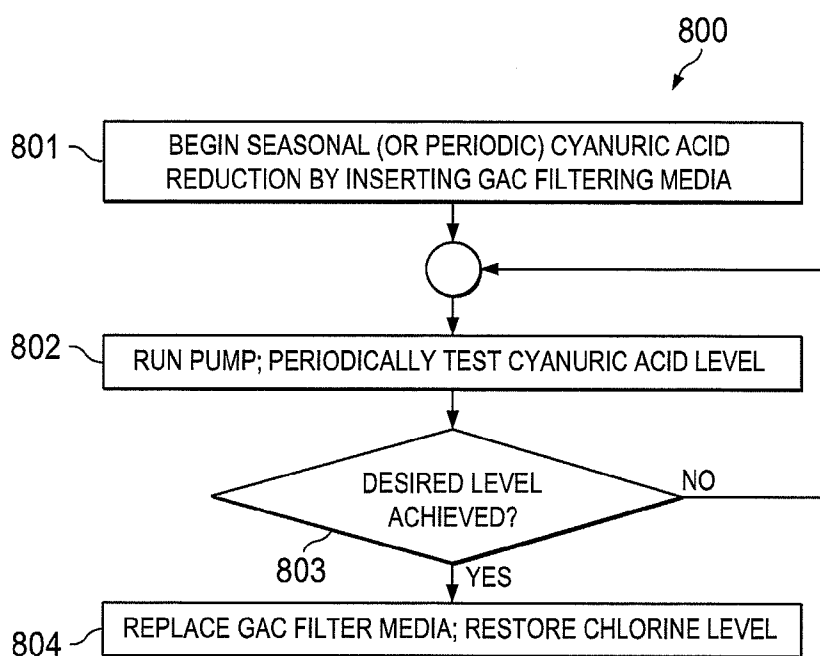


FIG. 8

CYANURIC ACID REMOVAL

[0001] The present application incorporates by reference the subject matter of U.S. Provisional Patent Application No. 61/702,813 entitled "CYANURIC ACID REMOVAL PROCESS" and filed on Sep. 19, 2012.

TECHNICAL FIELD

[0002] The present application relates generally to removal of cyanuric acid from water in swimming pools, spas and other recreational aquatic vessels requiring the presence of free chlorine for disinfecting the water and, more specifically, to removal of cyanuric acid without purging the water from the aquatic vessel.

BACKGROUND

[0003] There are numerous ongoing maintenance and repair requirements associated with swimming pool ownership. In order to keep a pool safe and sanitized, chemical treatment is required to maintain proper water balance, particularly in response to variables such as pool usage, precipitation and temperature. A swimming pool is chemically balanced when the disinfectant, pH, alkalinity, hardness and dissolved solids are at the desired levels.

[0004] Environmental factors (such as the intensity and duration of sunlight, bather loads, landscaping and vegetation) significantly affect the rate of chemical reactions within a pool and so maintenance chemicals must be added in different proportions under different circumstances and at different intervals. When the pool is chemically balanced, problems such as algae, mineral and salt saturation, corrosive water, staining, eye irritation and strong chlorine smell are less likely to occur. A regular testing and maintenance routine will result in a stable and more easily maintained pool.

[0005] The maintenance of proper chemical balance and the related upkeep and repair of swimming pool equipment, such as pumps, heaters, and filters, as well as safety equipment, create a non-discretionary demand for pool chemicals and other swimming pool supplies and services. The majority of swimming pool owners use chlorine to disinfect their pools. However, regardless of how well appropriate levels of chlorine are maintained, "shocking" is periodically required to break up the contaminants which invariably build up in the pool water. To accomplish this, the pool owner can either super-chlorinate the pool or use a non-chlorinated oxidizing compound.

[0006] Independent of super-chlorination, an undesirable accumulate of cyanuric acid is generally seen over time with the use of chlorine in any appreciable amount. Because the cyanuric acid does not dissipate, as does the chlorine, periodic purging of the water within the aquatic vessel is typically required, to eliminate accumulated cyanuric acid and other dissolved solids.

[0007] There is, therefore, a need in the art for improved water treatment of recreational aquatic vessels.

SUMMARY

[0008] A filter media component containing activated carbon, which undesirably filters chlorine from water in an aquatic reservoir in which a minimum level of chlorine is desired to be maintained, is inserted into a fluid pumping path for water from the reservoir to reduce levels of cyanuric acid without purging the reservoir. Once levels of cyanuric acid

drop below a target reduced concentration, chlorine and other required chemicals may be added to the water to restore proper water balance and increase the chlorine concentration to at least the minimum level of chlorine desired to be maintained. The process, which can be completed in a short period of time with sufficient quantities of activated carbon, need only be performed seasonally or periodically and avoids waste and potential damage associated with purging and replacing the water within the aquatic reservoir to reduce cyanuric acid levels.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] For a more complete understanding of the present disclosure, and the advantages thereof, reference is now made to the following descriptions taken in conjunction with the accompanying drawings, wherein like numbers designate like objects, and in which:

[0010] FIG. 1 is a graph illustrating the build-up of cyanuric acid over a 26-week pool season for a 20,000-gallon pool;

[0011] FIG. 2 is a chart illustrating the water required for purging cyanuric acid for three states having substantial numbers of outdoor swimming pools;

[0012] FIG. 3 is a diagram of a swimming pool system implementing cyanuric acid removal in accordance with various embodiments of the present disclosure;

[0013] FIG. 4 is a diagram of a filter using sand and activated carbon as filter media within the swimming pool system of FIG. 1, and FIGS. 4A and 4B are a plan view and a side sectional view illustrating the filter media component from FIG. 4 in greater detail;

[0014] FIG. 5 is a diagram of a filter using diatomaceous earth and activated carbon as filter media within the swimming pool system of FIG. 1, and FIG. 5A is a perspective view illustrating portions of the structure of the filter media component from FIG. 5 in greater detail;

[0015] FIG. 6 is a diagram of a filter using fabric and activated carbon as filter media within the swimming pool system of FIG. 1, and FIG. 6A is a cut away perspective view illustrating portions of the structure of the filter media component from FIG. 6 in greater detail;

[0016] FIG. 7 is a diagram of a skimmer basket within the swimming pool system of FIG. 1, which may be filled with activated carbon for removal of cyanuric acid from the water; and

[0017] FIG. 8 is a high level flow diagram for a process of removing cyanuric acid from the water within the swimming pool system of FIG. 1.

[0018] Before undertaking the DETAILED DESCRIPTION below, it may be advantageous to set forth definitions of certain words or phrases used throughout this patent document: the terms "include" and "comprise," as well as derivatives thereof, mean inclusion without limitation; the term "or" is inclusive, meaning and/or; the phrases "associated with" and "associated therewith," as well as derivatives thereof, may mean to include, be included within, interconnect with, contain, be contained within, connect to or with, couple to or with, be communicable with, cooperate with, interleave, juxtapose, be proximate to, be bound to or with, have, have a property of, or the like; and the term "controller" means any hardware device that controls at least one operation, whether based upon firmware or user-supplied software executing within the controller. It should be noted that the functionality associated with any particular controller might be centralized or distributed, whether locally or remotely. Definitions for

certain words and phrases are provided throughout this patent document, and those of ordinary skill in the art will understand that such definitions apply in many, if not most, instances to prior as well as future uses of such defined words and phrases. While some terms may include a wide variety of embodiments, the appended claims may expressly limit these terms to specific embodiments.

DETAILED DESCRIPTION

[0019] FIGS. 1 through 8, discussed below, and the various embodiments used to describe the principles of the present disclosure in this patent document are by way of illustration only and should not be construed in any way to limit the scope of the disclosure. Those skilled in the art will understand that the principles of the present disclosure may be implemented in any suitably arranged system.

[0020] Cyanuric acid (CYA) is marketed as a chlorine stabilizer for use in chlorinated swimming pools. Properly managed, cyanuric acid reduces the amount of chlorine needed to effectively sanitize an outdoor pool by preventing the sun's ultraviolet rays from breaking down the chlorine and rendering it ineffective. On long, sunny days, chlorine breaks down as quickly as the same day as the chlorine is added. However, the use of CYA-stabilized chlorine allows pool operators to add chlorine weekly instead of daily while still maintaining the minimum free chlorine required to effectively sanitize and disinfect pool water.

[0021] Between 80-85% of the 10 million residential pools in the United States use chlorine as the primary sanitizer, with nearly all using stabilized chlorine—that is, chlorine that is packaged and sold with cyanuric acid already combined. Dichlor and trichlor are examples of solid chlorine compounds that include CYA.

[0022] Introduced into the marketplace in 1958 for swimming pool application, dichlor and trichlor have become the most widely used pool sanitizers in the United States, with industry estimates putting market share at around 75 to 80% of all sanitizers sold. Dichlor usually comes in a granular form and is marketed for the residential swimming pool market, while trichlor is often sold in a tablet or stick form for use in an erosion feeder for small commercial pools, such as those at hotels and motels. Dichlor contains 57% cyanuric acid by weight; trichlor contains 54% cyanuric acid.

[0023] Cyanuric acid slows the disinfecting action of chlorine, so that the amount of time required to kill viruses, germs, and bacteria lengthens as the concentration of cyanuric acid increases. Although there is some debate about how much CYA is optimal, most experts agree that about 30-50 parts per million (ppm) offers the best balance and that pools reach the point of diminishing returns (where the reduction in chlorine effectiveness outweighs the benefits) at levels above about 50 ppm. CYA levels above 100 ppm create dangerous situations where disease can last for many hours or even days in the water before killed by free chlorine. A pool with too much CYA is said to be “over-stabilized.”

[0024] Unlike chlorine, cyanuric acid is never used up and accumulates in the pool. Once added to the pool water, the cyanuric acid will remain in the water. For each individual pool the build-up of CYA varies depending on a) the frequency in which stabilized chlorine is added and b) the frequency and volume of backwashing (build-up is slowed if the filtration system in use requires regular backwashing). For example, the build-up of cyanuric acid over a 26-week pool season is shown in the graph of FIG. 1 for a 20,000-gallon

pool. A weekly backwashing routine is presumed, each of which purges 1% of the water (about 200 gallons), as is an industry prescribed CYA level of 30-50 ppm at the start of the season.

[0025] As noted above, as the level of cyanuric acid rises, free chlorine's ability to act as a disinfectant is weakened. At above 50 ppm of cyanuric acid, the time required to kill bacteria in the water is longer compared to swimming pool water without cyanuric acid unless more chlorine is added. As the level of chlorine required for effective sanitization increases in the over-stabilized pool, problems with skin and eye irritation also rise. Ultimately, cyanuric acid build up will lead to cloudiness, algae growth and, finally, unsanitary pool conditions. In addition, regulations applicable to commercial pools (including the Model Aquatic Health Code and various state and city codes) generally limit the permissible concentration of cyanuric acid to, for example, levels less than 100 ppm.

[0026] The only current option for operators to reduce CYA is to drain the pool and refill with fresh water. The purging can be seasonal or when the cyanuric acid concentration reaches a level where the pool operator begins to experience trouble maintaining water quality. Such draining is wasteful of natural resources, including water in many regions of the United States and other countries, and can negatively impact the environment with excessive amounts of waste water being released. In addition, draining pools (particularly large, commercial pools) can cause “float” due to hydrostatic pressure under the aquatic reservoir, weakening or even cracking the reservoir structure. Moreover, even after draining and refilling, some cyanuric acid will cling to the pool surface, plumbing and filtration system, so there will likely still be detectable to moderate levels of cyanuric acid in the newly added water. To remove 60 ppm of cyanuric acid from a 20,000-gallon swimming pool containing 80 ppm cyanuric acid, replacement of 75% of the pool volume (i.e., 15,000 gallons) with fresh water is required. Because CYA build-up occurs in nearly all chlorinated pools, this routine practice of purging results in many billions of gallons of water being unnecessarily poured into waste lines every year, as reflected by the chart of FIG. 2.

[0027] FIG. 3 is a diagram of a swimming pool system implementing cyanuric acid removal in accordance with various embodiments of the present disclosure. The pool system 300 includes an aquatic reservoir 301 which is constructed with one or more main drains 302 through which water may be drained from the aquatic reservoir into a filtering or pumping system, one or more water returns 303 through which water circulated through a filtering system is returned to the aquatic reservoir 301, a vacuum port 304 for attachment of a vacuum pool cleaner, and ports 305 for passing water from the aquatic reservoir 301 into skimmers 306 which skim floating debris from the water. A piping system connected to the main drains 302, the returns 303 and the ports 304-305 circulates water from/to aquatic reservoir 301 using a pump (and integral motor) 307 attached thereto. The water may optionally be heated by a heater 308 coupled to the piping system, and is filtered by a filter 309. A valve 310 and drain outlet 311 allow the water to be drained from aquatic reservoir 301.

[0028] The filter media within filter 309 may be changed to include a region of granular activated carbon (GAC) to perform the process in the present disclosure. Coconut shell-based activated carbon has the highest, most dense pore structure of various types of activated carbon currently

commercially available, and therefore has exceptional adsorption properties and is particularly suitable for use in the processes of the present disclosure. Use of one-half pound of coconut shell activated carbon can be used to filter 2,000 gallons of water and can produce a 20 ppm reduction in cyanuric acid concentration in the first 30 minutes, and another 20 ppm reduction in the next 30 minutes, depending upon the initial chemical make-up of the water.

[0029] Other types of granular activated carbon may also be used, and all forms of activated carbon will generally filter dissolved solids, including calcium, salt, fecal matter, organic or man-made materials, etc. A significant difference in performance exists, however, such that coconut shell activated carbon can filter 30% of cyanuric acid from water having 100 ppm concentration of that substance while (for example) bituminous coal activated carbon might only filter 10% in 3-4 hours or longer with the same initial concentration.

[0030] Activated carbon will undesirably filter free chlorine as well as cyanuric acid. Because free chlorine is desired at minimum concentrations within the water, use of activated carbon to filter and remove cyanuric acid is thus counter-intuitive. However, chlorine can be added back to the water after filtering, and less chlorine overall will be required than if the filtering to remove cyanuric acid had not been performed. Moreover, the filtering enables control over water chemistry, including pH (i.e., total alkalinity). The change in pool chemistry is effected without drainage and with fewer chemicals, at reduced operating costs.

[0031] Filtering with activated carbon to remove cyanuric acid may be performed twice per year, consistent with existing seasonal maintenance requirements already necessary, and may exploit existing equipment as discussed in detail herein. Using test currently available, the operator can determine when filtering has reduced cyanuric acid concentrations to levels below 30-50 ppm, which should be within 3-4 hours and will almost always take less than 24 hours of filtering, depending upon the amount of filtering material employed, flow rates, etc. Optionally, the filtering to remove cyanuric acid could be performed monthly, or as needed based on use of the aquatic facility and/or environmental conditions.

[0032] A separate container of activated carbon may be attached inline anywhere in the piping system on the suction or return side of the water pump **307**. Thus, a bag of granular activated carbon may be placed in the skimmers **306**, inside the existing filter media for filter **308**, or over the main drains **302** for water to flow through that granular activated carbon. Cyanuric acid (as well as other chemicals and contaminants known or not known) is removed by the granular activated carbon through adsorption, generally a physical process where dissolved contaminants or impurities adhere to the pore structure on the surface of the carbon particles. Granular activated carbon can then be removed, regenerated and recycled for repeated use if desired. This is a key factor in activated carbon's usefulness in this process because it facilitates the recycling and/or reuse of the used carbon material.

[0033] This process may be performed by attaching a separate filter containing granular activated carbon to an existing operational water circulation system, or by filling porous bags with granular activated carbon and placing those bags over and/or in front of suction outlets (e.g., skimmer ports, drains, etc.) in the aquatic vessel (pool, spa or other water feature) in a manner that allows water to pass through the granular activated carbon to achieve the desired cyanuric acid removal. In some embodiments, the porous bags may take the shape of the

structures in which those bags are being placed. For example, the bags could be appropriately shaped to substantially conform to a skimmer basket, thereby increasing the surface area of contact between the water and the granular activated carbon.

[0034] Granular activated carbon is substituted for (or at least used to supplement) the filter media in a conventional filter (sand, diatomaceous earth, paper cartridges, etc.). In one example, the granular activated carbon fills the conventional filter housing. In another, such as might be used in a diatomaceous earth filter, one or more of the existing grids within the filter are exchanged for granular activated carbon grid(s). A similar procedure may be employed for cartridge filters, whereby the standard cartridge is replaced for a short time with a granular activated carbon cartridge. Granular activated carbon may alternatively be added to existing water circulation systems by other means or in other ways.

[0035] The granular activated carbon containers should be monitored to ensure that the particles are filtering effectively. A granular activated carbon monitoring system should include: testing of treated water to ensure that the system is removing cyanuric acid and/or other chemicals and contaminants; head loss/reduced flow rate (the amount of friction created by plumbing and contactor walls as water moves from one point to another within the system) through the system to ensure that backwashing (reversing the flow to remove trapped material) is performed as required to ensure proper filtration. In general, as it relates to this process, the flow rate may be in the range of 10 to 120 gallons per minute (GPM).

[0036] Using a vessel or contactor containing 30 pounds of coconut shell GAC at a flow rate of 40 GPM should produce a cyanuric acid reduction of 10 ppm per hour per 3,500 gallons of water. When the desired level of cyanuric acid has been removed, the granular activated carbon filtration is ended and normal water filtration should resume. Since granular activated carbon also adsorbs chlorine and other chemicals normally used in aquatic facilities, bather water should be tested for free chlorine, alkalinity and pH upon completion of the cyanuric removal process. Based on test results, proper water balance based on industry standards should be immediately restored as needed.

[0037] A separate/independent circulation system (portable) may also be built using granular activated carbon as the filter media for mobile service applications.

[0038] FIG. 4 is a diagram of a filter using sand and activated carbon as filter media within the swimming pool system of FIG. 1. The filter **309a** includes a spherical or obloid metal housing **401** holding loose filter media (e.g., sand) **402** inside in a quantity sufficient to leave an open space **403** at the top. Water to be filtered is injected into the filter **309a** through an inlet **405** and passes, selectively under the control of one of a pair of bulkhead fittings **406**, through a diffuser **407** within the empty space **403**. The diffuser **407** may include an air relief tube **408** for venting air from the outlet fluid path. The water passes through the filter media **402** to a lateral assembly **409** intaking water from the filter media. The water then passes, selectively under the control of the other of the pair of bulkhead fittings **406** and a valve **410**, to either an outlet **411** back into the aquatic reservoir or an outlet **412** to waste water disposal (e.g., a sewer). The filter **309a** may also include a removable dome lid **413** providing access to the interior of the filter **309a**, to exchange or replenish the loose filter media **402** or to insert or remove a body of activated carbon as discussed further below, an air relief valve **414** to selectively permit

equalization of air pressure inside filter 309a with the exterior, and a pressure gauge 415 for providing the user with readings of air pressure inside filter 309a.

[0039] In the present disclosure, a filter media component 416 may be selectively inserted into the interior of filter 309a, placed on top of the loose filter media 402. FIG. 4A is a plan view of such a filter media component 416, while FIG. 4B is a side sectional view taken at section line B-B in FIG. 4A, and illustrates the structure of an exemplary filter media component 416 from FIG. 4 in greater detail. Filter media component 416 is formed of a flexible, porous or water permeable material that can contain particles of activated carbon within the inside of filter media component 416, and is in the general nature of a water permeable bag containing the activated carbon for passage of water.

[0040] The filter media component 416 is configured such that the media contained therein (activated carbon) spans the cross-section of the water flow path through the filter 309a. In the example shown, the configuration of the filter media component 416 is generally disk shaped, with a diameter allowing the filter media component 416 to extend across the entire interior cross-section of the filter 309a at a level equal to the top of the loose filter media 402. An opening 417 at the center of filter media component 416 fits snugly around the feed pipe to diffuser 407 when in place, and a slit 418 allows the filter media component 416 to be placed in such a position around the feed pipe. Although depicted for clarity in FIG. 4A as encompassing slightly less than 360°, as implemented the filter media component 416 is preferably formed so that the edges of slit 418 slightly overlap when the filter media component 416 is in place within filter 309a. When in place within filter 309a on top of loose filter media 402, filter media component 416 holds activated carbon in a cross-section extending from the feed pipe of the diffuser 407 to the interior surfaces of the filter 309a, substantially covering the water path from the diffuser 407 to the lateral assembly 409.

[0041] Filter media component 416 is selectively removable from the interior of filter 309a, and may be placed in the position shown in FIG. 4 for a time period sufficient to allow filtering of cyanuric acid from the water within an associated aquatic reservoir as discussed above, then removed. If necessary, depending upon the amount of water filtered and/or the amount of cyanuric acid removed, a particular instance of filter media component 416 may become “spent” (saturated with cyanuric acid such that continued use may re-release cyanuric acid into the water being filtered), more than one instance of filter media component 416 may be used (i.e., replaced during filtering of cyanuric acid). Conventional testing of the water within the aquatic reservoir will allow the user to determine when cyanuric acid within the reservoir has reached desired levels, and filter media component 416 may be removed until the next seasonal filtering of cyanuric acid is undertaken. As discussed above, the activated carbon will remove chlorine as well as cyanuric acid, such that chlorine will need to be added back to the water following filtering for cyanuric acid.

[0042] FIG. 5 is a diagram of a filter using diatomaceous earth and activated carbon as filter media within the swimming pool system of FIG. 1. The exemplary filter 309b includes a substantially cylindrical housing 501 enclosing an interior space 503 through which water passes. Similar to filter 309a, water to be filtered is pumped into the filter 309b through an inlet 505 and passes, selectively under the control of one of a pair of bulkhead fittings 506, into the interior space

503 of the housing. The water passes through the filter media or grids 502 to an upper manifold 509 intaking water from the filter media. The upper manifold 509 may include an air relief tube 508 for venting air from the outlet fluid path. The filtered water then passes through a stand pipe 507 and, selectively under the control of the other of the pair of bulkhead fittings 506 and a valve 510, to either an outlet 511 back into the aquatic reservoir or an outlet 512 to waste water disposal. The filter 309b may include an opening (not shown) providing access to the interior of the filter 309b to exchange the grids 502 as discussed further below, an air relief valve 514 to selectively permit equalization of air pressure inside filter 309b with the exterior, and a pressure gauge 515 providing the user with readings of air pressure inside filter 309b.

[0043] In the present disclosure, a filter media component 516 may be selectively inserted as each one of the grids 502 of filter 309b. FIG. 5A is a perspective view illustrating portions of the structure of such a filter media component 516 in greater detail. A rigid, plastic structure 517 that is, in the example shown, of elongate arcuate (whiskey flask) shape, to contain the granules of activated carbon and with openings 518 along the sides to allow water to pass through the structure and the activate carbon contained therein and through an intake 519 into the upper manifold 509. The rigid structure 517 shown in FIG. 5A is covered with a porous or water permeable flexible covering (not shown) retaining the activated carbon particles inside. Water passes from the interior 503 of the housing 501 through that material and the activated carbon, and through the intake 519 into the upper manifold 509. As shown in FIG. 5, a number of instances of the filter media component 516 are suspended from the upper manifold 502. The filter media components 516 with activated carbon may replace grids 502 having the same shape but for use with diatomaceous earth, used during conventional filtering of the pool water. In alternative embodiments, the filter media components 516 installed as grids 502 for filtering of cyanuric acid may be filled partially with diatomaceous earth and partially with activated carbon. However, in such embodiments the arrangement should ensure that all filtered water passed through the activated carbon.

[0044] Similar to filter media component 416, filter media component 516 is selectively removable from the interior of filter 309b and may be installed in the position shown in FIG. 5 for only the length of time necessary to reduce cyanuric acid concentrations to the desired levels, at which time all filter media components 516 containing activated carbon are removed and replaced with conventional filter components (containing diatomaceous earth). The filter media components 516 may likewise be removed and replaced upon becoming “spent.”

[0045] FIG. 6 is a diagram of a filter using fabric and activated carbon as filter media within the swimming pool system of FIG. 1. The exemplary filter 309c includes a substantially cylindrical housing 601 enclosing an interior space 603 through which water passes. Similar to filters 309a and 309b, water to be filtered is pumped into the filter 309c through an inlet 605 and passes, selectively under the control of one of a pair of bulkhead fittings 606, into the interior space 603 of the housing. The water passes through the filter media 616 to a lower manifold 609 intaking water from the interior space 603. An upper filter support may include an air relief tube 608 communicably coupled to a center conduit within filter media 616 for venting air from the outlet fluid path. The filtered water passes through lower manifold 609 and, selec-

tively under the control of the other of the pair of bulkhead fittings **606** and a valve (not shown), to either an outlet **611** back into the aquatic reservoir or an outlet to waste water disposal. The filter **309c** may include an opening (not shown) providing access to the interior of the filter **309c** to exchange the filter media **616** as discussed further below, an air relief valve **614** to selectively permit equalization of air pressure inside filter **309c** with the exterior, and a pressure gauge **615** providing the user with readings of air pressure inside filter **309c**.

[0046] In the present disclosure, a filter media component **616** may be selectively inserted into the interior **603** within the fluid path between inlet **605** and outlet **611**. FIG. 6A is a cut away perspective view illustrating portions of the structure of such a filter media component **616** in greater detail. In FIG. 6, a conventional paper or fabric filter media component is depicted, in which paper or fabric filtering “fins” extend radially outward from a central cylindrical conduit between two annular disk shaped end caps, trapping dirt and debris as filtered water passes through the filter media component. In the alternative of FIG. 6A, the annular, disk shaped end caps **617** terminate either end of an annular, cylindrical enclosure forming by inner and outer annular cylinders **618** and **619**, respectively, each formed of a porous or water permeable material (e.g., paper or fabric). The space between the inner and outer cylinders **618** and **619** holds the activated carbon granules filtering cyanuric acid from the water as described above. As shown in FIG. 6, the filter media component **6161** is mounted within the interior **603** of housing **601** such that water necessarily passes through the activated carbon during passage through the filter.

[0047] Similar to filter media components **416** and **516**, filter media component **616** is selectively removable from the interior of filter **309c** and may be installed in the position shown in FIG. 6 for only the length of time necessary to reduce cyanuric acid concentrations to the desired levels, at which time a conventional filter media component is installed. The filter media component **616** may also be removed and replaced upon becoming “spent.”

[0048] FIG. 7 is a diagram of a skimmer basket within the swimming pool system of FIG. 1, which may be filled with activated carbon for removal of cyanuric acid from the water. A recess or weir adjacent to the reservoir for the pool, open to the water of the pool through skimmer ports **305**, houses an opening into the skimmer **306** and receives pool water into the skimmer **306**. An access port **701**, covered in the example shown, allows selective access to the interior of the skimmer **306**. A suction line **702** connected by the piping to the pump system and an equalizer line **704** opening into the reservoir with a cover **704** facilitate fluid movement through the skimmer **306**. A skimmer basket **705** within the body of the skimmer **306** collects floating debris such as leaves and the like. In the present disclosure, the skimmer basket **705** may hold a filter media component analogous to that depicted in FIGS. 4A and 4B, except without the center opening and slit. That is, a (continuous) disk shaped porous or water permeable bag filled with activated carbon may cover the bottom of the skimmer basket **705** (and fill the bottom portion of that basket), and in particular covers the openings in skimmer **306** for suction line **702** and equalizer line **703** so that water passing through skimmer basket into those lines necessarily passes through the activated carbon. For both cylindrical and

inverted frustoconical shaped skimmer baskets (two common skimmer basket shapes), the bag should be shaped according to the skimmer basket shape.

[0049] FIG. 8 is a high level flow diagram for a process of removing cyanuric acid from the water within the swimming pool system of FIG. 1. The process **800** begins with initiation of seasonal or periodic (e.g., monthly) reduction of cyanuric acid by insertion of GAC filtering media within the pool fluid pumping system (step **801**) as discussed above. For example, a GAC filter media component may be inserted into the filter (s) **309** and bags of GAC may be inserted into the skimmer baskets of each of the skimmers **306**. Preferably the amount of activated carbon placed in the pool system’s fluid paths is sufficient (based on the factors identified above) to achieve the desired reduction of cyanuric acid without replacement. However, if necessary the GAC media may be replaced with fresh activated carbon filter media components during the filtering process.

[0050] The pool system’s pump(s) are then run and levels of cyanuric acid remaining are at least periodically tested (step **802**). For example, an initial period of 1, 2 or 3 hours may be allowed to pass before first testing the amount of reduction of cyanuric acid. After that, if the reduction has not yet achieved the desired levels, checks may be made a 1, 4 or 6 hour increments, until the desired reduction is achieved. For as long as the cyanuric acid levels within the water remains above the desired levels discussed above, the pump(s) are run, GAC filter media components are replaced when necessary, and periodic checks of the remaining cyanuric acid levels are made.

[0051] Once the level of remaining cyanuric acid is established as having fallen below the desired maximum level (step **803**), the GAC filter media components are replaced within conventional filter media components (step **804**). In addition, the level of chlorine remaining is tested and additional chlorine is added until the desired level is achieved.

[0052] While each process flow and/or event sequence depicted in the figures and described herein involves a sequence of steps and/or events, occurring either in series or in tandem, unless explicitly stated or otherwise self-evident, no inference should be drawn regarding specific order of performance of steps or occurrence of events, performance of steps or portions thereof or occurrence of events serially rather than concurrently or in an overlapping manner, or performance the steps or occurrence of the events depicted exclusively without the occurrence of intervening or intermediate steps or events. Moreover, those skilled in the art will recognize that complete processes and event sequences are not illustrated or described. Instead, for simplicity and clarity, only so much of the respective processes and event sequences as is unique to the present disclosure or necessary for an understanding of the present disclosure is depicted and described.

[0053] While this disclosure has described certain embodiments and generally associated methods, alterations and permutations of these embodiments and methods will be apparent to those skilled in the art. Accordingly, the descriptions of example embodiments do not define or constrain this disclosure. Other changes, substitutions, and alterations are also possible without departing from the spirit and scope of this disclosure, as defined by the following claims.

What is claimed is:

1. A method, comprising:
inserting a filter media component containing activated carbon in a fluid pumping system for an aquatic reservoir in which maintenance of a minimum level of chlorine is desired;
pumping fluid from the aquatic reservoir through the activated carbon in the filter media component to reduce an amount of cyanuric acid within the fluid;
removing the filter media component containing the activated carbon once a level of remaining cyanuric acid within the fluid falls below a desired concentration; and
adding chlorine to the fluid to restore a level of chlorine in the fluid to at least the minimum level of chlorine desired.
2. The method according to claim 1, further comprising:
placing the filter media component on top of loose filter media within a filter housing, between a diffuser and a lateral outlet assembly, the filter media component spanning a region between a supply line to the diffuser and interior surfaces of the filter housing.
3. The method according to claim 1, further comprising:
connecting the activated carbon filter media component to a manifold sized to receive a diatomaceous earth filter media component, the activated carbon filter media spanning an outlet from a filter housing.
4. The method according to claim 1, further comprising:
mounting an annulus formed by porous materials and filled with the activated carbon within a filter housing in a position spanning a fluid communication path between an inlet and an outlet for the filter housing at at least one point along the fluid communication path.
5. The method according to claim 1, further comprising:
replacing the activated carbon filter media component with a traditional filter media component.
6. The method according to claim 1, further comprising:
reducing both a level of chlorine in the fluid and a level of cyanuric acid within the fluid.
7. A system, comprising:
a filter receptacle for a filter configured to filter water from an aquatic reservoir in which maintenance of a minimum level of chlorine is desired, the filter receptacle having an inlet configured to admit fluid into an interior space of the filter receptacle and an outlet configured to permit passage of fluid from the interior space; and
a filter media component sized to fit within the filter receptacle and configured to span a fluid communication path within the interior space between the inlet and the outlet at at least one point along the fluid communication path, the filter media component containing activated carbon in a quantity sufficient to reduce levels of cyanuric acid within water from the aquatic reservoir.
8. The system according to claim 7, wherein the filter media component is configured to rest on top of loose filter media within the filter receptacle, between a diffuser and a lateral outlet assembly, and to span a region between a supply line to the diffuser and interior surfaces of the filter housing.
9. The system according to claim 7, wherein the activated carbon filter media component is configured to connect to a manifold sized to receive diatomaceous earth filter media component, and to span an outlet from the filter receptacle.
10. The system according to claim 7, wherein the filter media further comprises:
an annulus formed by porous materials and filled with the activated carbon, the annulus configured to pass fluid from the inlet through a sidewall of the annulus and to pass fluid from a center conduit of the annulus to the outlet.
11. The system according to claim 7, wherein the filter media further comprises:
an enclosure formed of a porous material and configured to contain the activated carbon in a body sized to span the fluid communication path between the inlet and the outlet at the at least one point.
12. The system according to claim 7, wherein the filter media further comprises:
a rigid enclosure with openings and covered by a porous material, the rigid enclosure and the porous material collectively configured to contain the activated carbon in a body sized to span the fluid communication path between the inlet and the outlet at the at least one point.
13. A filter media component, comprising:
a porous material forming an enclosure sized to fit within a filter receptacle and configured to span a fluid communication path within an interior space of a filter receptacle for a filter configured to filter water from an aquatic reservoir in which maintenance of a minimum level of chlorine is desired, the interior space in fluid communication with an inlet configured to admit fluid into the filter receptacle and an outlet configured to permit passage of fluid from the interior space; and
a body of activated carbon within the enclosure in a quantity sufficient to reduce levels of cyanuric acid within water from the aquatic reservoir.
14. The filter media component according to claim 13, wherein the filter media component is configured to rest on top of loose filter media within the filter receptacle, between a diffuser and a lateral outlet assembly, and to span a region between a supply line to the diffuser and interior surfaces of the filter receptacle.
15. The filter media component according to claim 13, wherein the activated carbon filter media component is configured to connect to a manifold sized to receive diatomaceous earth filter media component, and to span an outlet from the filter receptacle.
16. The filter media component according to claim 13, wherein the filter media further comprises:
an annulus formed by porous materials and filled with the activated, carbon, the annulus configured to pass fluid from the inlet through a sidewall of the annulus and to pass fluid from a center conduit of the annulus to the outlet.
17. The filter media component according to claim 13, wherein the filter media further comprises:
an enclosure formed of a porous material and configured to contain the activated carbon in a body sized to span the fluid communication path between the inlet and the outlet at the at least one point.
18. The filter media component according to claim 13, wherein the filter media further comprises:
a rigid enclosure with openings and covered by a porous material, the rigid enclosure and the porous material collectively configured to contain the activated carbon in a body sized to span the fluid communication path between the inlet and the outlet at the at least one point.