United States Patent

Burgess et al.

[15] **3,675,261**

[45] **July 11, 1972**

[54] POOL CLEANING APPARATUS

[72] Inventors: **Kenneth M. Burgess,** 624 Barrington Avenue, Los Angeles, Calif. 90049; **Doland M. Burgess,** 1060 El Medio Place, Los Angeles, Calif. 90272

[22] Filed: **July 6, 1970**

[21] Appl. No.: **52,618**

[52] **U.S. Cl.** **15/1.7**

[51] **Int. Cl.** **E04h 3/20**

[58] **Field of Search** 15/1.7; 210/169

[56] **References Cited**

UNITED STATES PATENTS

3,384,914 5/1968 Wilhelmsen 15/1.7

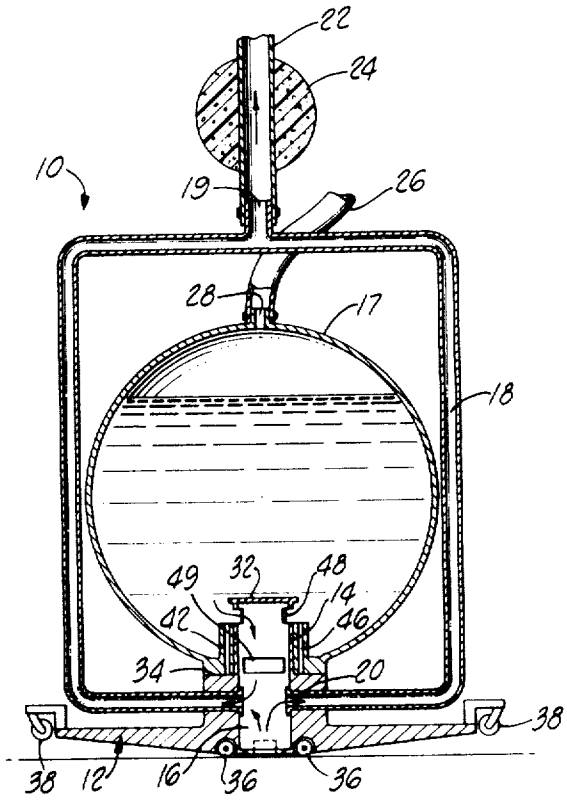
Primary Examiner—Edward L. Roberts

Attorney—Whann & McManigal

[57] **ABSTRACT**

A pool cleaning apparatus for automatically cleaning swimming pools and the like which requires no operator supervision during the cleaning process. The apparatus comprises a vacuum head, a means for raising and lowering the vacuum head in the form of a float having a water inlet and a water outlet, valves for opening and closing the water inlet and water outlet, means for supplying air to the float, and means for maintaining a vacuum at the vacuum head.

9 Claims, 5 Drawing Figures



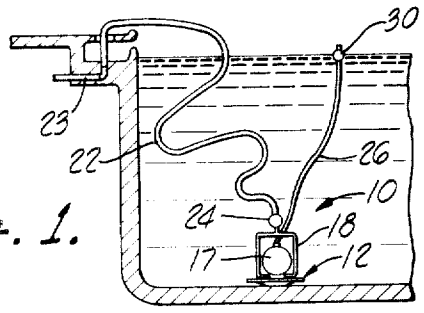


FIG. 1.

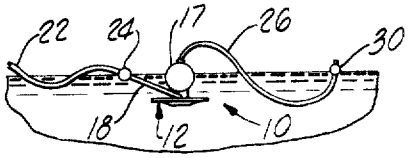


FIG. 2.

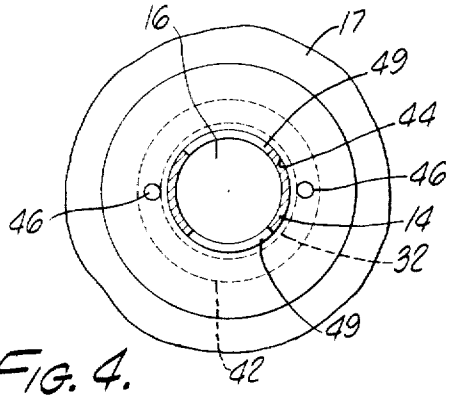


FIG. 4.

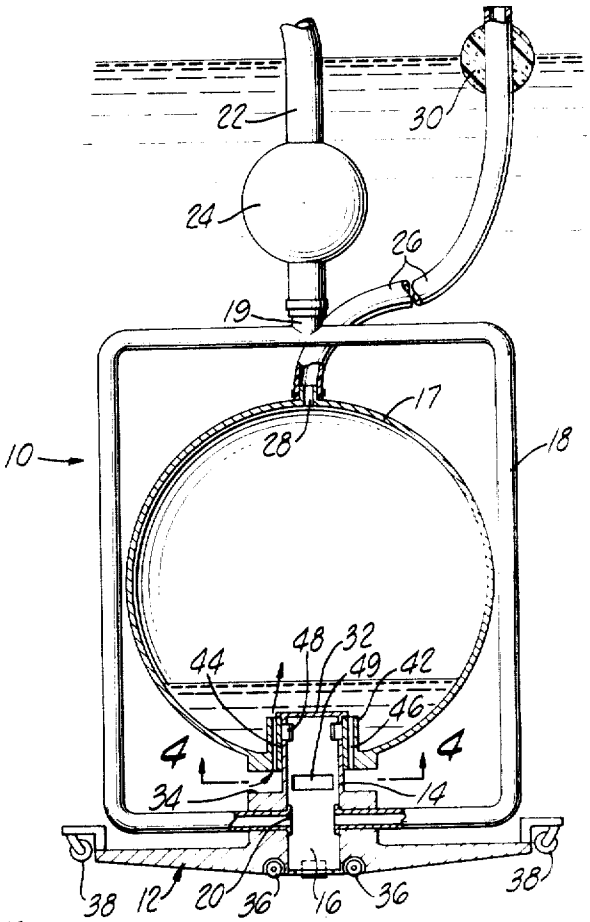


FIG. 3.

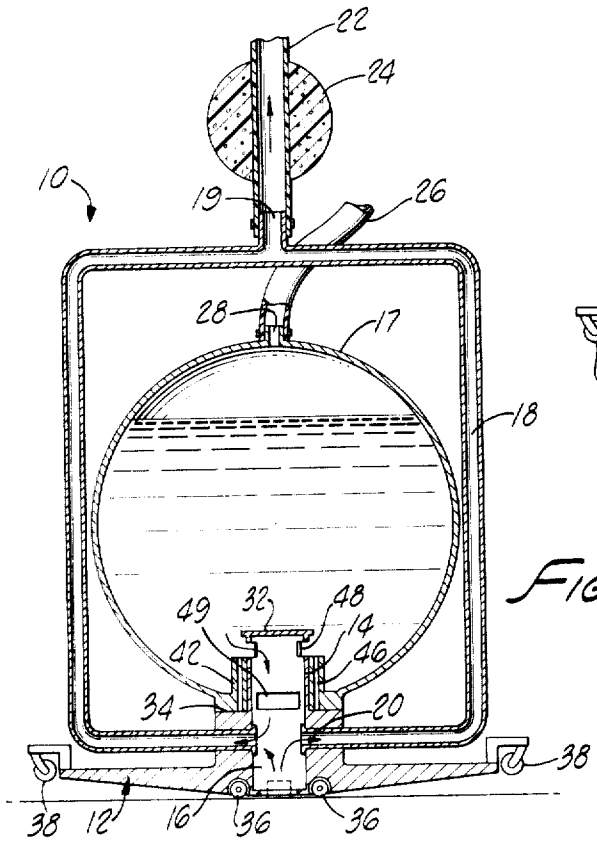


FIG. 5.

KENNETH M. BURGESS
DONALD M. BURGESS
INVENTORS
WHANN & McMANIGAL
Attorneys for Applicants
BY

POOL CLEANING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to apparatus for cleaning the inner surfaces of vessels containing liquids, and more particularly, to an apparatus for removing dirt and other foreign matter from the inner surfaces of swimming pools.

2. Description of the Prior Art

Prior to this invention various types of devices have been developed for cleaning swimming pools and the like. Many of these devices require continuous attention and manipulation by an operator. Others, which are designed for automatic operation, often require elaborate and expensive associated support equipment.

Deficiencies inherent in prior devices are overcome by the apparatus of our invention which is fully automatic, requires no operator attention during the cleaning process, is inexpensive to fabricate, and requires no complex auxiliary support equipment.

SUMMARY OF THE INVENTION

This invention involves an improved and highly novel type of apparatus for automatically cleaning the inner surfaces of vessels containing liquids, such as swimming pools. It comprises a vacuum head which is adapted to suck up foreign matter from the surfaces of the pool, means for exhausting the foreign matter from the pool, and means operatively associated with the vacuum head for causing it to automatically move from place to place within the pool.

A principal object of our invention is to provide a pool cleaning apparatus which automatically removes dirt and foreign materials from the surfaces of pools containing water or other liquids.

Another object is to provide an apparatus of the character referred to having a suction means operable by a swimming pool vacuum means for removing dirt from the surfaces of swimming pools.

Still another object of our invention is to provide an apparatus of the character referred to in the preceding paragraph having a lifting means which is operatively associated with the suction means for automatically moving it from place to place within the pool.

A further object is to provide an apparatus of the character previously described in which the lifting means for moving the suction means comprises a hollow float adapted to contain water and air, having an air supply means, a water inlet means, and a water outlet means.

Still another object of our invention is to provide an apparatus of the character referred to in the preceding paragraphs having valve means for opening and closing the water inlet and water outlet means of the hollow float so that the float may alternately be filled and emptied of water, causing it to float and sink within the pool in a cyclic manner.

Still a further object of our invention is to provide an apparatus of the class described having roller means for causing the apparatus to roll along the surfaces of the pool.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the accompanying drawings, which are for illustrative purposes only:

FIG. 1 is an illustration depicting the pool cleaning apparatus positioned in a cleaning attitude at the bottom of a water-filled pool;

FIG. 2 is an illustration depicting the pool cleaning apparatus at a point during its transfer cycle floating at the surface of a water-filled pool;

FIG. 3 is an enlarged fragmentary side view of the pool cleaning apparatus shown at a second point during its transfer cycle, partly broken away to show its internal construction;

FIG. 4 is a fragmentary plan view, taken along the lines 4—4 of FIG. 3; and

FIG. 5 is an enlarged cross-sectional view of that portion of the apparatus which is shown resting on the bottom of the pool in FIG. 1, illustrating its internal construction.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings, FIGS. 1 and 2 illustrate the operation of the apparatus of my invention. In a manner which will be described in detail hereinafter, when the apparatus, generally designated by the numeral 10, is placed in a pool of water such as a swimming pool, it will move automatically into the working attitude depicted in FIG. 1. While in this position, the apparatus is adapted to suck up dirt or other foreign matter in its immediate vicinity and exhaust it from the pool. Without operator assistance the apparatus will then automatically start into its transfer mode, rising to a position such as is illustrated in FIG. 2. After a brief period, it will once again return to the bottom of the pool at a new location and the cleaning operation will be repeated. This process will continue unattended until the entire pool is clean and the apparatus is removed.

As can be seen in FIGS. 3 and 4, pool cleaning apparatus 10 has a suction means shown in the form of a vacuum head or base member 12 having a cylindrically shaped column 14 protruding therefrom with a duct or passageway 16 therethrough. Operatively associated with base member 12 is a lifting means shown here in the form of a hollow spherically-shaped float 17. Numeral 18 designates an exhaust manifold pivotally coupled with base 12 having an exhaust port 19 and a plurality of intake ports 20 communicating with duct 16 of base member 12. A vacuum means for maintaining a vacuum at the vacuum head is provided in the form of an exhaust line 22 having its first end connected to exhaust port 19 of manifold 18, and its second end operatively associated with swimming pool vacuum means 23. Attached near the first end of exhaust line 22 is a buoyant body 24 which is adapted to hold manifold 18 in a generally upright position during periods when the cleaning apparatus 10 is submerged below the surface of the pool. It is to be noted that exhaust line 22 must be of a sufficient length to permit access by cleaning apparatus 10 to all parts of the pool. An air supply means for continually supplying air to float 17 is provided in the form of a conduit 26 having its first end connected to air intake means 28 of float 17, and its second end supported above the surface of the water by a second buoyant body 30.

Referring now particularly to FIG. 3, cleaning apparatus 10 is shown disposed at an intermediate position of its transfer mode at which it is starting its descent to the bottom of the pool. In this view, duct 16 of base member 12 can be seen to be open at its lower first extremity and closed at its upper second extremity by a closure member 32. As illustrated, closure member 32 is of a diameter slightly larger than the opening in the upper extremity of duct 16. Intermediate of duct 16 is a first valve means in the form of a flat surface 34 integral to base member 12 and lying in a plane normal to the longitudinal axis of duct 16.

A plurality of spacer means in the form of rollers 36 are rotatably mounted on base member 12 adjacent duct 16. Rollers 36 are adapted to maintain a spaced relationship between the lower surfaces of base member 12 and the bottom of the pool during the time the apparatus is in its cleaning attitude. A plurality of outer rollers 38 are also rotatably mounted near the outer extremities of base 12. ROllers 38 are arranged to cooperate with rollers 36 to cause apparatus 10 to roll along inclined portions of the inner surfaces of the pool so that it may expeditiously move into its cleaning attitude at the bottom of the pool, as shown in FIG. 1.

Referring again to both FIG. 3 and FIG. 4, float 17 can be seen to have a second valve means in the form of a cylindrically-shaped element 42 located opposite air intake means 28. Element 42 has a duct or passageway 44 therethrough. Duct 44 is open at both ends and is of such a diameter as to permit telescopic association between element 42 of float 17 and

column 14 of base member 12. Element 42 can also be seen to have a plurality of longitudinal passageways 46 therethrough. Passageways 46 are arranged to communicate with the interior of float 17 at one of their extremities, and with the water in the pool at their other extremities forming the water intake means of float 17 when first valve means 34 is in an open position. As can best be seen in FIG. 4, column 14 of base member 12 also has a plurality of passageways or openings 48 near its upper end. Passageways 48 are arranged so as to communicate with the interior of float 17, forming the water exhaust means of float 17 when second valve means formed by element 42 is in an open position.

In the attitude of the apparatus as illustrated in FIG. 3, it is to be observed that float 17 contains a significantly smaller volume of water than air. In this attitude the buoyancy of float 17 causes relative telescopic movement between column 14 of base member 12 and element 42 of float 17 so that the upper surface of element 42 moves into contact with the lower surface of closure member 32. In this position, second valve means in the form of element 42 is in the closed position, and the water exhaust means formed by openings 48 in column 14 is sealed. It is to be observed, however, that in this position first valve means formed by surface 34 is in the open position, allowing water to flow from the pool into float 17 through the water intake means formed by passageways 46. Water will continue to flow into float 17 until the majority of the air has been displaced through conduit 26. This, of course, results in loss of buoyancy of float 17 which will cause it, along with base member 12, to sink to the bottom of the pool, as is shown in FIG. 5. The loss of buoyancy of float 17 will also result in its moving relative to base member 12 to a point where the lower surfaces of element 42 rest against surface 34 of base member 12. As can be seen in FIG. 5, in this position the lower extremities of passageways 46 are closed to flow of water. It is to be observed, however, that the downward telescopic movement of element 42 of float 17 relative to column 14 of base member 12 opens the second valve means formed by element 42 and allows openings 48 in column 14 to communicate directly with the interior of float 17.

With apparatus 10 in the working mode as illustrated in FIG. 5, rollers 36 hold base member 12 in a spaced relationship with the bottom of the pool. In this position, pool vacuum means 23 communicating with duct 16 through the path formed by exhaust line 22 and manifold 18 causes water at the bottom of the pool in the vicinity of the apparatus to be sucked upwardly into duct 16 at a relatively high velocity. This suction causes dirt and other foreign materials resting on the bottom of the pool to move with the water in the direction of the arrows into duct 16, through manifold 18, and finally through exhaust line 22 into the pool filtering system. Openings 49 permit water to flow from the pool in duct 16, thus bypassing the vacuum head and reducing suction on the head.

At the same time the water from the pool is being urged by vacuum means 24 to flow upwardly through duct 16, water from the interior of float 17 is being urged to flow downwardly through openings 48, as is indicated by the direction arrow. After a period of time, the water in float 17 will thus be substantially exhausted and will be replaced by air supplied through air conduit 26. This results in increased buoyancy of float 17, causing it to float upwardly. At the point at which element 42 of float 17 engages closure member 32, base member or vacuum head 12 will be lifted from the bottom of the pool and float 17, along with base member 12, will float as a unit to the surface.

When the apparatus reaches the surface of the pool, as shown in FIG. 2, or reaches some intermediate point as, for example, is shown in FIG. 3, the cycle will start again. Water will flow into float 17 through passageways 46, causing float 17 to lose buoyancy and sink to the bottom of the pool at some new randomly selected location. During the cleaning cycle water will be exhausted from float 17, causing it and base member 12 to again float to the surface. The cycle will thus be continually repeated until the pool is satisfactorily cleaned and the apparatus is removed from the pool for storage.

While specific embodiments of the invention have been shown and described, the invention is not limited to the particular constructions disclosed. Accordingly, it is intended that all modifications which fall within the true scope of the invention be included in the appended claims.

We claim:

1. A pool cleaning apparatus comprising:
   a. a suction means;
   b. a lifting means including a hollow float for raising and lowering said suction means, said lifting means having:
      1. a chamber
      2. a water intake means; and
      3. a water exhaust means;
   c. valve means for opening and closing said water intake means and said water exhaust means of said lifting means;
   d. means for supplying air to said lifting means; and
   e. vacuum means for maintaining a negative pressure within said suction means.

2. The apparatus defined in claim 1, wherein said suction means comprises a base member having a passageway therethrough adapted and arranged to communicate with water located proximate to the bottom surface of a pool containing water.

3. The apparatus defined in claim 2, wherein said vacuum means comprises a conduit having a first end operatively associated with a swimming pool vacuum means and a second end communicating with the passageway of said base member.

4. The apparatus defined in claim 3, wherein said base member has a plurality of roller means rotatably mounted thereon for maintaining a spaced relationship between said base member and the bottom surface of a pool containing water.

5. The apparatus defined in claim 1, wherein said means for supplying air to said lifting means comprises a conduit having a first end connected to said hollow float and having a second end communicating with a source of air.

6. The apparatus defined in claim 2, wherein said lifting means is operatively coupled with said base member so that said water exhaust means of said lifting means communicates with the passageway of said base member.

7. The apparatus defined in claim 6 in which said base member comprises a normally horizontally disposed base portion and a generally vertically extending column integral thereto, and in which said valve means comprises:
   a. a first valve means in the form of a surface of said base member; and
   b. a second valve means in the form of a cylindrical element operatively associated with the hollow float of said lifting means and adapted for telescopic engagement with the vertically extending column of said base member.

8. The apparatus defined in claim 7, wherein said base member has a plurality of roller means rotatably mounted thereon for rolling said base member along the inner surface of a pool containing water.

9. The apparatus defined in claim 1, wherein:
   a. said suction means comprises a vacuum head having a duct therethrough; and
   b. said valve means comprises:
      1. a first valve means in the form of a surface of said vacuum head; and
      2. a second valve means in the form of an element integral with said hollow float.

* * * * *