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SWIMMING POOL CLEANING METHOD AND APPARATUS

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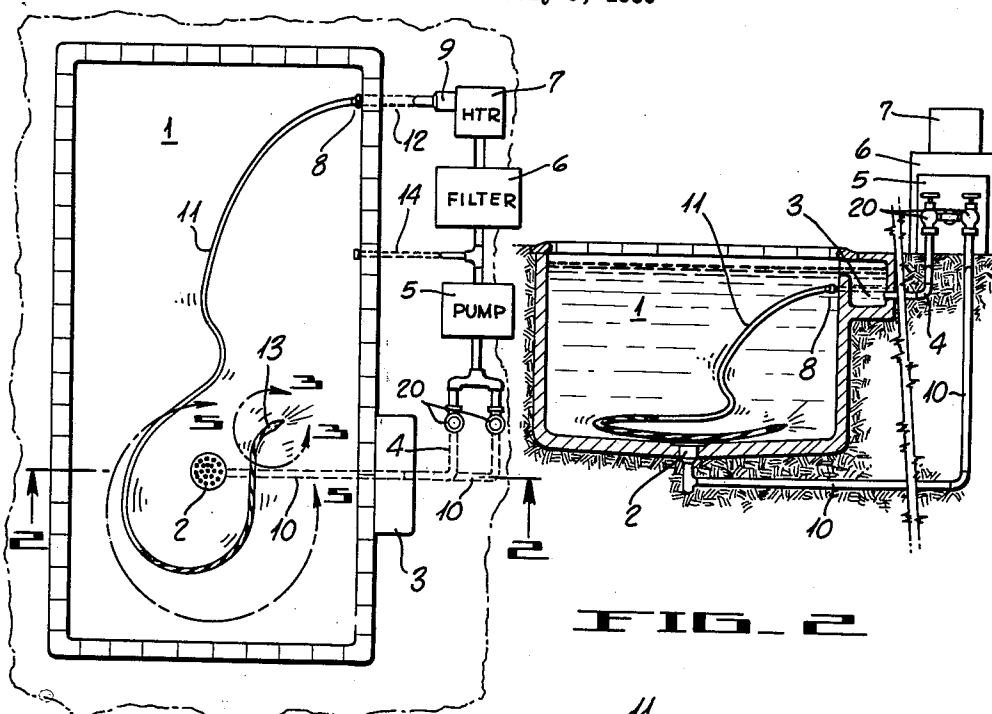


FIG. 1

FIG. 2

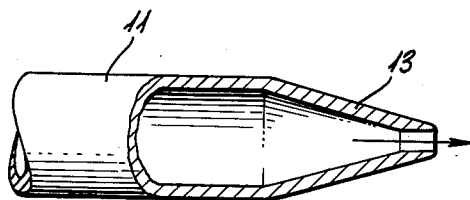


FIG. 3

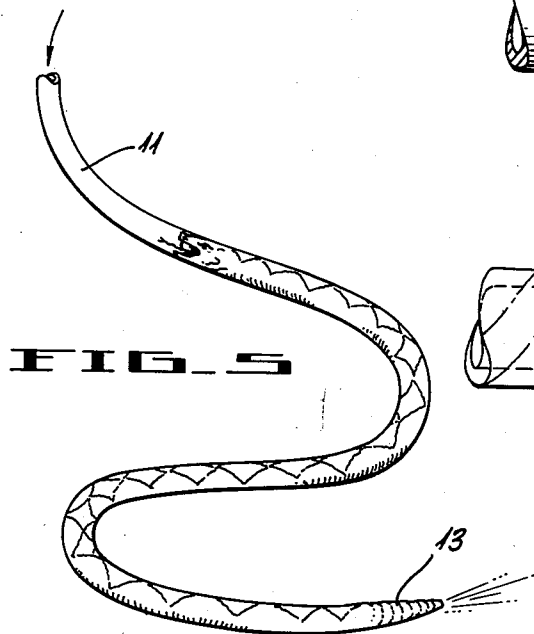


FIG. 5

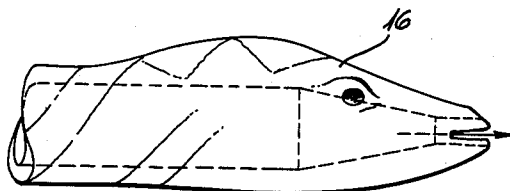


FIG. 4

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SWIMMING POOL CLEANING METHOD AND APPARATUS

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The present invention relates in general to a swimming pool cleaning method and apparatus and more specifically to a novel silt agitator for keeping silt in suspension which would otherwise settle out on the bottom of the pool, such that the suspended silt may be readily removed by the pool's normal water filter apparatus.

Airborne dust blown into a swimming pool settles to the bottom of the pool forming a silt deposit. This silt deposit gives the pool an unsightly appearance and heretofore has been difficult to remove. One prior art method for removing the deposit is to brush down the bottom and sides of the pool preferably toward the main pool drain. Brushing removes some of the silt but much of the silt is merely brushed up into suspension and soon settles out after brushing is completed. Another prior art method for removing silt is to vacuum the pool with an underwater pool vacuum cleaner as taught in U.S. 2,725,356. Vacuuming the pool is a tedious time consuming chore and like brushing stirs much of the silt up into suspension only to settle out after vacuuming is completed.

The present invention provides a simple, inexpensive, automatic silt agitator apparatus which works itself back and forth in a random fashion over the bottom and sides of the swimming pool thereby keeping silt in suspension, such that the pool water circulating and filtering system may remove the silt. The automatic silt agitator apparatus includes a length of hose having water forced therethrough under pressure whereby the reactive force on the free end of the hose, produced by the discharging water, causes the free end of the hose to writhe about the bottom and sides of the pool. The force of the discharging water and the motion of the hose agitates the silt putting it into suspension to be pulled into the pool filter system through the pool water circulating suction line usually located in the main drain.

The principal object of the present invention is to provide simple and inexpensive apparatus for automatically preventing undesired deposits of silt in swimming pools while not interfering with normal use of the pool.

One feature of the present invention is the provision of a self-propelled length of hose adapted for the flow of water therethrough under pressure to agitate silt deposits on the bottom and sides of the swimming pool.

Another feature of the present invention is the provision of a novel silt agitating hose which is compatible for use with the typical pool water circulating system whereby the expense of the silt agitating apparatus is minimized.

Another feature of the present invention is the provision of means for connecting the silt agitating hose to the filtered pool water return line whereby the water level in the pool is not altered by use of the novel silt agitator hose and separate feed hoses running over the pool bank are not required.

Another feature of the present invention is the provision of distinctive markings and/or reptile characteristic features on the silt agitating hose thereby providing a fascinating and amusing toy.

Another feature of the present invention is the provision of a novel simple and inexpensive pool silt agitator hose and nozzle assembly in which the hose is necked down at the free end thereof to form the nozzle.

Other further features and advantages of the present invention will become apparent upon a perusal of the

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following specification taken in connection with the accompanying drawings wherein:

FIGURE 1 is a plan view of a swimming pool utilizing the novel pool cleaning method and apparatus of the present invention,

FIGURE 2 is a transverse cross sectional view of the structure of FIGURE 1 taken along line 2-2 in the direction of the arrows,

FIGURE 3 is an enlarged detail cross sectional view of the hose and nozzle of the present invention delineated by line 3-3 of FIGURE 1,

FIGURE 4 is an enlarged side elevational view of an alternative nozzle assembly of the present invention, and FIGURE 5 is an enlarged alternative portion of the structure of FIGURE 1 delineated by line 5-5.

Referring now to FIGURES 1 and 2 of the drawings there is shown a typical homeowners' private swimming pool 1. Such a pool is typically 15-20 feet wide, 30-40 feet long and 7-10 feet deep at the deepest point.

A main drain 2 is normally provided at the deepest point in the pool 1. The main drain 2 together with a skimmer drain 3, at or near the water level of the pool 1, are connected by pipes 4 and 10 and valves 20 to the suction side of a pool circulating pump 5.

The pool circulating pump 5 normally raises the pressure of the water to between 10 and 25 pounds per square inch and has a capacity of between 10 and 80 gallons per minute. The pool water under pressure is then fed to a water filter 6 as of, for example, the sand type for removing silt and other foreign matter suspended in the pool water.

A water heater 7 takes the filtered pool water and heats it as necessary to maintain the desired water temperature in the pool. The heated water is fed to a pool inlet 8 via pool water return line 9.

It has been discovered that there are several ways in which a novel silt agitating hose 11 of the present invention may be compatibly connected into an existing pool water circulating and filtering system. Each of these ways will be described below.

One factor to be considered, when connecting the hose 11 of the present invention into the filtering system, is that the typical water filter 6 normally operates more efficiently when a back pressure of between 5 and 19 p.s.i. is provided. This back pressure keeps air in water solution within the filter to prevent collection of air bubbles within the filter medium thereby deleteriously affecting the filtering capacity. The back pressure for filter 6 is normally derived by the provision of a restriction 12 in the pool water return line 9 as, for example, by a 10 foot length of 3/4" pipe connected in series with the typical 2" diameter return line 9. Thus the pool return water entering the pool 1 at the inlet 8 has relatively fast flow at a relatively low pressure as, for example, 1-5 p.s.i.

Another factor to be considered, when connecting the hose 11 of the present invention into the filter system, is that the total filtered flow of pool water should not be restricted below the minimum flow rate necessary to provide the minimum number of filtered pool water exchanges per 24 hour period. Typically it is desirable to filter the entire volume of the pool every 24 hours. Since the typical homeowners' pool has a volume of between 15,000 and 35,000 gallons a continuously operating pump 5 preferably provides a filtered flow rate of at least 10 gallons per minute.

In one embodiment of the present invention the low pressure fast flow pool return water emerging at the outlet 8, downstream from the restriction 12, may be utilized for operating the novel silt agitating hose 11. In this case the hose 11 is connected to the pool water outlet 8 and some or all of the filtered pool return water

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is run through the silt agitating hose 11. Hose 11 preferably offers little resistance to the water flow and due to the relatively large capacity flow very little if any restriction below the diameter of restriction 12 is utilized in a nozzle 13, at the free end of the hose 11. A suitable hose 11 for use downstream of a $\frac{3}{4}$ " inside diameter, restriction 12 is a $\frac{3}{4}$ to 2 inch inside diameter, 20-40 foot length of thin walled plastic hose material as, for example, vinyl having an effective specific gravity slightly higher than water and having a nozzle opening of approximately $\frac{1}{2}$ " in diameter. The typical 10-80 gallons per minute water flow discharging from the nozzle 13 of the silt agitating hose 11 stirs up the silt deposits at the bottom and sides of the pool. The stirred up silt is picked up at the main drain 2 and circulated through the pool filter 6 thereby removing the silt.

The reactive force on the silt agitating hose 11 produced by the discharging water causes the hose 11 to be self-propelled in a random fashion over substantially the entire interior surface of the pool 1.

The proper combination of hose stiffness, hose material density and discharge flow rate are best determined empirically in each case. The aforementioned parameters being proportioned to cause the free end of the hose 11 to trace a curvilinear track over the pool interior surfaces, a preponderance of the track having a radius of curvature in excess of 4 feet whereby the hose 11 is caused to range over relatively large distances within the pool 1. If the track has less curvature, the hose will enter into rapid lashing oscillations as obtainable if the hose has very little stiffness and a strong reactive force exerted on the end thereof. On the other hand, the hose should not be excessively stiff or it will flip out of the water causing water to be sprayed out of the pool 1 or become lodged in a corner of the pool.

The following is an example of a silt agitating hose installation in which the hose 11 is connected to the return pool water outlet 8 downstream of the restriction 12. In this particular case a 15,000 gallon capacity pool 1 had two $\frac{3}{4}$ " outlets 8 vertically spaced apart one above the other and being fed from a $\frac{3}{4}$ " diameter restriction 12 via a T, not shown.

The pump 5 had a capacity of 40 gallons per minute when connected to pump the pool water into a low impedance sewer, not shown. The pump 5 was capable of delivering a 20 gallon per minute flow rate through the filter 6, heater 7, restriction 12 and out through the two outlets 8. A 40 foot length of $\frac{3}{4}$ " diameter, 0.030" wall thickness, vinyl hose having a specific gravity of 1.2 and sold under Minnesota Mining's trademark Airflex was connected directly, via suitable fittings, to the upper outlet 8. The free end of the hose 11 was necked down to form a $\frac{1}{2}$ " diameter opening.

The lower outlet 8 was provided with a nozzle restricting the lower outlet opening to $\frac{1}{2}$ " diameter thereby tending to equalize the impedance of the discharge flow paths from the two outlets 8 and raising the back pressure at the pump 5 from 16 to 18 p.s.i. This increased back pressure on the pump 5 reduced the filtered flow rate by approximately 50% to 10 gallons per minute, 5 gallons through each outlet 8. The silt agitating hose 11 ranged over 95% of the submerged bottom and sides of the pool 1 keeping it free of silt deposits while still permitting the filter system to filter the pool volume once every 24 hours.

In another embodiment of the present invention the silt agitating hose 11 is compatibly operated with the pool water circulating system by diverting less than 25% of the pool return water around the restriction 12. More specifically, a suitable conduit 14 as, for example, a $\frac{3}{8}$ " outside diameter tubing is connected into the piping upstream of the restriction 12 and downstream of the pump 5. The conduit 14 is connected to one end of the silt agitating hose 11 at 15.

In this case water pressure of between 5-19 p.s.i. is typically available for operation of the hose 11 with rela-

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tively small water flow as of, for example, $\frac{1}{4}$ -5 gallons per minute. An example of a suitable silt agitating hose 11, in this case, is a $\frac{3}{8}$ " O.D. 30-40 foot length of hose having a wall thickness of 0.030" made of a suitably rigid formulation of vinyl as, for example, a vinyl, marketed under the Minnesota Mining trademark, Airflex, and is supplied with water at a pressure of 16 p.s.i. The free end of the hose 11 is necked down forming a $\frac{1}{16}$ " diameter nozzle 13, as shown in FIGURE 3, to provide a maximum reactive force of water discharge for agitating silt deposits and moving the hose about the pool. The water flow rate through the above exemplary hose 11 was one quart per minute.

In another embodiment of the present invention the novel silt agitating hose 11 is compatibly connected to a pool water circulating system in which the back pressure for the filter 6 is supplied by the silt agitating hose 11 and therefore the necessity of the separate restriction 12 is eliminated.

In this case there is no restriction 12, the pool water return line 9 offers little impedance to water flow and the silt agitating hose 11 is connected to the pool outlet 8. The dimensions of the hose 11 are selected to yield a large capacity flow of 10-80 gallons per minute at 5-30 p.s.i. as required for effective filtering. The pressure drop provided by the hose 11 may be taken along its length as by a 1" diameter 20-40 foot length of hose with only a slight if any restriction at the nozzle 13. In the alternative the pressure drop may be taken at the nozzle 13. In the latter case the hose 11 may have a diameter of between 1-2" or greater with a restriction at the nozzle 13 to $\frac{3}{4}$ of an inch or less but of sufficient diameter to yield the required relatively large flow rate of between 10-80 gallons per minute for proper filtering.

In another embodiment of the present invention the silt agitating hose 11 is provided with distinctive markings as of, for example, in the form of stripes, spots, rings, or merely solid color to give the illusion of a reptile fanciful or otherwise and to clearly distinguish the hose 11 from the typical solid white background color. The illusion may be further enhanced (see FIGURE 4) by the provision of a snake-like head 16 affixed over the nozzle 13 at the free end of the hose 11, or by decorating the end of the hose as illustrated in FIGURE 5 by placing the head of the reptile intermediate the hose and the tail of the reptile at the free end of the hose 11.

The random life-like gyrations and writhing of the so decorated silt agitating hose 11 creates a fascinating and amusing toy while performing its normal pool cleaning function.

The foregoing detailed description of the invention is not to be taken as restrictive of the same as it is obvious that minor variations in design may be made without departing from the spirit of the invention.

What is claimed is:

1. The method for cleaning the interior walls of a swimming pool of silt deposits including the steps of: submerging at least a free end portion of a hose adjacent to the interior walls of the swimming pool; discharging water through the free end of the hose to stir up silt deposits and to self-propel the hose due to the reactive force of the discharging water on the free end thereof; proportioning the effective density of the hose; stiffness of the hose, and water flow through the hose to cause the free end of the hose to trace a random curvilinear track over the interior surface of the pool, a preponderance of the track having a radius of curvature in excess of four feet whereby the self-propelled hose will range over relatively large distances within the pool.

2. The method according to claim 1 wherein the step of discharging water through the hose includes the step of discharging water under pressure derived from the pool water filter circulating pump whereby the pool is

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automatically cleaned as the pool water is recirculated without altering the pool water level.

3. The method according to claim 2 wherein the step of discharging water through the hose includes the step of discharging less than 25% of the circulated pool water flow and less than 5 gallons per minute through the hose at a water pressure applied to the hose of between 5 and 30 pounds per square inch.

4. The method according to claim 2 wherein the step of discharging water through the hose includes the step of discharging at least a portion of the circulated pool water flow and more than 3 gallons of water per minute through the hose at a pressure of less than 5 pounds per square inch.

5. The method according to claim 2 wherein the step of discharging water through the hose includes the step of discharging more than 10 gallons per minute of filtered pool water through the hose with a pressure drop through the hose of more than 5 pounds per square inch for providing a back pressure for the pool water filter.

6. Apparatus for cleaning silt deposits from a pool including, a pump having its suction side connected to draw water from the pool and its pressure side connected for returning the water to the pool, a water filter connected for filtering the pool water, a silt agitating hose connected downstream of said pump in the pressure side thereof, said silt agitating hose having a free end thereof for discharge of water therethrough, said hose being submerged at its free end adjacent to the interior wall surface of the pool, whereby the discharging water circulated by the pump stirs up the silt deposits on the bottom and side of the pool and the reactive force on the free end of said hose self-propels said hose over the interior surfaces of the pool.

7. The apparatus according to claim 6 wherein said silt agitating hose is submerged adjacent to the interior surface of the pool for in excess of 90% of its length within the pool whereby said silt agitating hose does not interfere with normal use of the pool.

8. Apparatus according to claim 6 wherein said hose is connected directly to a fixed pool water outlet at an interior wall of the pool whereby said silt agitating hose does not interfere with normal use of the pool.

9. Apparatus according to claim 6 including a water flow restriction in the pressure side of said pump downstream of said filter and upstream of said silt agitating hose for supplying a back pressure in excess of five pounds per square inch to said filter, and said silt agitating hose connected downstream of said restriction and being dimensioned to discharge therethrough at least a portion of the filtered pool return water at a flow rate in excess of 3 gallons per minute at a pressure of less than five pounds per square inch.

10. Apparatus according to claim 6 including means for diverting less than 25% of the circulated pool water flow through said silt agitating hose whereby a relatively low flow capacity silt agitating hose is utilized and a restricting nozzle at the free end of said hose for discharging water at relatively high velocity whereby efficient use of the diverted circulated pool water flow is obtained.

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11. The apparatus according to claim 6 wherein said silt agitating hose has a certain combination of effective density, stiffness and force of reaction due to discharge flow therethrough to cause the free end of said hose to trace a random curvilinear track over the interior surface of the pool, said curvilinear track having a radius of curvature greater than four feet for in excess of 90% of its length, whereby said hose is caused to range over relatively large distances within said pool.

12. The apparatus according to claim 6 wherein said silt agitating hose is connected downstream of said filter on the pressure side of said pump, said hose being dimensioned for discharge of in excess of 10 gallons per minute with applied water pressure in excess of five pounds per square inch, and being further dimensioned that the discharge of water through said hose produces a pressure drop of in excess of five pounds per square inch whereby back pressure for said filter is obtained.

13. Apparatus for cleaning silt deposits from a swimming pool including a water pump having its suction side connected to draw water from the pool and its pressure side connected for returning the water to the pool; a water filter connected to said pump for filtering the pool water; means for agitating silt deposits on the interior wall surfaces of the pool; said silt agitating means including substantially solely, a conduit for passing therethrough returning pool water from said pump, one end of said conduit being connected to the pressure side of said water pump, said conduit entering the pool through an opening in an interior side wall thereof, at least 90% of the length of said conduit from the opening in the interior side wall of the pool to the free end of said conduit being submerged within the pool water, at least a portion of the submerged length of said conduit including the terminating free end portion being made of materials having a certain effective density and stiffness whereby due to the discharge of water therethrough said free end portion is caused to trace a random curvilinear track over the sides and bottom of the pool, said track having a radius of curvature for a preponderance of its length in excess of 4 feet.

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