March 8, 1966 B. H. BURLIN ET AL 3,238,549

SWIMMING POOL CLEANER

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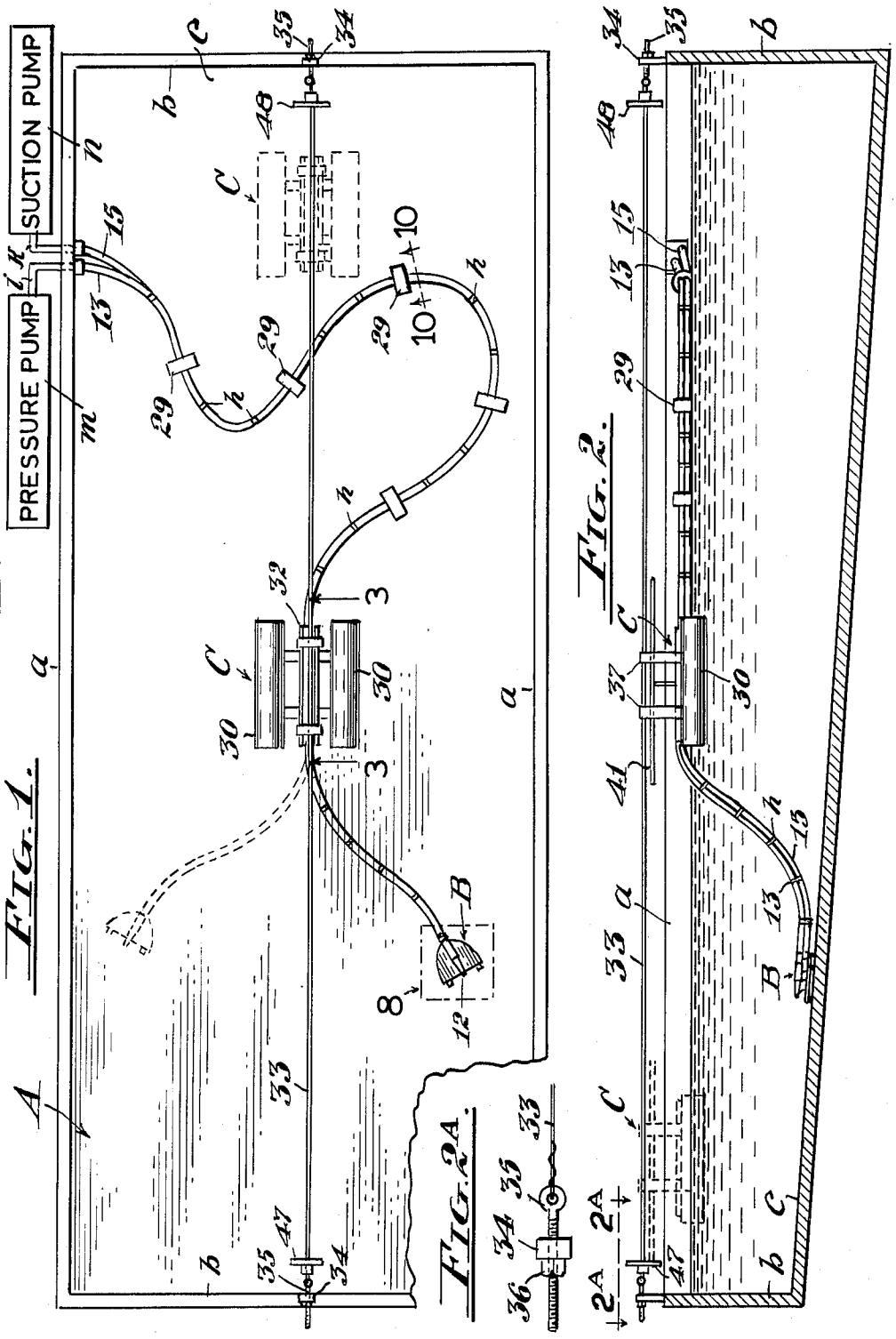


FIG. 1.

FIG. 2.

FIG. 2A.

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FIG. 3.

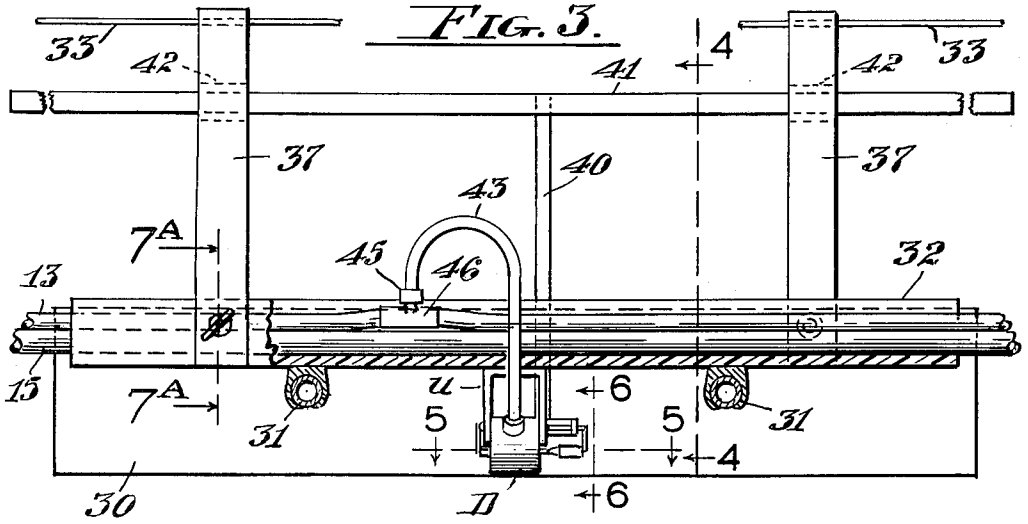


FIG. 4.

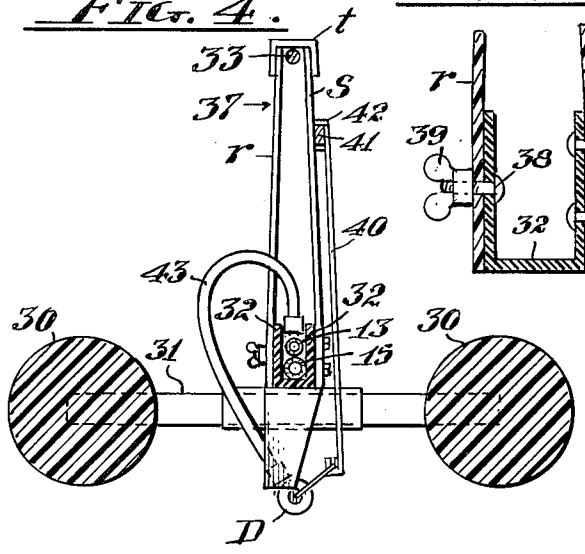


FIG. 7A.

FIG. 6.

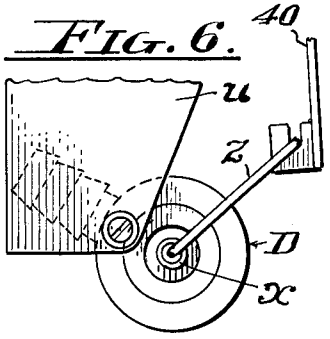


FIG. 7.

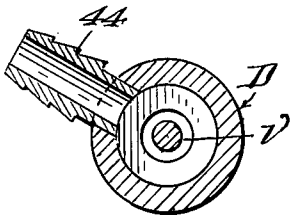
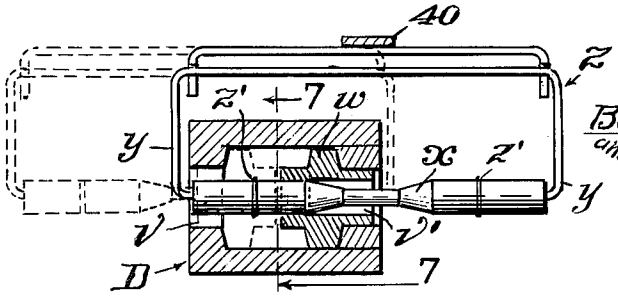


FIG. 5.



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FIG. 8.

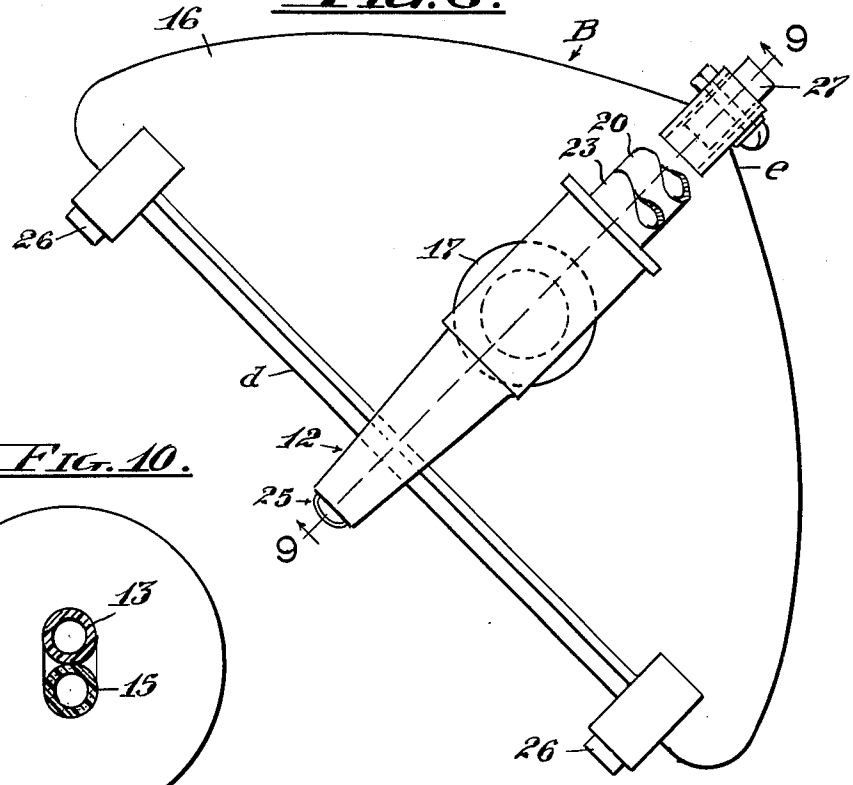
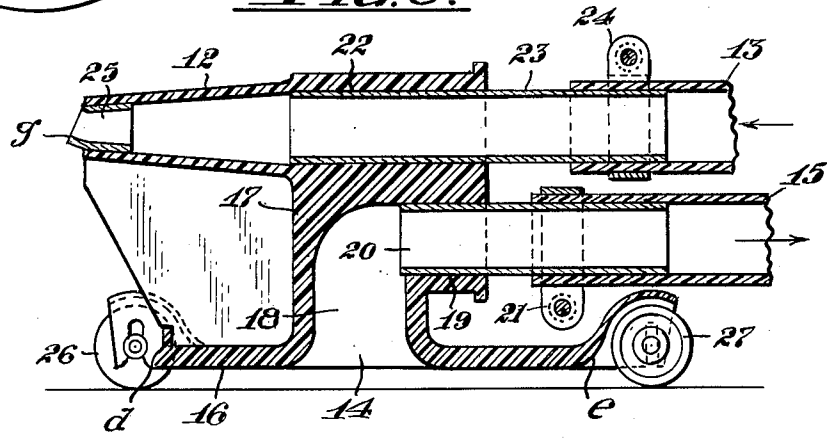


FIG. 10.

FIG. 9.



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United States Patent Office

3,238,549

Patented Mar. 8, 1966

3,238,549

SWIMMING POOL CLEANER

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Filed Jan. 13, 1964, Ser. No. 337,257

5 Claims. (Cl. 15—1.7)

This invention relates to an apparatus for cleansing the submerged floors of swimming pools and particularly pertains to improvements in the type of such apparatus wherein a carriage bearing a suction nozzle is self directed back and forth over the floor of a swimming pool under the urge of a jet of water under pressure such as is shown in the patent to R. J. Gelinas Number 3,108,298, issued October 29, 1963.

In the above recited patent and in other submarine floor cleaning mechanism, the services of an attendant is usually employed to move the cleaning apparatus bodily at random to various places in the pool while the carriage is being automatically swung laterally back and forth across the floor of the pool.

An object of the invention is to provide an improved means whereby a buoyant support for the pool cleaning carriage may be power propelled in a defined rectilineal path of travel over the floor of a pool while the carriage is being automatically swung laterally relative thereto.

Another object is to provide the pool cleaning carriage with a jet propulsion nozzle arranged to exert a combined longitudinal and downward thrust on the carriage and in which the activating jet comprises an upwardly deflected convergent stream whereby the jet enters the surrounding body of the pool in the form of a compact column so as to exert a concentrated thrust on the carriage serving to stable its movement and while exerting a down thrust on the carriage serving to maintain it in its seated position also in being directed upward away from the floor minimizes disturbance of loose sediment detrimental to the suction pick up.

The pool cleaning apparatus of the recited type is characterized by the embodiment of a cleaning head or carriage to which is connected the discharge end of an elongate hose leading from a source of water under pressure from which the water is discharged in such fashion as to impart lashing movement to the carriage whereby it is caused to sweep back and forth over the floor of the pool; the carriage also being equipped with an intake nozzle on its under side connecting with a hose leading to a discharge pump which acts to induct sediment collected on the bottom of the pool.

Heretofor the construction of devices of this nature has been such that the carriage in being motivated by the stream of water rejected therefrom, has a tendency to become inverted and occasionally does, thereby rendering the sediment ejection nozzle ineffectual until the carriage rights itself or is restored to its operating position by an attendant.

A further object of the invention is to provide a mode of attachment of the hoses to the carriage so as to have a stabilizing effect tending to maintain the carriage in its upright position, and in event of its becoming inverted, to automatically restore it to its normal position.

The invention is illustrated in the accompanying drawings in which:

FIG. 1 is a schematic plan view of a swimming pool showing it as equipped with the cleaning apparatus; with portions of the pool broken away:

FIG. 2 is a view of the pool as seen in longitudinal section and indicating in dotted lines the manner in which the apparatus is shifted longitudinally of the pool:

FIG. 2A is a detail in plan as seen on the line 2A—2Aof FIG. 2;

FIG. 3 is an enlarged detail in section and elevation taken on the line 3—3 of FIG. 1 with portions broken away;

FIG. 4 is a view in cross section as seen on the line 4—4 of FIG. 3;

FIG. 5 is an enlarged detail in horizontal section and plan as seen approximately on the line 5—5 of FIG. 3;

FIG. 6 is a view in end elevation taken on the line 6—6 of FIG. 3 as seen in the direction of the arrows;

FIG. 7 is a detail in cross section as seen on the line 7—7 of FIG. 5;

FIG. 7A is a detail in cross section taken on the line 7A—7A of FIG. 3;

FIG. 8 is an enlarged plan view of the pool cleaning carriage depicted in the broken line rectangle 8 of FIG. 1;

FIG. 9 is a view in section and elevation as seen on the line 9—9 of FIG 8; and

FIG. 10 is an enlarged cross section as seen on the line 10—10 of FIG. 1 showing the float supported hoses.

Referring to the drawings more specifically A indicates generally a conventional swimming pool having side walls *a—a*, ends walls *b—b* and a floor *c*.

The pool cleaning apparatus with which our invention pertains embodies a wheeled carriage B adapted to traverse the floor *c* of the pool A, the carriage being equipped with a jet propulsion nozzle 12 which, when water under pressure is directed therethrough, acts to impell the submerged carriage over the floor *c*. An elongate flexible hose 13 leading from a pumped supply of water under pressure connects with the nozzle 12. The carriage B is also equipped with a suction intake passage 14 opening to the under side thereof to which is connected a hose 15 connecting with a suction pump, whereby sediment deposited on the floor of the pool may be removed therefrom. The carriage B, particularly shown in FIGS. 8 and 9, embodies a flat bed-plate 16 having a front end *d* and a rear end *e* and erected on the bed-plate 16 intermediate its side margins and substantially centrally thereof, is a cylindrical standard 17 having an axial passage 18 leading from the inlet 14 to a side aperture 19 opening toward the rear end *e* of the carriage. Leading from the passage 19 and fixed relative to the standard 17 is a nipple 20 which extends longitudinally into the hose 15 and to which the latter is securely and fixedly fastened by means of a conventional hose clamp 21.

The nozzle 12 is formed on the upper end portion of the standard 17 integral therewith which standard is provided with a transverse passage 22 leading from the inner end of the nozzle 12 and opening to the rear side of the standard above the passage 19. Fixedly mounted in the passage 22 and projecting rearwardly from the standard is a nipple 23 the outer end of which extends longitudinally into the hose 13 and to which the latter is firmly and fixedly secured by a conventional hose clamp 24. The outer or discharge end of the nozzle 12 is provided with a restricted jet outlet 25 consisting of a convergent tube seated interiorally of the nozzle 12, the discharge tip of which tube has a lip *g* slightly inclined upward from its lower side so that a jet of liquid under pressure discharged from the nozzle into the body of water in which the carriage B is submerged, will exert a combined end thrust and downthrust on the carriage, acting to move the carriage over the floor *c* of the pool and at the same time tending to retain the carriage in its seated position on the floor.

Mounted on the forward margin of the bed-plate 16 adjacent each end thereof is a roller 26 and mounted

centrally of the rear portion of the bed-plate is a roller **27** which rollers afford a three point support for the bed-plate **16** and dispose the under side of the bed-plate contiguous to but spaced from the surface of the floor *c* to permit passage of the bed-plate over debris and sediment deposited on the floor.

By providing the rigid connection of the hoses **13** and **15** to the standard **17** and equipping the nozzle **12** with the upwardly and rearwardly opening restricted outlet **25**, tilting and overturning of the carriage while in operation is practically eliminated thereby overcoming an objectionable feature incident to similar carriages heretofor devised.

The hoses **13** and **15** are elongate and extend in superimposed parallel relation to each other and are fastened together at suitable intervals throughout their lengths as by clamps, bands or straps *h*. The outer ends of the hoses are connected by suitable couplings to conduits *i* and *k* of which the conduit *i* leads to a source of clear water under pressure such as a pump *m*, while the conduit *k* leads to a suction pump *n*. The hose **13** preferably comprises an extruded vinyl plastic hose which is slightly less than buoyant and, while stiff in short sections thereof, is flexible and subject to bending in its entirety. The hose **15** preferably comprises a wire reinforced non-collapsible light weight polyethylene hose which has a positive buoyancy and while stiff in short lengths is quite flexible in its entirety. The hoses **13** and **15** collectively have neutral buoyancy.

As a means of buoyantly supporting the major portion of the length of the hoses **13** and **15** on the surface of the pool, a suitable number of floats **29** are spaced apart at desired intervals along the length of the hoses leading from the margin of the pool, as indicated in FIG. 1, which floats comprise short cylindrical lengths of foam polyethylene having axial bores *p* through which the hoses **13–15** extend in intimate contact therewith as shown in FIG. 10.

The floats **29** are supplemented by a mobile float C embodying a pair of parallel pontoons **30—30** consisting of elongate cylinders of polyethylene interconnected by a pair of spaced tie-bars **31—31**. An elongate rigid channel **32** is fixedly supported on the tie-bars **31** and extends intermediate the pontoons **30—30** in spaced parallel relation thereto. A length of the united hoses **13–15**, suitably spaced from the carriage B, is seated in the channel **32** and extends longitudinally thereof, the hoses being suitably fastened in the channel against displacement.

The float C is designed to be moved over the surface of the pool and to co-operate with the jet propulsion of the carriage B in moving the latter over the surface of the floor *c*. Means are provided for confining movement of the float C longitudinally thereof to a rectilineal path of travel. This means embodies a taut line or cable **33** stretched across the pool in spaced relation to the surface thereof with the ends of the cable connected to standards **34—34** rigidly erected on opposed margins of the pool. Either one or both ends of the cable are connected to a threaded bolt **35** passing through the standard **34** and engaged by a nut **36** threaded on the bolt and bearing against the standard **34**, whereby tightening of the nut on the bolt will act to draw the cable **33** taut in the manner of a turn-buckle.

Projecting upwardly from the channel **32** and rigidly attached thereto is a pair of spaced standards **37—37** comprising elongate parallel side members *r* and *s* extending astride the cable **31** which side members are connected together at their upper ends by a cap *t*.

As a means for facilitating positioning of side members *r–s* of the standards **37—37** on opposite sides of the cable **33**, the lower ends of the side members *r* are detachably connected to the adjacent side member of the channel **32** by bolts **38** and wing nuts **39** as shown in FIG. **7A**. By removing the wing nuts **39** the lower ends of the side members *r* may be sprung away from the channel **32** thereby providing a gap through which the cable **33** may be passed laterally in or out of the space between the side members *r–s*. The standards **37** extending astride the cable **33** in slidable relation thereto co-operate with the cable to direct the float C along a rectilineal path of travel.

The space between the elongate side members *r–s* of the standards **37—37** is likewise elongate, being of a length and extending beneath the cap *t* a distance exceeding ten times the diameter of the cable **33** whereby the standards **37—37** while depicted in the drawings as positioned with the cap *t* seated on the cable, may have a long range of vertical movement relative to the cable, as under variation in the level of water in the pool raising or lowering the float, without imposing a drag on the cable. The space between the members *r–s* is of a width exceeding the diameter of the cable **33** so as to afford ample clearance between the sides of the cable and the standards. The float is thus free to move longitudinally of the cable with little or no resistance due to frictional engagement between the cable and its connection with the float.

Means are provided for jet propelling the float C longitudinally of the cable **33** and means are provided for automatically reversing the direction of travel of the float at predetermined points along the length of the cable. The means for jet propelling the float C is here shown as embodying a valve housing D carried on hangers *u* depending from the under side of the channel **32** which valve housing is arranged to be submerged in the pool intermediate the pontoons **30—30**. The valve housing D has opposed end walls presented in the direction of the pontoons having aligned ports *v–v'* through which jets of water under pressure are alternately discharged to effect propulsion of the float C. The discharge ports *v–v'* are controlled by a valve element *w* reciprocally mounted in the valve housing for movement in and out of seated positions over the ports. The valve element is tubular and extending therethrough is a reciprocal valve actuating bar *x* slidably supported in the valve *w* with its end portions projecting into the ports *v–v'* in spaced relation to the margins thereof.

The bar *x* has a length substantially twice that of the valve housing D and has its ends engaged with the side members *y—y* of a yoke *z* positioned astride the valve housing D and connected to the lower end of an upright stem **40** leading to and attached to a horizontal elongate slide bar **41** supported in guide-ways **42** on the standards **37**. The slide bar **41** serves as a means for actuating the valve *w* to alternately open and close the ports *v–v'* to control the flow of water under pressure therethrough, as will presently be described.

The valve actuating bar *x* is provided with a pair of spaced apart snap rings *z'* forming abutments arranged to be alternately engaged with the opposed ends of the valve *w* on reciprocation of the bar *x* to thereby effect movement of the valve *w* in and out of its seated position over the ports *v–v'*.

Means are provided for delivering water under pressure to the interior of the valve housing D for delivery to the open ports *v* or *v'* which means comprises a conduit **43** connected at one end to a nipple **44** on the valve housing D and opening to the interior thereof and connected at its other end by a coupling **45** to a T-fitting **46** in the hose **13**, as particularly shown in FIG. 3 whereby a portion of the water being delivered under pressure through the hose **13** will be diverted through the conduit **43** to the valve housing. The valve housing D and its valve *w* comprises a conventional slide valve now on the market and is not our invention other than as a means, in combination with other elements of construction, controlling the reciprocal operation of the mobile float C.

The means for timing the operation of the valve to terminate the movement of the float C in either direction and to effect reversal thereof, comprises a pair of abutments **47–48** mounted on the cable **33** at suitable points proximate the ends of the latter; the abutments being here

shown as comprising disks encircling the cable **33** and extending in the path of travel of the ends of the slide bar **41** the disks being mounted on hubs encompassing and fixedly secured to the cable.

When it is desired to employ the pool cleaning apparatus, the cable **33** is secured at its ends to the standards **34** and drawn taut by tightening the nut **36** on the bolt **35** at either or both ends of the cable. The float C is then set on the surface of the pool with the standards **37—37** positioned astride the cable **33** by detaching the wing nuts **39** and spreading the side members *r* of the standards as before described. At the same time, the length of the hoses **13–15** to be seated in the channel **32** is applied through the gap afforded by the spread side members *r* after which the wing nuts **39** are screwed in place on the bolts **38**.

In the mean time the carriage B on the outer ends of the hoses **13–15** is disposed in its submerged position on the floor *c* of the pool A and the inner ends of the hoses are coupled to the conduits *i* and *k*. On setting the pumps *m* and *n* in operation and communicating the discharge of the pressure pump *m* to the hose **13** and connecting the intake of the suction pump *n* to the hose **15** the apparatus will be placed in operation, as follows:

Water under pressure delivered to and through the hose **13** is directed through the nozzle **12** to discharge in the pool and portion of such water is delivered from the hose **13** through the conduit **43** to and through the valve housing D of the float C. The water delivered from the nozzle **12** in the form of a convergent jet acts to propel the carriage B over the floor of the pool with a somewhat erratic or random swinging movement somewhat analagous to that of the nozzle of a garden hose when free and discharging water under pressure. However, in this instance the carriage B is maintained on and parallel with the floor *c* throughout the greater part of its movement by the down thrust of the upwardly directed jet delivered from the nozzle **25** by the deflecting lip on the tip thereof.

While the carriage B is being thus swung laterally from side to side, the float C is being advanced along the cable **33** by the jet discharged from the valve housing D in a direction to trail the carriage there-behind and which direction will be according to whether the port *v* or the port *v'* of the valve housing D is open and which is determined by the initial position of the slide-bar **41**. The slide bar is initially positioned with one end thereof extended outermost away from the adjacent end of the pool so that the port *v* or *v'* contiguous such end will be open whereby the jet discharged from the open port will propel the float C toward the opposite end of the pool. On movement of the float to a position adjacent the opposite end of the pool the extended end of the slide-bar **41** will strike the abutment **47** or **48** as indicated in dotted lines in FIG. 1 and under the urge of the advancing float C will be retracted so as to reverse the valve *w* and then accordingly reverse the direction of travel of the float C.

During this back and forth movement of the float C, the end portions of the hoses **13–15** supported by the floats **29** will be shifted here and there over the surface of the pool while the length of the hoses extending between the float C and the carriage B will follow the float C in its travel in either direction. In this manner the jet propelled float C will act to advance the carriage B longitudinally of the cable **33** co-incident with the lateral swinging movement of the carriage under the thrust of the jet from the nozzle **12**. During movement of the carriage over the floor of the pool, suction induced by the pump *n* acts through the hose **15** and nipple **20** to induct debris and sediment off the floor and to remove it from the pool.

A particularly advantageous feature of the recited apparatus is the rigid or fixed connection of the hoses **13–15** to the carriage, which with the pull imparted to the carriage through the hoses by advance of the float C acts to stabilize the carriage so as to minimize lateral tilting and up-setting of the carriage while the down thrust of the jet delivered from the nozzle **25** acts on the front end of the carriage to prevent longitudinal tilting thereof under the drag imposed on the rear end of the carriage by the hoses **13–15**, it being essential for efficient operation of the apparatus in cleaning the pool that the bed-plate **16** be maintained substantially parallel with the floor during its movement thereover.

We claim:

1. In a swimming pool cleaning apparatus embodying a pair of hoses inter-connected side-by-side, and a carriage to which said hoses are attached equipped with a jet propulsion nozzle with which one of said hoses connects and having a suction intake with which the other hose connects, a mobile float, means supporting a length of said hoses on said float, and means on said float for impelling said float back and forth over the surface of a swimming pool along a rectilineal path of travel; said float embodying a pair of spaced elongate parallel polyethylene pontoons, tie rods inter-connecting said pontoons, an elongate channel supported on said tie rods extending intermediate said pontoons in parallel relation thereto, said channel constituting said hose supporting means, said hoses being positioned in said channel and extending longitudinally thereof.

2. In a swimming pool cleaning device, the combination with a wheeled carriage embodying a flat bed plate having a suction inlet through which sediment may be inducted from the floor of a pool traversed by said carriage and including an upstanding column on said bed plate having a passage leading from said inlet; of a nipple leading from said passage toward one end of said carriage, a flexible suction hose rigidly connected to said nipple, a jet propulsion nozzle on said column, a nipple on said column paralleling said first named nipple leading to said nozzle, a hose rigidly connected to said nipple for conveying water under pressure to said nozzle, said nozzle having a restricted outlet opening toward the other end of said carriage and at an upward inclination relative thereto whereby a jet discharged from said nozzle will exert a combined down thrust and end thrust on said carriage, together with a float embodying a pair of parallel pontoons and an elongate channel member extending between said pontoons and supported thereby, in which an intermediate portion of the lengths of said hoses is longitudinally seated.

3. The combination called for in claim **2** together with an elongate horizontally extending taut cable spaced above said channel in parallel relation thereto, and means slidably connecting said channel to said cable for guiding said float and channel along a rectilineal path of travel in the direction of the length thereof.

4. The combination called for in claim **3** together with means carried by said channel apart from said float for jet-impelling said channel and float in the direction of the length of said cable including a conduit leading from one of said hoses seated in said channel and leading to said jet-impelling means.

5. In a swimming pool cleaning apparatus the combination with a submersible carriage moveable on the floor of a swimming pool, said carriage having a suction intake through which sediment on the floor of the pool may be inducted, and a pair of elongate flexible hoses connected to said carriage one of which is for delivering water under pressure to impel said carriage by jet propulsion, and the other is for conveying sediment inducted through said intake; of a mobile float to which said hoses are attached in spaced relation to said carriage, powered means for impelling said float, and means for confining the movement of said float to a rectilineal path of travel between opposed margins of a swimming pool comprising a fixed guide cable leading between opposed margins of the pool, and means inter-connecting said float to said

cable for movement longitudinally thereof; said float comprising a pair of spaced parallel interconnected pontoons arranged beneath said cable in spaced parallel longitudinal relation thereto and said means inter-connecting the float and cable comprises a pair of spaced fixed standards carried by and upstanding from between said pontoons having spaced elongate side portions positioned astride said cable in spaced vertical slideable relation thereto.

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