

- [54] **SWIMMING POOL CLEANER**
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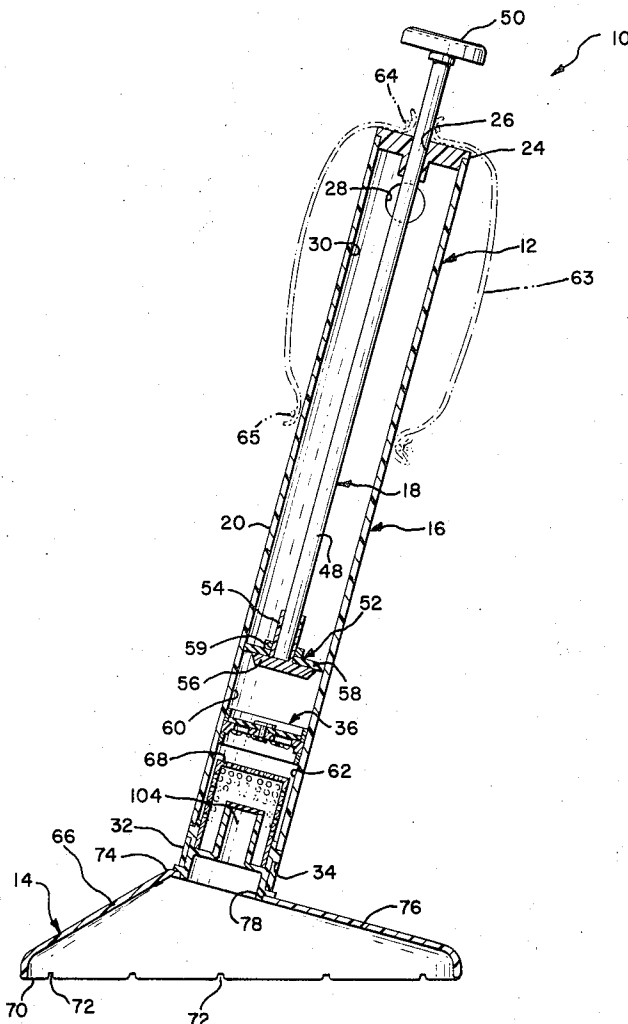
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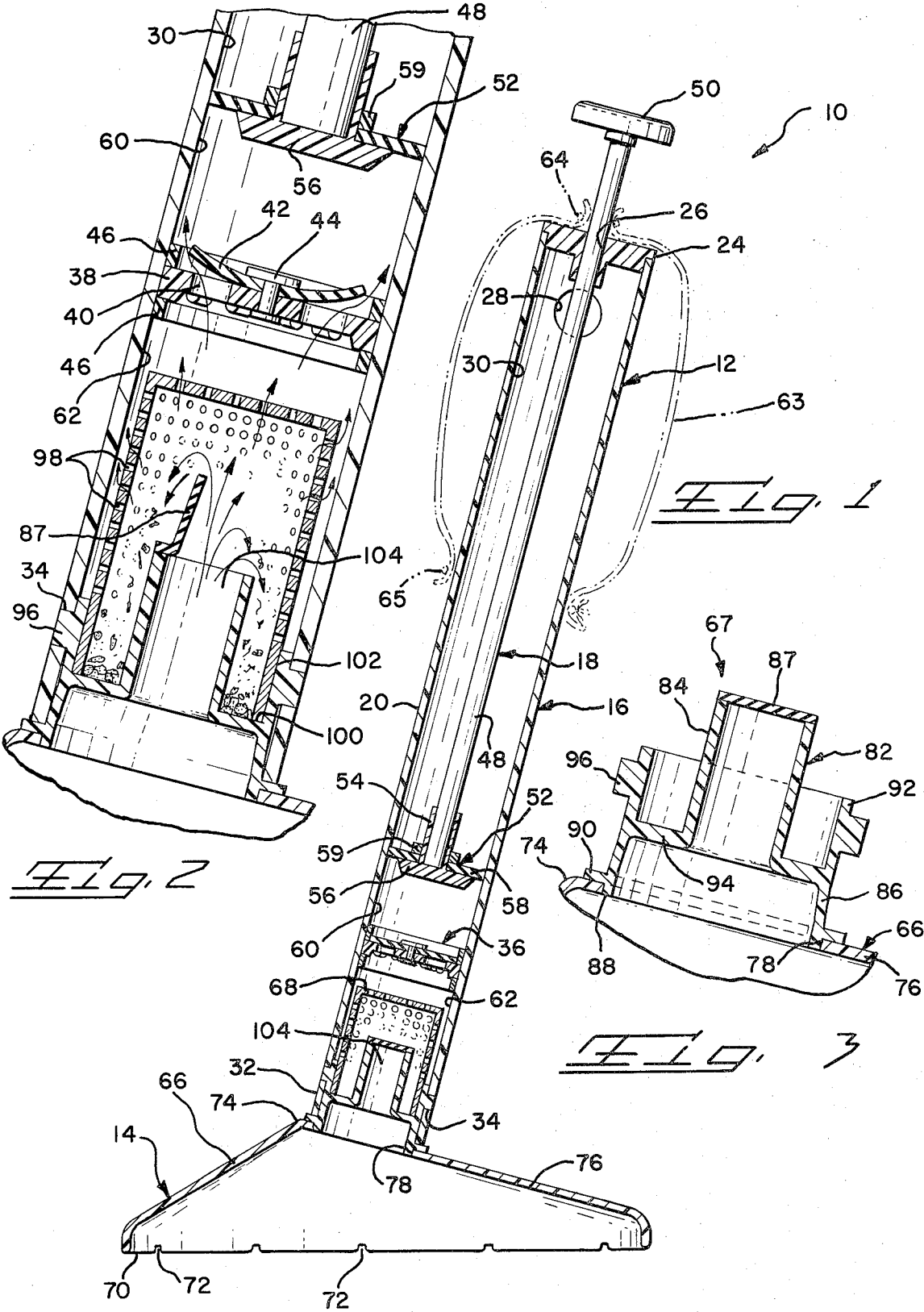
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[57] **ABSTRACT**

The invention disclosed herein relates to a cleaning device for swimming pools and more particularly to a hand-operated cleaner having a reciprocating piston assembly which draws debris-laden water from the floor of the pool into a barrel assembly and sequentially through a liner which catches and retains macroscopic particles such as pebbles, leaves, paper and the like and through a strainer which catches and retains microscopic particles.

2 Claims, 3 Drawing Figures





SWIMMING POOL CLEANER

BACKGROUND OF THE INVENTION

Within recent years there has been a significant increase in the purchase and use of swimming pools for the home. The size of these range from plastic welding pools to large concrete pools embedded in the ground and having diving boards, slides and the like.

Other than the wading pools which contain a relatively small volume of water and are emptied almost on a daily basis, the larger pools present a cleaning problem to the owner. Such pools, particularly those set up in one's backyard receive a large volume of debris via the continual ingress-egress of the children for whom most of such pools are purchased. Grass blades, gum wappers, leaves, drinking straws, little pebbles and ice cream sticks represent a fair number of items which can be found at any given time in a pool. In addition, bacterial growth seems to always be present on the floor and walls.

In larger pools complex filtration circulating systems are frequently employed to cycle the water through filtering mediums. However, as the intake pipes for these systems are permanently positioned somewhere in the pool; i.e., they are immobile, only debris which is water-borne can be carried into the filtering mediums. Water-logged material which settle on the bottom, pebbles, bacterial growth on the floors and the like are not removable by such systems.

Smaller pools have the same problem but a greater degree per volume of water because their size and purchase cost negate a filtration system such as discussed above. As these pools are difficult to clean, they go for a considerable length of time before they are emptied, scrubbed-out and refilled.

While any debris in a pool detracts from the pleasure thereof, pebbles on the floor of those pools having a plastic lining creates a special problem. Such pebbles are often angular and press into and through the lining whereby the pool develops a leak. Not only do these leaks cause muddy conditions around a pool, they waste water which in some parts of the country is becoming scarce and expensive.

Accordingly, it is an object of the present invention to provide a hand-operated swimming pool cleaner capable of removing debris from swimming pools.

It is another object of this invention to provide an inexpensive cleaner which will remove both microscopic and macroscopic particles from a swimming pool.

Yet another object of the present invention is to provide a swimming pool cleaner which will remove debris without the loss of water therefrom.

Still another object of this invention is to provide a cleaner which will operate in any depth of water and which is operable by children as well as adults.

These and other objects can be obtained in accordance with this invention, by providing a novel type of swimming pool cleaner that can be inexpensively manufactured and which includes a pump assembly reciprocally positioned in a barrel and which pulls the debris-laden water into the barrel and sequentially through a liner which catches macroscopic particles and a strainer which catches microscopic particles. Such a cleaner includes a venturi tube which increases the velocity and hence the carrying capacity of the water being drawn into the barrel.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a longitudinal cross-sectional view of the preferred embodiment of the present invention;

FIG. 2 is an enlarged cross-sectional view of the valves and liner portions of the preferred embodiment; and

FIG. 3 is an enlarged cross-sectional view of the venturi member of the preferred embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 is a cross-sectional elevation view of a swimming pool cleaner 10 showing the several elements of the present invention and their relationship one to the other.

The elements of cleaner 10 are assembled into the pump assembly 12 and the head assembly 14 which is removably attached to the lower end of the pump assembly by conventional lugs and slot means.

The pump assembly 12 consists of a barrel subassembly 16 and piston subassembly 18 which is reciprocally mounted in barrel subassembly 16 along its longitudinal axis.

Barrel subassembly 16 include an elongated barrel member 20 with its upper end 22 closed by a cap 24 having a centrally located bore 26 therethrough. A lateral opening 28, located just below upper end 22, communicates with the upper interior chamber 30 of barrel 20.

The lower end 32 of barrel 20, opened to receive head assembly 14, has a pair of inverted L-shaped slots 34 disposed in diametrically spaced relation to each other and extend up the sides of barrel 20 from the transverse opening.

Intermediate the two ends of barrel 20 but closer to lower end 32 is an upwardly opening check valve structure 36. Referring now also to FIG. 2, valve structure 36 includes a valve seat 38 having openings 40 through which water may pass. The flexible valve 42 sits on top of the seat and is retained thereon by conventional means such as rivet 44. The valve structure is retained in a fixed position within barrel 20 by two retaining rings 46, one on either side of valve seat 38. The rings may be fixed to the sides of the barrel by adhesive bonding or the like.

Returning to FIG. 1 again, piston subassembly 18 consists of an elongated piston rod 48 which extends through bore 26 in cap 24 and is provided with a handle 50 at its upper end above barrel 20.

The lower end of piston rod 48 contains an upwardly opening check valve structure 52. Valve structure 52 includes collar 54 which has solid valve seat 56 on the bottom thereof and integral therewith. The diameter of the annular valve seat is only slightly less than the inside diameter of barrel 20. An annular flexible valve 58 having a centrally positioned bore therethrough (not shown) is placed on the collar 54 in abutting engagement with the top of valve seat 56. The valve 58 is the same diameter as the inside diameter of the barrel or slightly greater so that the valve is a piston during the upstroke of piston rod 48. A retaining ring 59 is positioned on top of valve 58 and cemented to collar 54 to retain the valve in place.

The interior chamber of barrel 20 which is between valve structure 36 and valve structure 52 is hereinafter referred to as middle chamber 60 while the interior

chamber of barrel 20 below valve structure 36 is hereinafter referred to a lower chamber 62.

An elongated straining sleeve 63 which is permeable to water but not microscopic particles, is removably attached to pump assembly 12 by means of a first drawstring 64 which holds the sleeve up over cap 24 and around piston rod 48 and a second drawstring 65 which holds the sleeve down around the middle of barrel 20. Of course, drawstring 64 is not drawn up so tight as to prevent the reciprocal motion of piston rod 48.

Head assembly 14 consists of a conical shaped shell 66, a venturi member 67 and a macroparticle catch liner 68.

Intake shell 66 has on its circular base edge 70 a plurality of spaced notches 72.

From its base, intake shell 66 converges upwardly to a generally rounded point 74. On one side, which may be designated as the trailing side 76, an opening 78 is positioned adjacent to point 74. This opening receives venturi member 67 which is secured to shell 66 by adhesive bonding or other conventional means.

Referring now to FIG. 3, venturi member 67 consists of a member 82 having a tube 84 and an enlarged skirt 86 depending therefrom. A flapper valve 87 may be attached to the top of tube 84.

Adjacent to the free end 88 of skirt 86 is an annular flange 90. The outside diameter of the free end 88 is slightly less than the diameter of opening 78 to permit the insertion of the free end thereinto. Flange 90 abuts the shell 66 surrounding opening 78 and is bonded thereto as noted above.

A collar 92 which telescopingly receives the lower end 32 of barrel 20, projects upwardly from the perimeter of the shoulder 94 defined by the change in diameter between tube 84 and skirt 86. A pair of lugs 96, disposed in diametrically spaced relation to each other, project laterally from collar 92. These lugs and the aforementioned inverted L-shaped slots 34 from the attachment means between pump and head assemblies 12 and 14 respectively.

As FIG. 3 indicates, tube 84 projects upwardly at least twice as far as collar 92 although the exact dimensions are not critical.

Macroparticle catch liner 68, elongated and cup-shaped, is made from plastic material having a plurality of holes 98 therethrough. As FIG. 2 shows, catch liner 68 fits upside down into venturi member 67 with the free ends 100 abutting shoulder 94 and the lower portion of sides 102 pressing against the inside of collar 92. It is apparent that exit 104 of tube 84 is completely enclosed by the liner.

OPERATION OF THE PREFERRED EMBODIMENT

One of the novel features of swimming pool cleaner 10 is that the use thereof, as well as the disassembly for cleaning purposes, is uncomplicated so that it may be effectively used by children as well as adults. Another novel feature of the cleaner is that it may be effectively used in any depth of water; i.e., cleaner 10 cleans as well when it is completely submerged as well as where the water in a pool comes up to a location between the top of venturi tube 84 and valve structure 36. Where a flapper valve 87 is positioned on top of tube 84 the water level in the pool need only be deep enough to completely cover notches 72.

To clean a swimming or wading pool, cleaner 10 is placed therein so that the head assembly 14; i.e., intake shell 66, rests on or near the floor. The operator then simply reciprocates piston rod 48 and moves the cleaner about the pool.

In describing the operation, reference will be made to FIGS. 1 and 2. On the upstroke of piston rod 48 the suction created below check valve 52; i.e., in middle and lower chambers 60 - 62, pulls water, microparticles suspended therein, leaves, paper, pebbles, sand and other debris into intake shell 66 up through tube 84 and into macroparticle catch liner 68. The suction or lifting power of the cleaner is enhanced by the reduced diameter of tube 84 relative to shell 66; i.e., the tube acts as a venturi and causes an increase in the velocity of the incoming water and as is well known, the carrying capacity of water increases with increases in its velocity. Thus, cleaner 10 is able to gather pebbles of large sizes.

The incoming water, indicated by arrows in FIG. 2, and the suspended microparticles which includes dirt and the like, coming out of exit 104 of tube 84 flow through holes 98 in catch liner 68 while pebbles, leaves and other macroparticles, which otherwise could lodge in either or both check valves 36 - 52, are caught therein. The suspended microparticles in the water pass upwardly through check valve 36 and into middle chamber 60 below ascending check valve 52.

Upon piston rod 48 reaching its upper limit of travel and during its subsequent downstroke, the pressure in lower chamber 62; i.e., below check valve 36 and particularly around the vicinity of tube 84 and catch liner 68, returns to whatever pressure exists outside shell 66; i.e., atmospheric plus the weight of the column of water in the pool. All activity within chamber 62 substantially ceases and there exists a period of quiescence which allows the settling of pebbles and other macroparticles caught by catch liner 68. This debris accumulates between collar 92 and tube 84 as shown in FIG. 2.

At the conclusion of the upstroke of piston rod 48, the quantity of water with suspended microparticles which has been drawn into barrel 20 by the suction action, is trapped above check valve 36. On the downstroke, piston subassembly 18 passes through this body of water without compressing it as check valve 52 is opened.

Upon piston rod 48 reaching its lower limits of travel, check valve 52 is almost immediately above check valve 36 and most of the aforementioned quantity of water is now on top of check valve 52. As piston subassembly 18 is again reciprocated upwardly, the quantity of water and suspended microparticles is lifted upwardly by the closed check valve 52 and discharged outwardly of upper chamber 30 via opening 28. As the water flows through strainer 63 and returns to the pool the microparticles are caught and retained by the strainer.

At the conclusion of the cleaning operation, cleaner 10 is disassembled. Strainer 63 is removed and turned inside out so that the microparticles caught therein may be removed by flushing. Pump assembly 12 is removed from head assembly 14 by rotating barrel 20 and pulling up. Catch liner 68 may then be lifted off venturi member 67 and the pebbles, leaves and so forth emptied therefrom.

Reassembly is as simple; i.e., macroparticle catch liner 68 is replaced onto venturi member 67 and the

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lower end 32 on barrel 20 is slid down over collar 92 and rotated so that lugs 96 engage L-shaped slots 34. After strainer 63 is replaced, cleaner 10 is again ready for use.

As will be now readily apparent, refinements may be made to swimming pool cleaner 10. Instead of strainer 63, a flexible hose (not shown) may be attached to opening 28 so that the microparticle laden water can be discharged out of the pool.

Yet, another modification is adding rollers or wheels (not shown) to the base of intake shell 66 so that the cleaner will roll over the floor of the pool.

With the exception of strainer 63, cleaner 10 may be made completely from plastic materials such as acrylonitrile-butadiene-styrene. Valves 42, 52 and 87 may be made from vinyl or the like. Strainer 63 may be made from cheesecloth, nylon, or other similar material which is permeable to water but will trap microscopic particles down to about 5 microns in size.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as some modifications will be obvious to those skilled in the art.

What is claimed is:

1. A cleaner for removing debris from swimming pools, which comprises:
 - a. an elongated barrel;
 - b. a first valve means for permitting upward flow and preventing downward flow of fluids, said means positioned in the barrel adjacent the lower end;
 - c. an elongated rod slidably mounted axially in the barrel above the first valve means, and adapted for reciprocating movement therein;
 - d. a movable second valve means for lifting debris and water upwardly through the barrel and for creating a reduced pressure in the lower end of the barrel, said second valve means attached to the lower end of the elongated rod;
 - e. a head assembly removably fixed to the lower end

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of the barrel, said assembly including:

- i. a shell member having a lower opening, the edge thereof being notched at spaced intervals thereabout, said notches and opening adapted to admit debris and water thereinto,
 - ii. a venturi member positioned on the top surface of the shell member and extending up into the barrel when the head assembly is attached thereto, said venturi member having a lower and upper concentric and joined passageways, the lower passageway opening into the shell member and the upper passageway, being of smaller diameter than the lower passageway, opening into the barrel below the first valve means, with said opening having a hinged flapper valve thereover, the two passageways being adapted to increase the velocity of water and debris which may pass therethrough in response to the reduced pressure therein resulting from the reciprocating movement of the second valve means, and
 - iii. a collar spaced from and surrounding the venturi member and being telescopically received in the lower end of the barrel; and
 - f. an inverted U-shaped annular, generally rigid catch liner removably positioned in the space between the collar and the venturi member and thereby removable from the barrel with the head assembly, the liner enclosing the opening of the second passageway in the venturi member, said liner having a plurality of holes through the walls thereof through which water and microparticles may pass in response to the reduced pressure resulting from the reciprocating movement of the second valve means but in which macroparticles may be trapped.
2. The cleaner of claim 1 wherein the barrel has inverted L-shaped slots at its lower end and the collar has outwardly projecting lugs, said lugs being receivable in said slots thereby removably retaining the head assembly to the barrel.

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