Jan. 15, 1963 L. M. MULLINIX ETAL 3,073,727

SWIMMING POOL CLEANING DEVICE AND METHOD

Filed July 20, 1959 3 Sheets-Sheet 1

Fig. 1.

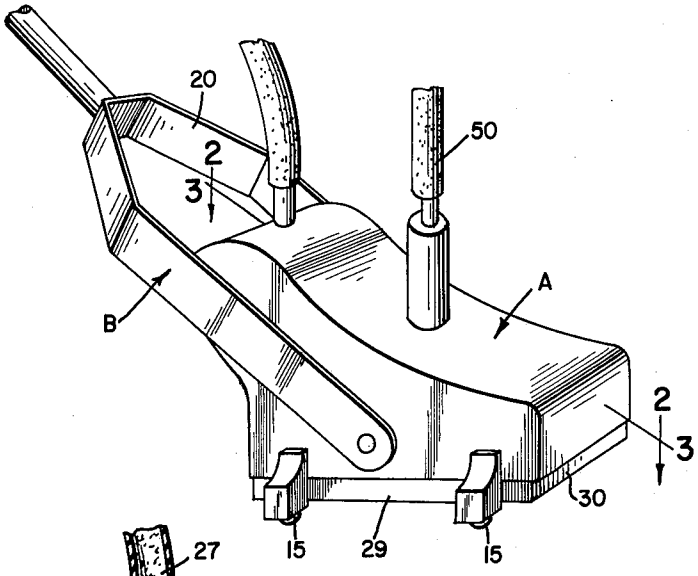
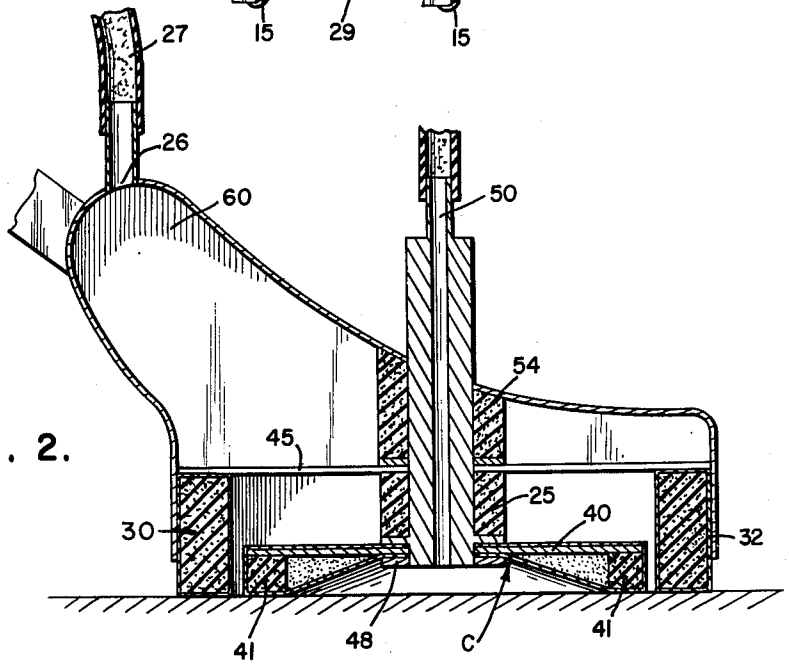


Fig. 2.



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Filed July 20, 1959 3 Sheets-Sheet 2

Fig. 3.

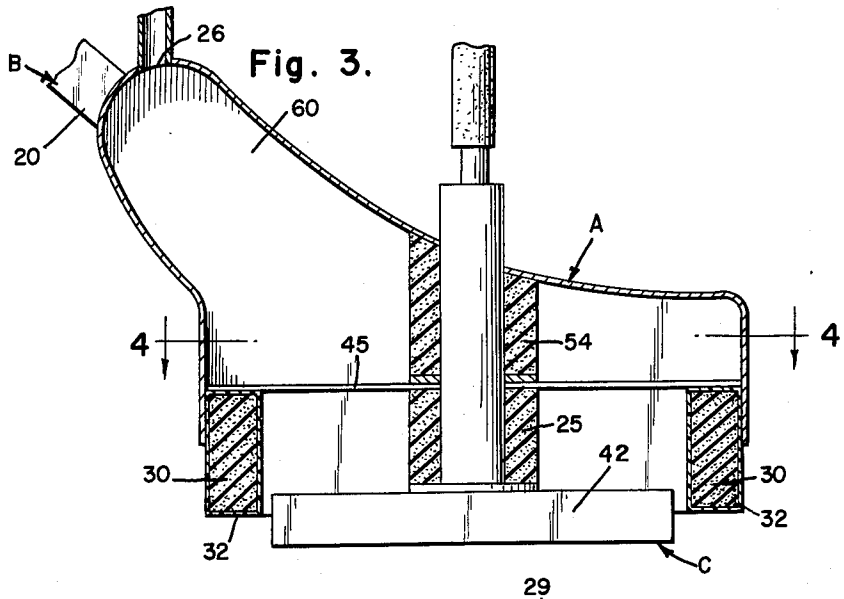


Fig. 4.

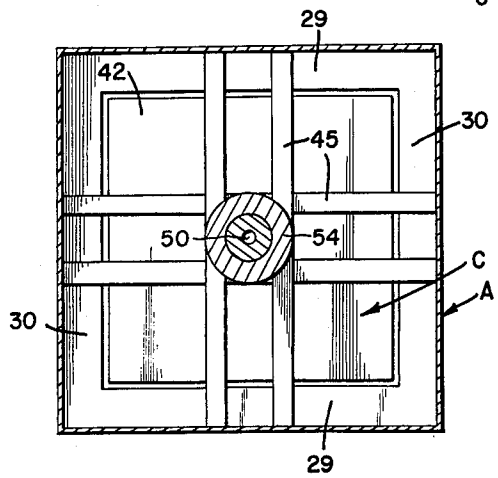
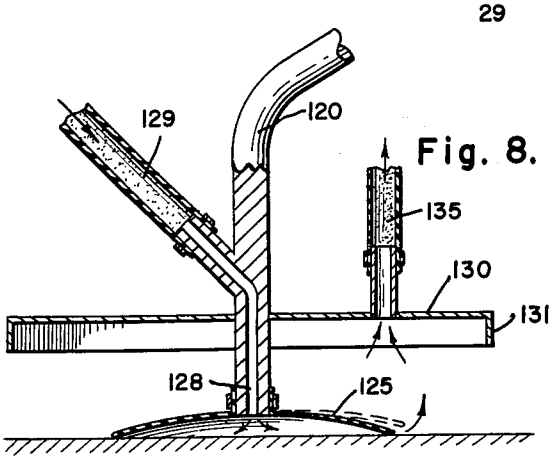


Fig. 8.



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Filed July 20, 1959 3 Sheets-Sheet 3

Fig. 5.

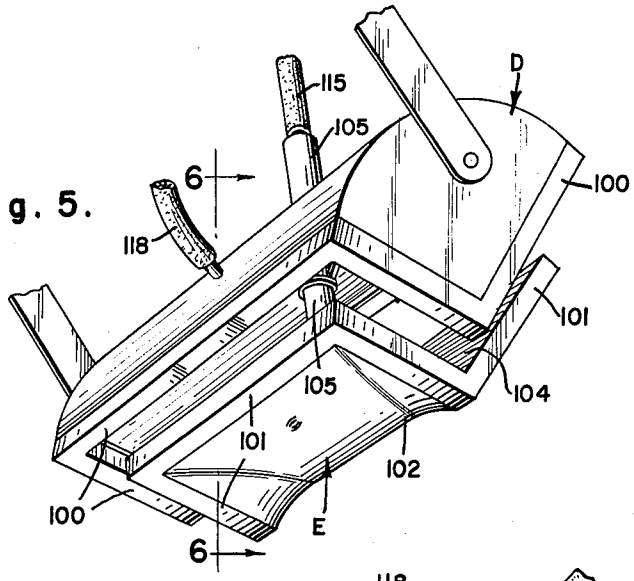
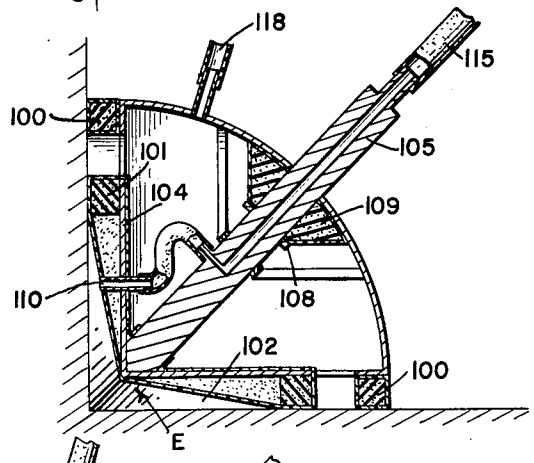


Fig. 6.



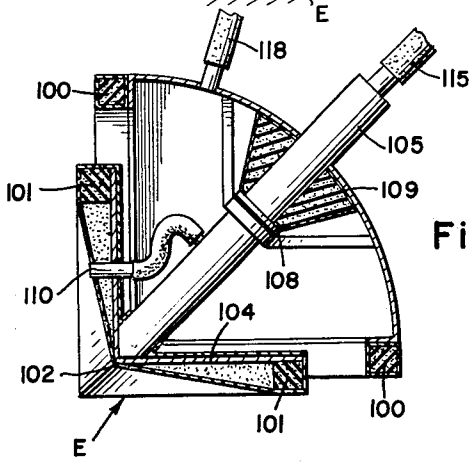


Fig. 7.

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SWIMMING POOL CLEANING DEVICE AND METHOD

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Filed July 20, 1959, Ser. No. 828,187
3 Claims. (Cl. 134—21)

This invention relates to a device for and a method of removing stains from the side and bottom walls of a swimming pool.

In the conventional swimming pools which are constructed with a concrete form or covered with a "gunite" or smooth surface concrete face there is a tendency for the concrete surface or face to stain because of calcium or other deposits which come to the surface of the side or bottom walls of the pool. Such stains can be removed by treating the stained area with a strong acid solution such as for example hydrochloric or muriatic acid. The acid tends to dissolve the staining material including calcium and other deposits and provides a finished clean surface.

One of the practical problems in cleaning swimming pool walls, however, is that water substantially covers a greater part of the concrete forming the body of the pool. Thus there are two alternatives in cleaning the side and bottom walls of the pool, one including the removal of water from the pool prior to scrubbing the bottom and side walls with an acid solution and the other necessitates some means of applying an acid bath or scrubbing action to the side or bottom walls of the pool during the time that the water is retained within the pool. The latter course of action is preferred. However, it has been found that the acid solutions that are effective in attacking the stain on the pool walls contaminates the pool water to such an extent that heretofore it has been impractical to employ such acids to the stained areas while the water was still retained in the pool.

A principal object of this invention is to provide a unique device which will provide an acid bath immediately adjacent the areas of the side or bottom walls of the pool to be cleaned without contaminating the pool water with the acid solution or the residual elements formed by the re-action of the acid with the concrete and water.

An object of this invention is to provide a unique acid bath forming device which operates in conjunction with a vacuum mechanism so that the areas of acid bath are completely surrounded by a vacuum manifold which will draw the contamination from the acid bath and the pool without contaminating the pool water.

Another object of this invention is to provide a novel device having a manifold which resiliently engages the side or bottom walls of a pool or other body to form a substantial vacuum seal between the side or bottom walls of the pool and the manifold of such a nature that the water immediately surrounding the seal can be drawn into the manifold but the water within the manifold cannot return back into the pool area.

Still another object of this invention is to provide within the aforesaid manifold an acid bath chamber which has resilient marginal edges urged against the side or bottom walls of the pool to provide a substantially fluid resistant seal between the marginal edges of the chamber and the bottom or side walls of the pool so that acid continually fed to the chamber stays in a concentrated area within the chamber so as to act against the pool walls immediately adjacent thereto.

A feature and advantage of this invention is that the sealing device between the chamber and the side and bottom walls of the pool is sufficiently resilient so that as gas pressure builds up due to the reaction of the acid with

the concrete there will be some seepage of the acid to the vacuum chamber or manifold thus providing means for expelling the salts and gases which would otherwise tend to dilute the acid within the chamber to allow room for the additional supply of fresh acid to the chamber.

Another feature and advantage of this invention is that the manifold effectively functions to withdraw any of the acid, salts or gases which are excreted from the acid chamber into the manifold without the danger of contaminating the pool water.

A further object of this invention is to provide a portable device which can be moved into engagement with the side and bottom walls of the pool and moved about the walls of the pool to provide a mobile acid bath which is positionable about the various spotted areas desired to be cleaned so as to effectively clean a pool without removal of water and without the danger of contamination of the pool water.

Still another feature and advantage of this invention is that the mobile unit can be constructed in a variety of configurations so that the device can conform with both flat and angular wall configurations.

Still a further object of this invention is to provide a spot removing device for cleaning randomly spaced small stained areas with a minimum of pool contamination.

A still further object of this invention is to provide a method of cleaning a pool including the steps of forming an acid bath immediately adjacent the portion of the pool wall that is to be cleaned, forming a first seal about said bath against the pool wall, forming a vacuum about said acid bath and forming a second fluid tight seal against the pool wall and said vacuum chamber, and relieving the first seal to allow fluid escape from the acid chamber to the vacuum chamber and releasing said second seal to allow fluid passage from the pool area into said evacuated area.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings in which similar characters of reference represent corresponding parts in each of the several views.

In the drawings:

FIG. 1 is a perspective view of a principal embodiment of the cleaning apparatus.

FIG. 2 is a sectional view of FIG. 1 taken at line 2—2.

FIG. 3 is a sectional view similar to FIG. 2 taken at line 3—3.

FIG. 4 is a sectional plan view taken at line 4—4, of FIG. 3.

FIG. 5 is a perspective view of a swimming pool cleaning apparatus formed for co-action with a right angle wall formation.

FIG. 6 is a cross-sectional view of the embodiment of FIG. 5 taken at line 6—6.

FIG. 7 is a cross-sectional view similar to FIG. 6 taken at line 7—7.

FIG. 8 is a sectional view of a modification of the invention provided for use in cleaning random small spots on a pool wall.

Referring now to the drawings with particular reference to FIGS. 1, 2, 3 and 4 there is provided a pool cleaning apparatus generally including a vacuum manifold A mounted on rollers 15 which are designed for engagement with the side or bottom walls of the pool. A handle B having a bifurcated yoke 20 is connected to manifold A to provide means to move the manifold about the side and bottom walls of the pool.

Internally within manifold A there is provided an acid bath chamber generally indicated at C which is resiliently urged against the side or bottom walls of the pool by a resilient member 25. The manifold is formed with an exhaust port 26 which is connected to a hose 27 through

which water is withdrawn by a pump (not shown) so as to create a substantial vacuum within the area formed by manifold A.

The side marginal edges **29** and front and rear marginal edges **30** are formed of a resilient material such as sponge rubber or other similar material enclosed in a polyethylene covering **32** as particularly seen in FIGS. 2 and 3. Resilient marginal edge members **29** and **30** are formed of sufficient length so that when rollers **15** are arranged to engage the walls of a pool the resilient members will be urged under limited pressure against the walls of the pool thus in effect forming a partial seal between the manifold and the walls of the pool. The seal created by the resilient edges or marginal members is sufficiently yieldable so that water can be drawn from the pool into the manifold but because of the partial vacuum within the manifold the reverse cannot take place, that is, water cannot pass from the manifold outwardly through the resilient marginal edges. In other words, the resilient members act substantially as a one way or check valve.

Acid bath chamber C is formed with a top rectangular plate **40** of a resilient material with a resilient marginal edge **40** circumscribing the bottom edge of the plate. Resilient member **25** is biased against two pairs of cross members **45** mounted on the manifold walls and the top central portion of plate **40** so as to force plate **40** outwardly toward the pool walls in such a way that when rollers **15** are in engagement with the pool walls resilient marginal edges **41** also will make substantially tight contact with the pool walls. The seal created between marginal edges **45** against the pool walls is such that normally there will be a fluid tight seal between acid bath chamber C and the manifold except when the pressure differential between the two becomes sufficiently great then the fluid within the higher pressure area, i.e., within the acid chamber, will seep under the marginal edgs **41** into manifold A.

Resilient marginal edges **41** and **42** are made of a material such as rubber and a polyethylene film jacket **42** is connected by a washer **48** to the central portion of plate **40** and wraps around marginal edges **41** and the top portion of plate **40** to completely enclose resilient members **41** and to prevent acid contact with the metal or other material forming plate **40** and the rubber or other material forming resilient marginal edges **41**.

Acid is fed into chamber C through a tube **50** which is centrally located to provide an opening in the center of plate **40**. A fluid seal **54** is arranged around the aperture through the top portion of the manifold through which tube **50** projects outwardly.

The top wall of the manifold is formed to provide an upper extending pocket **60** which provides an area within the manifold substantially above the other portions of the manifold and at the apex of which water exhaust port **26** is located.

In operation manifold A is placed within the pool with rollers **15** in rolling engagement with the side or bottom walls of the pool. The device is then positioned over stained areas by use of handle B which is formed of sufficient length so that it may be manipulated from areas outside the pool.

A pump is attached to hose **27** so as to provide a substantial vacuum within manifold A. Acid is then fed through tube **50** wherein the acid flows into chamber C. The acid then re-acts with the concrete forming the pool walls and dissolves the material such as calcium and the like forming the stains on the pool walls. With the dissolving of the stains the acid re-acts to create gas bubbles and salts. The presence of gas bubbles creates an area within manifold A of elevated pressure of such a nature that the pressure differential between acid bath chamber C and the manifold is sufficiently great so that there is a continual flow of acid under marginal edges **41** forming the acid bath.

Residual acid which flows into manifold A is then

removed through exhaust port **26** and hose **27**. At the same time some water also flows from the pool into manifold A to further dilute any of the acid which might be contained within the manifold and to provide a continual water flow through hose **27**.

The elevated chamber portion **60** is arranged so that when the device is used on the bottom of the pool the gas bubbles will rise to the highest point within the manifold so that they will first withdraw through exhaust port **26**. Similarly, when the side walls of the pool are to be cleaned the device is positioned so that the highest portion **60** is arranged above the remainder of manifold A so that similarly the gas bubbles will raise to the exhaust port.

In FIGS. 5, 6 and 7 there is provided a modification of the invention incorporating a manifold D having a bottom edge which is formed at right angles in cross-section and provided with resilient marginal edges indicated at **100** in such a way that the device may be inserted next to a right angle portion of a pool wherein resilient members **100** are in engagement with the side walls of the pool forming a fluid tight seal between the pool walls and manifold D.

Acid bath chamber E is positioned with manifold D similarly having a resilient marginal edge **101** and a polyethylene glove fitted over the entire structure forming the acid chamber. The body of the acid chamber is formed of a plate **104** formed at right angles and connected at the central portion to a piston member **105** which is slidably engaged with the housing forming manifold D. A washer **108** is mounted on piston **105** to engage a resilient body **108** which functions to urge piston **105** outwardly. Acid is fed into acid bath chamber E through an opening **110** and through a pipe conduit passing through the central portion of piston **105** and fed with acid through a hose **115**.

The device operates in exactly the same manner as the device shown in FIGS. 1, 2, 3 and 4 wherein the device is first positioned against a right angle portion of the pool with sufficient pressure so that resilient marginal edges **100** and **101** are tightly nested against the walls of the pool. A vacuum is then connected to a hose **118** mounted on the top portion of manifold D so as to continually withdraw water from the manifold. Simultaneously acid is applied through hose **115** so as to pass into the acid chamber thus providing an acid bath to remove the stains. As the gas pressure develops within the acid chamber the gas bubbles pass to the resilient margin edge **101** and into the vacuum chamber where the acid and gas is removed through hose **118**.

In FIG. 8 there is provided another modification of the invention designated particularly for use in removing small spots which might be randomly located on the pool walls and which will remove a substantial portion of the acid used for the spot remover. In this device there is provided a handle **120** of sufficient length so as to be manipulated external of the pool and mounted on the end of the handle is a concave resilient member **125**.

Handle **120** is provided with an axial chamber **128** connected to a hose **129** to allow the input of acid through the chamber **128**. The flexible member **125** is arranged with the peripheral portion in engagement with the pool wall over the spots to be removed.

A baffle member **130** is mounted on the end portion of the handle and is provided with depending edges **131** which are arranged to form a trap for bubbles of gas which are substantially lighter than the water.

An exhaust tube is connected in communication with the baffle plate **130** so that the bubbles emanating from the resilient member **125** within baffle **130** and thereafter removed through vacuum tube **135**. This device will create some pool contamination. However, if used in limited areas there is sufficient removal of the acid and gases so as to render the actual amount of contamination always negligible.

Although the foregoing invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be practiced within the spirit of the invention as limited only by the scope of the appended claims.

What is claimed:

1. A device for removing stains from water submerged surfaces of a swimming pool comprising: a vacuum chamber; means to withdraw water from said vacuum chamber; said vacuum chamber having one open end formed by a resilient wall; a smooth water proof covering about said resilient wall; means to mount said vacuum chamber against the pool walls with said resilient wall of the vacuum chamber forming a substantial seal against the pool walls; an acid bath chamber mounted within said vacuum chamber; said acid bath chamber formed with resilient marginal edges formed to nest against the pool walls to form a substantial seal against the pool walls; a water proof covering enclosing the resilient wall of said acid bath chamber; means to force said acid bath chamber against said pool walls positioned between said acid bath chamber and the top walls of said vacuum chamber; and means to meter liquid to said acid bath chamber.

2. A device according to claim 1 and wherein said vacuum chamber is formed with a housing having one portion substantially raised above the remaining portion of the housing; said means to withdraw fluid from said vacuum chamber being connected in communication to the uppermost portion of the raised portion of said chamber.

3. A method of treating submerged walls of a swimming pool comprising the steps of: forming a fluid treating area about a portion of the pool wall; metering fluid treating material to the fluid treating area; sealing the fluid treating area against the transfer of fluid within the area to the pool under conditions of normal pressure differential; forming a partial vacuum completely around the fluid treating area; raising the pressure within the fluid treating area by the action of fluid treating material with the pool wall to create a pressure differential which will cause the metering of some fluid from the fluid treating area into the area of partial vacuum; and withdrawing the escaped material from the area of partial vacuum.

References Cited in the file of this patent

UNITED STATES PATENTS

965,315	Moorhead	July 26, 1910
1,498,255	Winchester	June 17, 1924
1,929,345	Brown	Oct. 3, 1933
2,588,000	Hines	Mar. 4, 1952
2,646,889	Dulak	July 28, 1953