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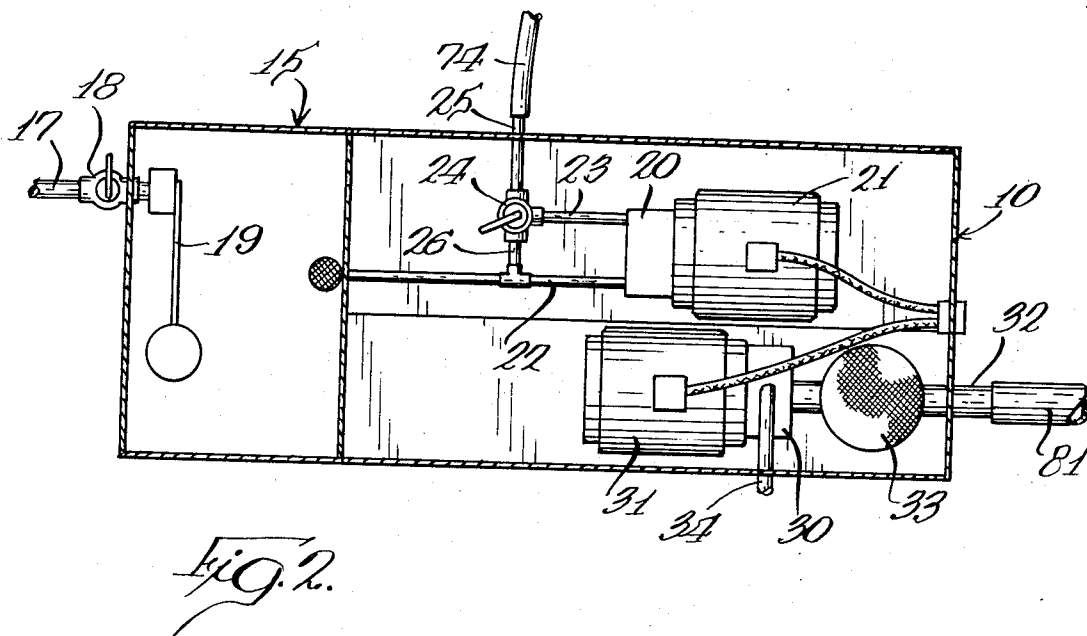
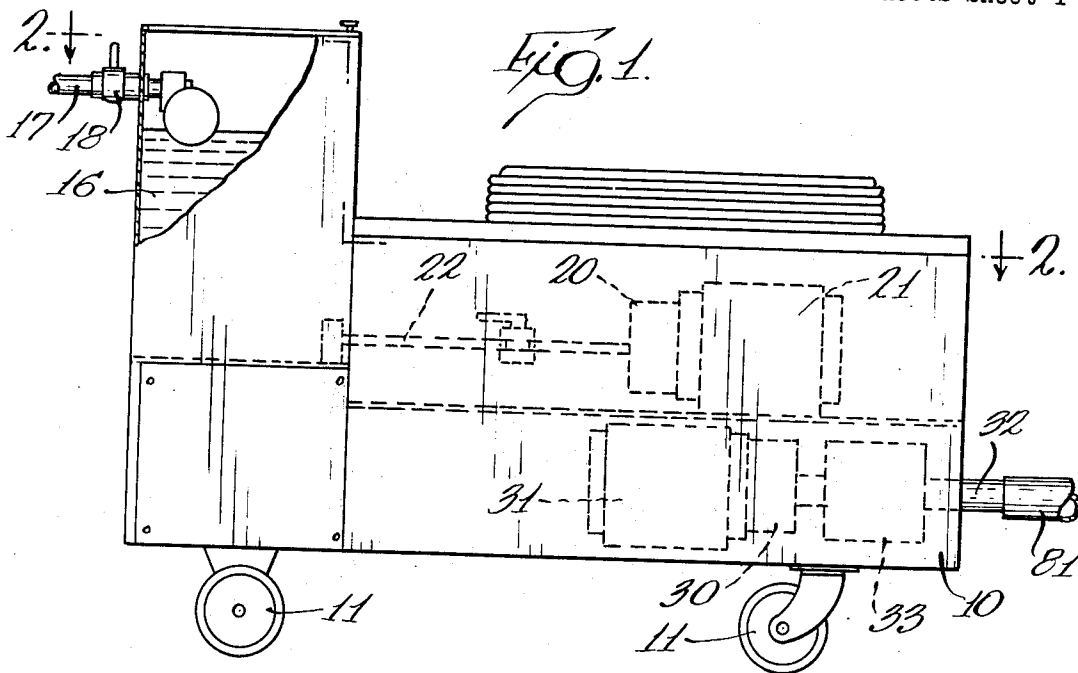
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SWIMMING POOL CLEANING METHODS AND APPARATUS THEREFOR

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2 Sheets-Sheet 1



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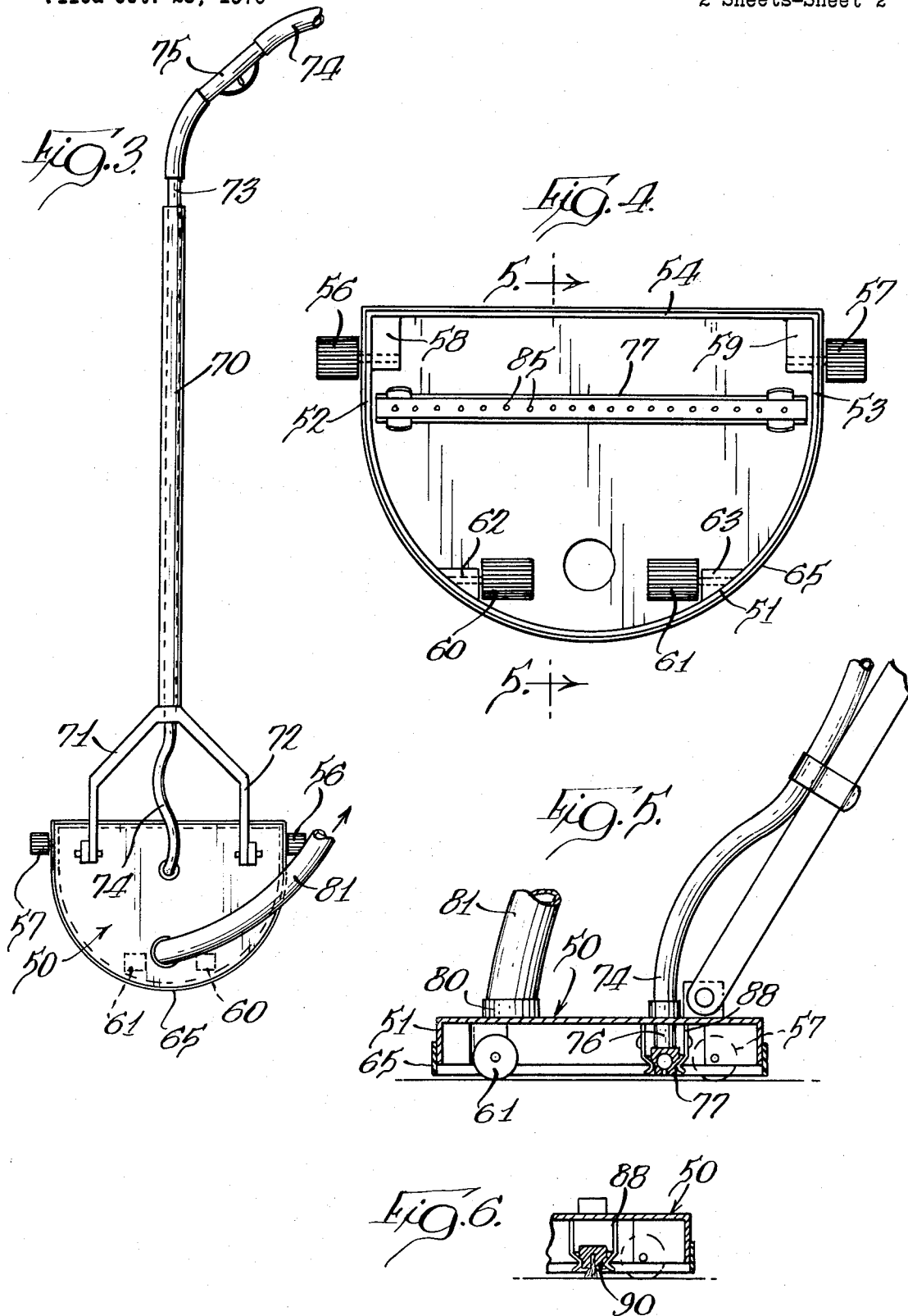
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2 Sheets-Sheet 2



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3,694,263

## SWIMMING POOL CLEANING METHODS AND APPARATUS THEREFOR

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7 Claims

### ABSTRACT OF THE DISCLOSURE

A method of cleaning swimming pool surfaces of dirt, algae, mineral stains and other material, without draining the pool, wherein a cleaning head is moved along the pool to define, with the pool surface, a substantially enclosed space and wherein liquid, in the form of a muriatic acid and water mixture, is delivered in the form of high velocity jets inside said head toward the pool surface and said mixture, along with entrained and dissolved materials, is withdrawn from the head by vacuum without substantial intermingling of the mixture with the pool water whereby the pool can be used immediately after cleaning. Apparatus for performing the method involves a base unit provided with motor-driven pumps, valving and a tank to supply water or an acid and water mixture to a portable cleaning head and with a vacuum pump for withdrawing material from the cleaning head. The cleaning head embodies a casing of a height to define a cleaning chamber permitting scrubbing action of the pool surfaces without forcing of material outside the cleaning head including a depending rubber skirt further confining the action to inside the cleaning head but permitting slight inflow of pool water and material as induced by a vacuum line connection to the cleaning head. The shape of the cleaning head coacts with the vacuum outflow line to induce an arcuate sweeping action of the liquid generally parallel to the pool surface for facilitating withdrawal of liquid and entrained and dissolved material from the head.

### BACKGROUND OF THE INVENTION

This invention pertains to methods for cleaning swimming pool surfaces and apparatus for performing such methods.

At the present time, swimming pools can be vacuumed simply by wand-type units connected to a vacuum line which are moved along the pool surfaces to pick up materials. Additionally, normal circulation of swimming pool water includes passing through a filter to remove suspended materials in the water to the extent that these materials are carried through the filtering system. A vacuum cleaning system does not do an adequate job for removing dirt and algae from the pool surfaces, nor does it have any effect in removing mineral stains. In the past, dirt and algae have been removed from pool surfaces by using liquid pressure jets directed against the material; however, such action merely causes entraining of the material into the body of pool water and is only removed as the pool water is filtered. Removal of mineral stains has been accomplished by the use of muriatic acid and water mixtures which, on a practical basis, have only been used after the pool has been at least partially drained.

Applicant has solved the deficiencies in the known prior systems by providing a method and apparatus for removing dirt, algae, and mineral stains from the pool surfaces without draining of the pool whereby upon completion of the cleaning operation the pool can be used and such removed materials are discharged without commingling with the pool water.

### SUMMARY OF THE INVENTION

An object of this invention is to provide a method of cleaning swimming pool surfaces, and apparatus therefor, wherein hard-to-remove mineral stains, as well as dirt and algae and other materials, can be removed from the swimming pool surfaces without draining of the pool and without commingling of these materials with the pool waters by a system which causes the cleaning action to occur within a confining chamber followed by withdrawal of the material from the confining chamber without commingling with the pool water.

Another object of the invention is to provide a method of cleaning swimming pool surfaces without draining the pool including the steps of moving a cleaning head along the surface of the pool which defines with the pool surface a substantially enclosed space, delivering liquid under pressure to the head and converting the liquid to high velocity jets inside the head directed toward the pool surface, with the liquid being a muriatic acid and water mixture for removal of mineral stains, and withdrawing said water and acid mixture along with entrained and dissolved materials from within said head by vacuum.

Another object of the invention is to provide a complete pool cleaning system comprising a mobile base unit and a portable cleaning head, with the base unit having a liquid supply tank and motor-driven pumps for supplying liquid under pressure and for drawing a vacuum in a vacuum line and with a pressure hose and vacuum line extended from the base unit to the cleaning head, said cleaning head having provision for optionally mounting either a cleaning brush or a pressure rake, with the pressure rake being connected to the pressure hose and with said cleaning head having a construction to define a confining chamber for material removed from the pool surface and a construction to facilitate, with the vacuum action, an arcuate sweeping action of the liquid generally parallel to the pool surface for withdrawal of material of material from the head, said confining action enabling the use of muriatic acid and water mixture with the pressure hose and the pressure rake to remove mineral stains and without substantial emission of muriatic acid into the pool waters.

Still another object of the invention is to provide a cleaning head unit for a pool cleaning system capable of using muriatic acid, without draining of the pool and without commingling of dissolved materials with the pool water, comprising a casing defining a cleaning chamber with a plurality of supporting rollers movable on a pool surface, a rubber-like skirt depending from the front, sides and rear of the casing to a position close to the pool surface but spaced therefrom to define, with the casing, a chamber of substantial height within which the cleaning and scrubbing action can occur while confining liquid within the head, a vacuum line connected to the top of the casing near the front thereof and coacting with a curved front of the casing to provide an arcuate sweeping action of the liquid generally parallel to the pool surface facilitating removal of material taken off the pool surface, mounting bracket means disposed rearwardly of the vacuum line connection for mounting of a brush in engagement with the pool surface or a pressure rake, said pressure rake having a length extending crosswise of said head and a series of orifice openings, and a pressure hose connectable to said rake for delivering liquid under high pressure to the rake to cause emission of high velocity jets from said rake against the pool surface to provide a scrubbing action. The construction of the cleaning head and associated structure insures that a scrubbing action can occur and that material removed, as well as a selectively usable muriatic acid and water mixture, will be substantially confined within the cleaning chamber for with-

drawal. The removed materials do not enter into the pool waters requiring subsequent removal of physical particles by the filtering system of the pool and the acid mixture does not substantially change the pH of the pool water.

#### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view of the base unit with parts broken away;

FIG. 2 is a plan section, taken generally along the line 2—2 in FIG. 1;

FIG. 3 is a plan view of the cleaning head unit with associated pressure hose and vacuum line;

FIG. 4 is an inverted bottom plan view of the cleaning head on an enlarged scale;

FIG. 5 is a vertical section, taken generally along the line 5—5 in FIG. 4, and showing an alternate form of pressure hose support to the handle; and

FIG. 6 is a fragmentary view, similar to FIG. 5, showing the mounting of a brush, rather than a pressure rake in the cleaning head.

#### DESCRIPTION OF THE PREFERRED EMBODIMENT

The pool cleaning system includes the base unit, shown in FIGS. 1 and 2, and the cleaning head, shown in FIGS. 3 and 6. Referring to the base unit, a body, indicated generally at 10, has a series of wheels 11 providing for mobility of the base unit. At one end thereof, a series of walls define a tank, indicated generally at 15, for holding a liquid 16 which can be either water or a muriatic acid and water mixture. Water is supplied to the tank 15 through an inlet line 17 connected to a gate valve 18 and a float valve 19. When plain water is in use the gate valve 18 is open permitting flow from line 17 into the tank under the control of the float valve 19. When a muriatic acid and water mixture is being used the tank is filled with the desired amount of water and then the gate valve 18 is closed.

The body 10 mounts a pressure pump 20 driven by a motor 21 with the pump having an inlet line 22 connected to the tank 15 adjacent the bottom thereof and having an outlet line 23 connected to a valve 24. A pressure line 25 extends from the valve 24. The valve 24 is a bypass and unloader valve which permits continuous operation of the pump 20 and when there is no flow through the pressure line 25, there is circulating flow through the valve 24 and the bypass line 26 back to the inlet line 22. This valve can be the valve as offered by Hypro Inc., their Model No. 3390-10. The function of this valve is to permit continuous circulation through the pump even when there is no demand in the outlet line 25. This pump delivers the desired volume of water at approximately 500 p.s.i. for a purpose to be described.

A second pump 30 mounted on the body 10 is a vacuum pump driven by a motor 31 with the suction inlet of the pump being connected to a line 32 having a catch basket 33 in circuit therewith and with the pump having an outlet line 34 extendible to a drain opening. The vacuum pump 30 draws liquid and dissolved and entrained materials from the cleaning head with the entrained materials being filtered by the catch basket 33 and the liquid being discharged to the drain.

The cleaning head as shown particularly in FIGS. 3 to 6 comprises a casing indicated generally at 50 having a curved front wall 51, side walls 52 and 53 and a rear wall 54. The casing is supported for movement to move along the surface of the pool by a plurality of rollers. These rollers are ribbed and are of rubber to increase the holding action against the surface of the pool. A pair of rear rollers 56 and 57 extend outwardly of the casing and are mounted in bosses 58 and 59, respectively, formed on the casing. A pair of front rollers 60 and 61 are mounted adjacent the front of the casing on a pair of bosses 62 and 63, respectively, with the rollers 60 and 61 being spaced

apart a substantial distance. This permits the inflow of pool water and entrained material to the interior of the casing between the front rollers. This action is induced by the outflow from the casing described subsequently along with the manual advance of the casing along the pool surface.

A skirt 65 of rubber or other flexible material depends downwardly from the casing about the front, sides and rear thereof. The skirt 65 provides a flexible lower side for the casing whereby the casing can follow changing slopes of the pool surface and further substantially confines liquid acting within the casing from outflow to the surrounding pool waters. In effect, the skirt and casing together define a cleaning chamber of substantial height whereby the cleaning action occurring within the casing can occur without substantial effect on the surrounding pool water. The lower side of this skirt is close to the pool surface but normally out of engagement therewith whereby a slight inward flow of pool water into the casing can occur.

The casing has a handle 70 with spaced lower ends 71 and 72 pivotally mounted to the top side of the casing. As shown in FIG. 3, a length of brass tubing 73 can extend through the interior of the hollow handle 70 with a pressure hose 74 at the upper end thereof connecting to the pressure line 25 of the base unit. A hose 75 at the lower end of the tube 73 connects the tube to the upper end 76 of a pressure rake 77 shown in FIG. 5. The pressure hose 74 includes a tubing section 75 having an on-off valve for liquid flow through the pressure hose 74.

An alternate form of pressure liquid connection to the head 50 is shown in FIG. 5 wherein instead of using the brass tubing the pressure hose 74 can connect directly to the rake section 76 with lengths of the hose being fastened by clips to the handle 70.

The cleaning head also has a fitting 80 for connection to a vacuum line 81 connected to the inlet line 32 of the base unit.

The pressure rake 77 shown particularly in FIGS. 4 and 5, includes a length of tubing extending across the width of the cleaning head and having a series of openings 85 on the underside thereof for directing high velocity jets of liquid from the pressure rake against the pool surface to obtain a good scouring scrubbing action. The pump 20 of the base unit delivers an adequate volume of water at 500 p.s.i. through the pressure hose 74 which in a preferred embodiment can be of a  $\frac{5}{16}$ " diameter. This delivers the water to the rake 77 having a length of 14" and with approximately fifty holes along the length thereof, each having a diameter of .018" the high velocity water jets are directed against the pool surface. The pressure rake 77 is removably mounted within the confining chamber of the cleaning head by a spring clip mounting 88. When pressure liquid is not to be used the pressure rake 77 is removed from the spring clip mounting 88 and, as shown in FIG. 6, a brush member 90 extending transverse of the cleaning head is mounted in the spring clip 88 in engagement with the pool surface for a brushing engagement with said surface.

The versatility of the mechanism as well as the method performed thereby are believed evident. However, it will be noted that for the most simple cleaning action the unit can be used with the vacuum line 81 operative and the brush 90 positioned within the cleaning head. This gives a good scrubbing cleaning action for general types of dirt found on pool surfaces. In this operation the pressure hose 74 would not be connected to the cleaning head.

When it is desired to utilize high velocity water jets the pressure hose 74 is used and the pressure rake 77 mounted in the head and connected to the pressure hose and the pump 20 is caused to operate as well as the vacuum line 81. When using water the tank 15 maintains a water quantity of adequate volume by operation of the float valve 19. The water can be used continuously or intermittently under the control of an operator by operat-

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ing the on-off valve in the section 75 of the pressure hose. The materials removed by the high velocity water jets are substantially confined within the chamber of the casing and withdrawn along with liquid through the vacuum line 81.

With the foregoing cleaning, either solely by vacuum or in addition with water jets, the material collected and removed does not enter into the general pool waters but is withdrawn because of the confining nature of the cleaning head. The foregoing will perform most common cleaning operations involving removal of foreign materials, dirt and algae. For removal of mineral stains either pure vacuum cleaning or cleaning with high velocity water jets is not sufficient but it is necessary to use a mixture of water and muriatic acid. In removing mineral stains, the tank 15 is provided with a water and muriatic acid mixture with a ratio of approximately 30 to 1 of water to acid. This mixture is supplied to the pressure rake 77 where it is delivered as high velocity jets against the pool surface and the mineral stains are caused to dissolve in the solution with the cleaning materials being substantially confined within the chamber of the casing. The curved contour of the front of the casing and the location of the vacuum outlet fitting 80 contribute to an arcuate sweeping action of the liquid generally parallel to the pool surface which in all operations assists in confining the material within the casing and carrying entrained particles for withdrawal from the cleaning head. With this confining action, my invention has made it practicable to use a muriatic acid and water mixture without draining of the pool since the muriatic acid will not be diluted by pool water and there will be very little leakage of muriatic acid into the pool water. This leakage, if it occurred, would lower the pH of the pool water and discolor the water.

The operator will manipulate the cleaning head by the handle 70 and can move it along the pool surface with a slight inflow through the front of the cleaning head between the rollers 60 and 61 and under the skirt 65. The ribbed rollers 56, 57, 60 and 61 permit using the cleaning head on sloped surfaces while maintaining adequate grip on the pool surface.

With the structure disclosed herein and the method performed utilizing this structure, it is possible to perform all the different types of cleaning operations required for a swimming pool without any substantial down time of the pool as by complete or partial draining thereof.

I claim:

1. A method of cleaning swimming pool surfaces of dirt, algae and mineral stains without draining the pool comprising, moving a cleaning head along the surface of the pool which defines with the pool surface a substantially enclosed space, delivering liquid under pressure to said head and converting said liquid to a plurality of high velocity jets inside said head and within said enclosed space directed toward said pool surface, said liquid being a chemical and water mixture, and withdrawing said water and chemical mixture along with entrained and dissolved materials from within said enclosed space by vacuum to a discharge location, said water and chemical mixture within the head being given an arcuate sweeping action generally parallel to the pool surface by the head contour and withdrawing vacuum action in open communication with said enclosed space to facilitate carrying of entrained particles away from the head.

2. A method as defined in claim 1 wherein the delivery

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of liquid to said head is selectively controlled to utilize the water and chemical mixture as required.

3. A cleaning head unit for a pool cleaning system capable of using strong chemicals without draining of the pool comprising a casing defining a cleanings chamber with a plurality of rollers thereon for supporting the head at a distance from a pool surface, a rubber-like skirt depending from said casing to a position close to the pool surface but spaced therefrom to substantially confine liquid within the head, a vacuum line connected to the top of the casing near the front thereof, mounting bracket means disposed rearwardly of the vacuum line connection for mounting of a brush in engagement with the pool surface or a pressure rake, a pressure rake having a length extending crosswise of said head and a series of orifice openings, and a hose connectable to said rake for delivering liquid under high pressure to said rake to cause emission of high velocity jets from said rake against the pool surface and a curved front wall at the front of the casing to coact with the vacuum induced outflow from the head to cause an arcuate sweeping action of the liquid generally parallel to the pool surface to assist in carrying entrained particles with the withdrawn liquid.

4. A head unit as defined in claim 3 wherein two of said plurality of rollers are at the front of the head and are spaced apart to permit inflow of pool water and particles to said head which flow under said skirt.

5. A cleaning head as defined in claim 3 wherein a handle is attached thereto, and said hose is supported by said handle, and an on-off valve for said hose is supported adjacent said handle.

6. A cleaning head unit as defined in claim 3 wherein said rubber-like skirt has sufficient height to permit movement of the unit along pool surfaces of changing shape without engagement thereof by the underside of the casing.

7. A cleaning head unit as defined in claim 3 wherein said cleaning head casing has depending side walls, a rear wall, and a top wall which with said skirt and curved front wall define a chamber of adequate dimensions to permit liquid agitation without forcing cleaning liquid out of the casing into the pool water, and said head having a minimal and the top wall being substantially flat to position the vacuum line connection close to the pool surface.

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