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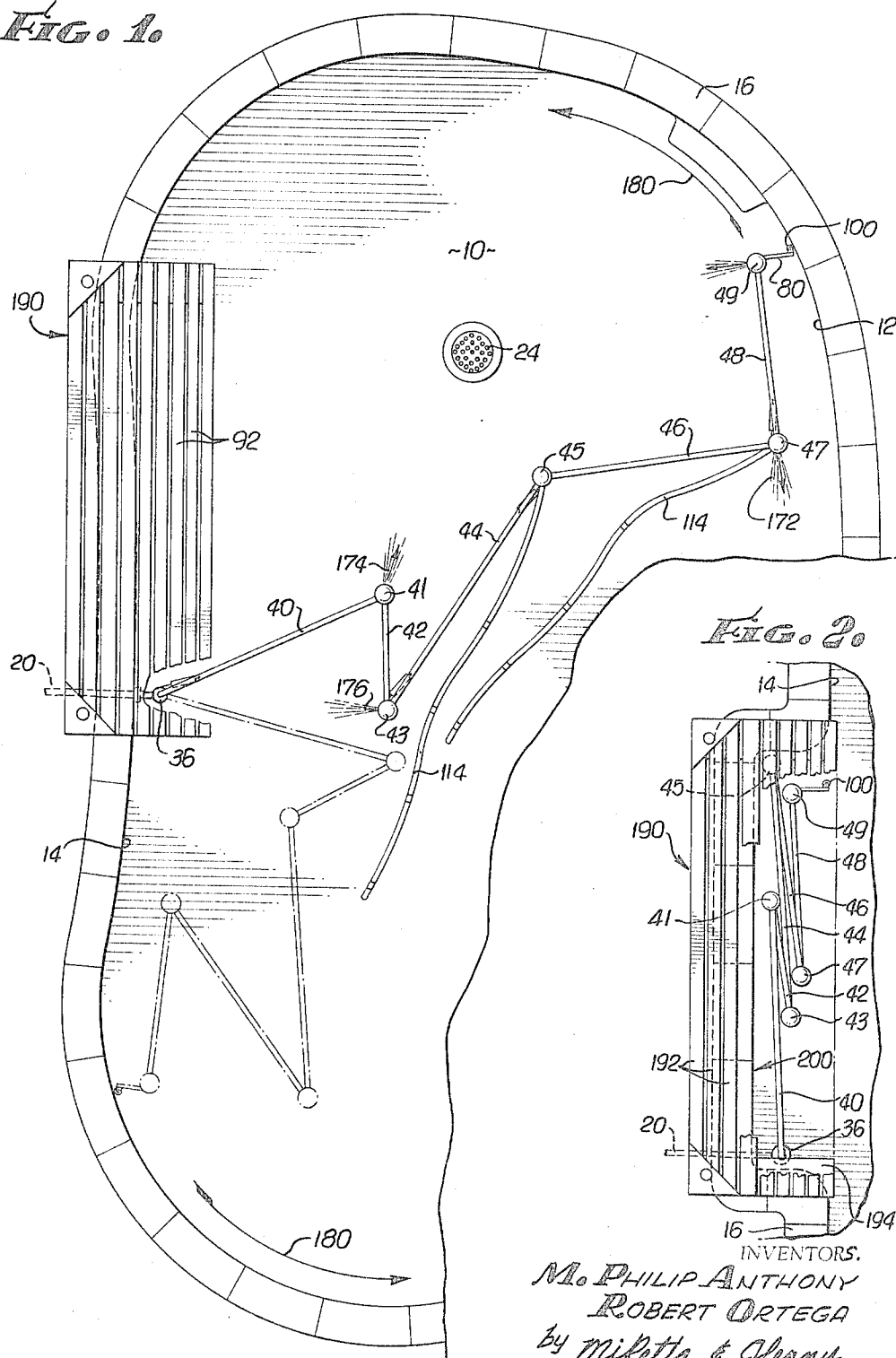
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RETRACTABLE SWIMMING POOL CLEANER

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3 Sheets-Sheet 1

FIG. 1.



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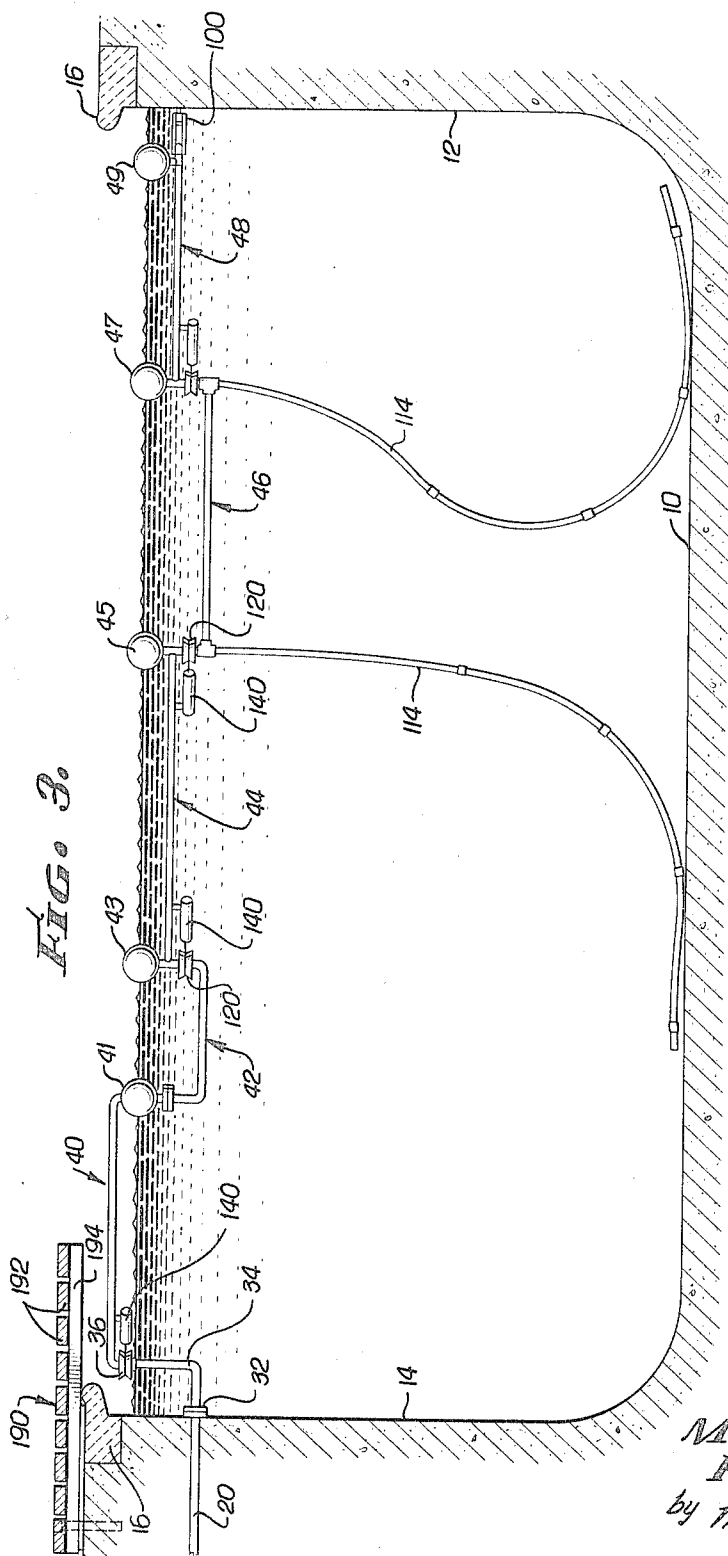
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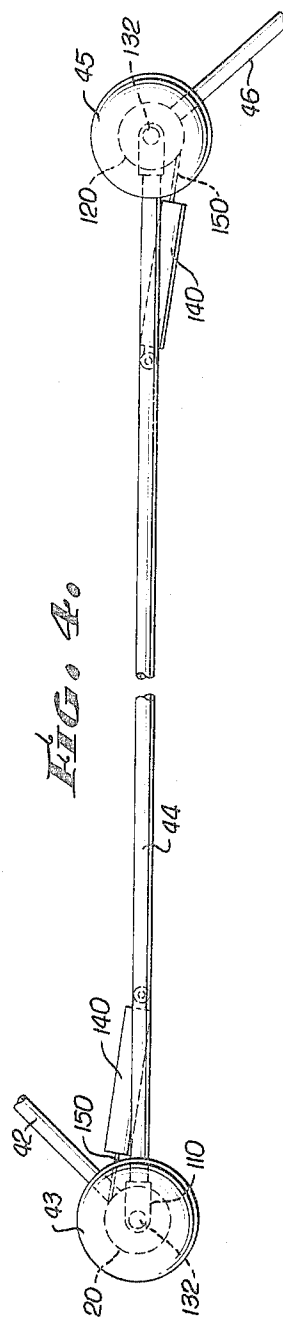
RETRACTABLE SWIMMING POOL CLEANER

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5 Sheets-Sheet 2



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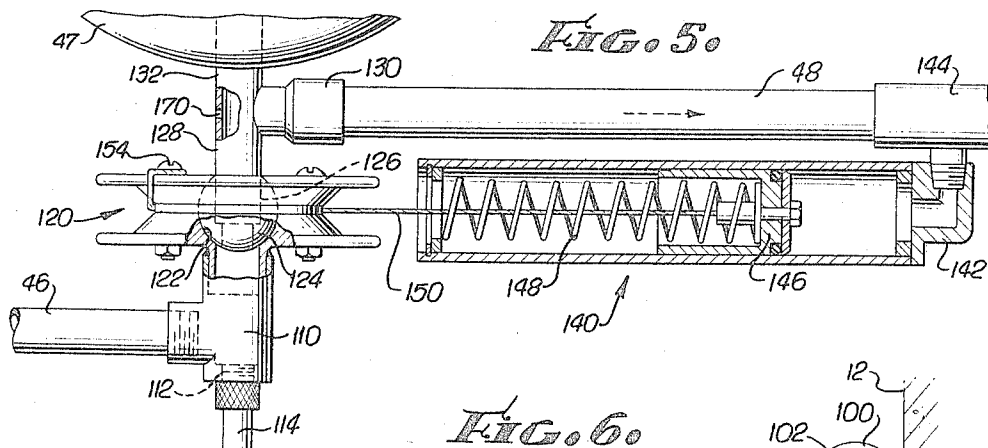
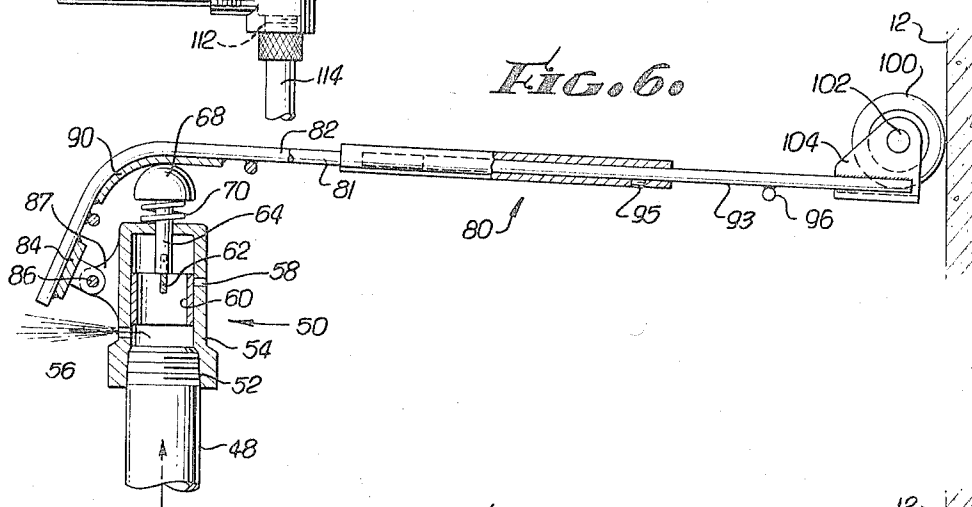
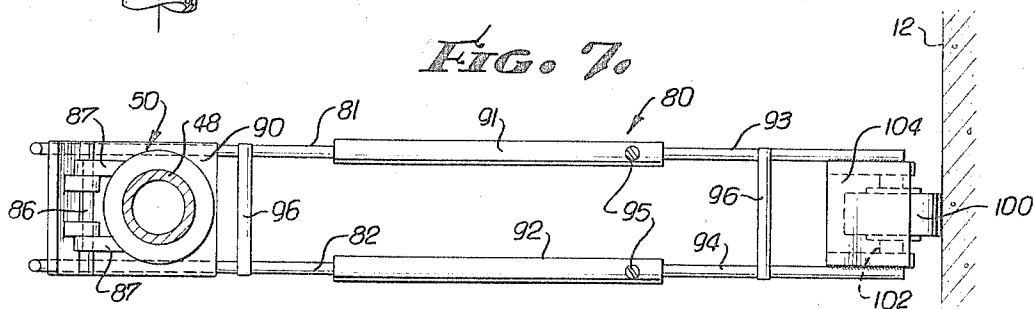
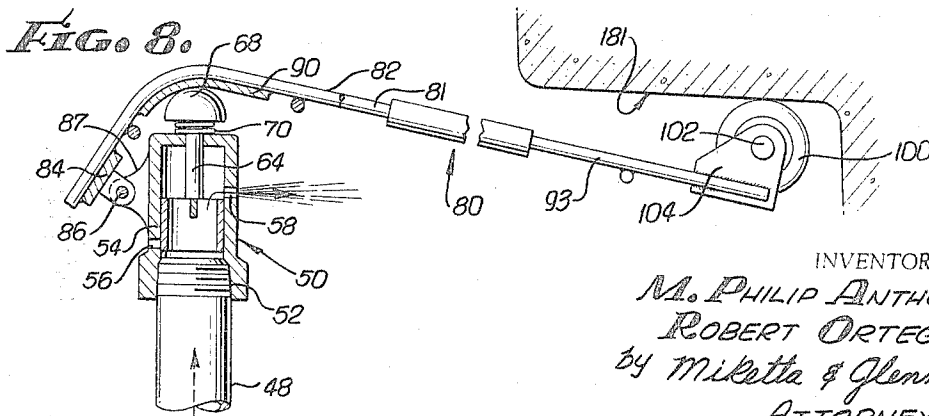
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RETRACTABLE SWIMMING POOL CLEANER

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3 Sheets-Sheet 3



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RETRACTABLE SWIMMING POOL CLEANER

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11 Claims. (Cl. 4—172)

The present invention relates generally to swimming pool cleaning devices and more particularly discloses such a device employing a leader assembly at the distal end of a floating, movable articulated arm assembly made of pivotally connected arms of tubular pipe or the like having one or more flexible hoses dangling therefrom, and including means for automatically retracting the articulated arm assembly into compact position when the pool cleaner is not being used.

Swimming pool cleaners employing one or more dangling hoses adapted to move sinuously through the water in random motion have been proposed in the past, relying for the cleaning action upon the jetting discharge of water from the free ends of the hoses. Such prior mechanisms have the disadvantage of occupying a substantial portion of the pool even when they are not actively in use performing their cleaning function. Consequently, they are usually removed from the pool when not in use, requiring a certain amount of work by the user in removal and subsequent reinstallation, and involving the risk of damaging the mechanism during such handling thereof.

The apparatus in accordance with the present invention is an improvement over such mechanisms, and provides a floating leader assembly connected to a water supply source through a conduit provided with means for retracting itself into compact position when water pressure is cut off. Thus the present cleaning mechanism, when not in active use, leaves virtually the entire body of the pool available for recreational use, especially when the retracted conduit is receivable in a small grotto-like recess formed in the pool wall adjacent the point of water supply to the cleaner.

In the exemplary form of the invention hereinafter described and illustrated in detail, the retractable conduit takes the form of an arm assembly including an articulated series of arms comprising pipes, successive arms being connected by floating pivotable joints providing means for water passage from one pipe arm to the next.

Resilient means are provided for retracting the arm assembly, and water pressure actuated means are provided for overcoming the force of the resilient retracting means. When the resilient retracting force is so overcome, the arm assembly is gently urged into extended operative position by the reactive force of water issuing from jet discharge orifices provided at appropriate points on the arm assembly. The leader assembly previously mentioned then commences to track the side wall of the pool, drawing behind it the rest of the arm assembly, while water discharging from hoses dangling from the assembly accomplishes the cleaning function. The tracking continues as long as water is supplied to the cleaner, and means are provided including a swivel connection at one of the junctions between adjacent arms to permit continuity of such tracking movement.

The leader assembly includes a main propulsion jet for urging the assembly in its tracking direction, as well as

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one or more auxiliary jets to insure that the leader assembly avoids obstructions and turns corners during its movement.

Accordingly, it is a principal object of the present invention to disclose novel improvements in swimming pool cleaning apparatus. Additional objects and purposes are to disclose, in such apparatus, an articulated arm assembly leading from a source of water at the edge of a pool outwardly to a movable leader assembly; to provide in such an apparatus means for retracting the articulated arm assembly into compact relationship when water pressure is removed therefrom; to provide, in such an arrangement, a grotto recessed in the side of the pool for receiving the retracted arm assembly; to provide, in such an apparatus, an articulated arm assembly consisting of a plurality of pivotally connected arms or segments, to permit freedom of movement of the leader assembly, and also to provide compactness when the apparatus is in retracted position; and for additional objects and purposes as will be understood from a study of the following description of a preferred embodiment of the invention, taken in connection with the accompanying drawings in which:

FIG. 1 is a plan view of a swimming pool, with a portion at the lower right broken away, showing a pool cleaner therein in accordance with the present invention in two typical positions during operation, one in solid lines and another in broken lines.

FIG. 2 is a fragmentary plan view of a modified form of the invention showing the pool cleaner in retracted position in a grotto-like recess in the pool side wall covered by an overlying deck, portions of the deck being broken away to more clearly show the cleaner itself.

FIG. 3 is a vertical sectional view of the pool showing the cleaner floating therein with the arms extended for clarity of presentation.

FIG. 4 is a plan view on an enlarged scale of the third arm, together with fragmentary portions of the second and fourth arms substantially in their relative positions seen in solid lines in FIG. 1.

FIG. 5 is a fragmentary side elevational view, partially in section, showing the pivotal juncture of the fourth and fifth arms, with cylinder of the hydraulic motor swung into the plane of the drawing for clarity of presentation.

FIG. 6 is a fragmentary plan view, partially in section, of the tracking or sensing arm of the leader assembly, showing the leader valve mechanism in its normal position.

FIG. 7 is an elevational view of the structure of FIG. 6.

FIG. 8 is a fragmentary view of the valve in the leader float assembly when actuated to obstacle-avoiding position by the valve control arm.

Referring in detail to the drawings showing an illustrative form of the invention, the pool shown in FIGS. 1 and 3 includes a bottom 10 and side walls 12 and 14 of any desired configuration, the side walls terminating upwardly in a conventional coping 16 defining the pool periphery.

A water supply pipe indicated generally at 20 extends inwardly through the side wall, desirably slightly below the established water level in the pool, and may be connected to a suitable source of water under pressure such as a pump and filter (not shown) supplied with water taken from the pool as through drain 24 and thereby

recirculated, the connections therefor being conventional and well known, and being omitted here in the interests of clarity.

Supply pipe 20 may be connected through a disconnect fitting or union 32 and an angle member 34 to a pivotal fitting 36, and thence to the articulated arm assembly of the present cleaner, including a plurality of rigid arms constituting pipe sections, each arm being pivotally connected to the adjacent arm through a water conducting fitting. The preferred form of the invention illustrated includes five such arms, indicated generally at 40, 42, 44, 46 and 48 successively outwardly from the water source 20. The fitting 38 joining pipe arms 40 and 42 is a 360° swivel connection, permitting continuous angular movement of pipe 42 about the vertical axis of fitting 38 during operation, while the fittings 36 and 120 are of a different construction, to be described later.

Float means are provided to support the water supply conduit. Thus at each juncture of successive arms there is a float member made of a suitable buoyant material such as styrofoam, vinyl or the like and indicated at 41, 43, 45 and 47 respectively, and a similar float 49 is provided near the outer or distal end of arm 48.

The outermost arm 48 is provided at its leading or distal end with a leader assembly shown in detail in FIGS. 6, 7 and 8. A valve head indicated generally at 50 is attached to pipe 48 as by threaded connection 52 and includes a hollow cylindrical body 54 having two jet ports or orifices 56 and 58 formed therein. Port 56 is directed leftwardly as seen in FIG. 6, so that the reactive force of water issuing therefrom tends to move pipe 48 and head 50 rightwardly. The other port 58 is directed rightwardly whereby water jetting therefrom urges the head leftwardly.

Slidably carried in cylindrical head 54 is a sleeve 60 which blocks one or the other of ports 56, 58 depending upon its longitudinal position in the head. Thus in its normal or forward position of FIG. 6, the sleeve blocks port 58 and opens port 56, while in its rearward position of FIG. 8 the opposite condition exists and water issues from port 58.

Sleeve 60 is provided with a crossbar 62 to which is attached an actuating plunger 64 projecting through an opening 66 in the end wall of the head and carrying at its outer end a tip 68. Sleeve 60 and its plunger 64 are normally biased into their forward position seen in FIG. 6 by the force of water pressure exerted against the base of the plunger, supplemented if desired by resilient means such as spring 70 between head 50 and tip 68.

A sensing arm indicated generally at 80 consists of upper and lower rods 81 and 82 (see FIG. 7) carrying a bracket 84 having lugs journaled through pivot pin 86 to ears 87 extending laterally from head 50. The arm 80 is thus permitted to move angularly in a horizontal plane about the vertical axis of pin 86. A plate 90 extends between and is fixed to rods 81 and 82, and bears against tip 68, whereby pivotal movement of sensing or control arm 80 causes linear movement of sleeve 60 within the valve head and thereby opens or closes ports 56 and 58.

The length of sensing arm 80 may be adjustable, as by sleeves 91 and 92 carried by rods 81 and 82 which provide telescoping engagement with rod extensions 93 and 94 retained in desired prolongation as by set screw means 95, and suitable cross braces 96 may be provided between the rods for rigidity.

A sensing probe is carried at the distal end of arm 80. In the present embodiment of the invention the probe includes a small roller 100 rotatably mounted on vertical shaft 102 carried by bracket 104 fixed to the outer end of arm 80. The probe is desirably mounted forwardly of the end of the sensing arm, and normally is in moving contact with the side wall 12 of the pool, being maintained in that position by the reactive force of water flowing from jet port 56 in the valve head 50.

Means are provided for retracting arm 40 into its position seen in FIG. 2 when no water under pressure is supplied to the cleaner, and similar means are provided at the pivotal junctures of arms 42, 44, of arms 44, 46 and of arms 46, 48 for similarly moving them to their positions of FIG. 2. A preferred form of such means is illustrated in FIG. 5, being the juncture of arms 46 and 48.

As there shown, arm 46 terminates in fitting 110 having a lower outlet 112 coupled to a flexible hose 114 and an upper outlet to which is fixedly mounted a sheave indicated generally at 120 having a spherical cavity 122 loosely retaining a hollow spherical member or ball 124 therein. The latter element is attached to the lower end 126 of a pipe fitting 128 having a T projection 130 connected to arm 48, and an upper projection 132 is supported by float member 47.

Hydraulic motor means include a horizontally disposed cylinder indicated generally at 140 supported at one end 142 by a fitting 144 carried by arm 48 and in fluid communication with the interior of the arm. Within cylinder 140 is slidably mounted a piston 146 biased rightwardly as seen in FIG. 5 by resilient means 148. A flexible line such as cable 150 is fixed at its right end to piston 146 and at its other end to sheave 120 as by fastening member 154 which may be one of the bolts retaining the split sheave in assembled position. Cable 150 passes at least partially around the sheave.

Keeping in mind that the sheave 120 is fixed to arm 46 and that the axis of cylinder 140 is spaced from the axis of its arm through a horizontal angle (see, illustratively, FIG. 4), it will be seen that rightward movement of piston 146 as seen in FIG. 5 under the force of spring 148 causes arm 48 to rotate counterclockwise as seen in FIG. 1 toward arm 46, so that the arms eventually assume their relative position seen in FIG. 2.

As best appears in FIG. 3, similar cylinders 140 and sheaves 120 are provided at the inner end of arm 40 and at the junctures of arms 42, 44 and of arms 44, 46.

The juncture of arms 40 and 42 includes a swivel fitting 160 permitting 360° rotation of arm 42 relative thereto, and it will be observed in FIG. 3 that arm 40 is disposed substantially higher than remaining portions of the cleaner to permit such portions to pass under arm 40 once during each peripheral tour of leader arm 48 around the pool. It will also be observed that the second arm 42 is substantially shorter in length than arm 40, to insure that there is no conflict during operation.

Jet orifice ports are provided in the arm assembly to insure continuous movement around the pool wall in a counterclockwise direction as seen in FIG. 1. Such a port 170 (see FIG. 5) in the fitting 128, for example, permits a water jet 172 therefrom to propel arm 48 forwardly, the jet port 170 being directed in axial or substantially axial rearward prolongation of arm 48. With further reference to FIG. 1, a jet 174 at the outer end of arm 40 urges the latter clockwise outwardly from its retracted position into a position extending generally into the pool, and a jet 176 at the outer end of arm 42 urges the latter generally counterclockwise about its 360° swivel juncture with arm 40.

With water pressure applied to the system through supply pipe 20, the force of the springs 148 within cylinders 140 is overcome, relieving the retracting torque therefore existing and permitting the jets just mentioned to gently move the system outwardly into the pool. The sensing assembly at the outer end of leader arm 48 approaches the pool side wall by the reactive force from jet port 56, and under the influence of jet discharge 172 commences its movement in the general direction indicated by the arrows 180 in FIG. 1. If any portion of the arm 80 strikes an obstruction indicated generally at 181, such as a ladder, a pool corner or the like, the valve of head 50 is actuated to its position of FIG. 8, thereby moving the outer end of arm 48 leftwardly to clear the obstruction or change direction.

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During movement of arm 48, the other arms 42, 44 and 46 trail in somewhat random fashion with one or more hoses 114 suspended from the arms, preferably at the junctures thereof, as illustrated in FIG. 5. Arm 40 may swing slowly through an angle as seen in FIG. 1, to insure maximum coverage of the pool. The hoses may be made of material having a density only slightly greater than water, so that their random sinuous movement may range over the entire surface of the pool walls and bottom. At least one hose must of course be long enough so that water discharging from its lower end contacts the deepest part of the pool.

It may be desirable to protect the retracted cleaner by an overlying platform structure such as a deck indicated generally at 190 in FIGS. 1 and 2 spaced above the pool water level and including in the present illustration a number of beams or planks 192 extending between and carried by suitable support members 194 projecting outwardly from the coping. In order to more completely withdraw the cleaner from the usable portion of the pool, the construction of FIG. 2 may be employed, providing a recess indicated generally at 200 in the pool side wall and forming, with deck 190, a grotto-like enclosure for housing the retracted cleaner.

When the water supply conduit takes the form of successive articulated pipe arms as hereinabove described and illustrated, the cumulative length of the several individual arms should desirably be substantially greater than the maximum radial distance from the water source to the most remote point on the pool periphery. In this way the included angle between successive pipe arms (excepting, of course, in the case of arms 40 and 42, where arm 42 is permitted continuous free rotation about the vertical axis of swivel fitting 38) is usually substantially less than a straight angle. In any event, the effective length of the water supply conduit, measured radially from the water source, should be sufficient to permit the leader assembly sensing probe to continuously contact the pool side wall. In an exemplary cleaner the arms 40, 42, 44, 46 and 48 may have lengths of 6, 3, 7, 6 and 5 feet respectively for satisfactorily cleaning a pool 15 feet wide and 25 feet long. The water source should be located approximately midway of one of the longer sides of the pool.

Modifications and changes from the illustrative embodiment of the invention are intended to be embraced within the scope of the appended claims.

We claim:

1. A swimming pool cleaner comprising:
 - an elongated conduit connectible at one end to a source of pressurized water at the edge of the pool and having an inoperative retracted position adjacent the pool side wall adjoining the water source and an operative extended position;
 - float means operably connected to said conduit for supporting said conduit in the pool water;
 - the conduit having an effective length when in operative position whereby its other end can reach to adjacent the entire pool periphery and including a leader assembly at said conduit other end for movably contacting the side wall around the pool periphery;
 - the leader assembly having a propulsion port formed therein in fluid communication with the conduit, reactive force of water flowing outwardly through said port serving to propel said leader assembly generally parallel to the pool side wall;
 - resiliently biased means for urging said conduit into inoperative retracted position;
 - means actuated by the pressure of water in the conduit for overcoming the force of said resiliently biased means;
 - and flexible hose means suspended from said conduit and supplied with water therefrom and submergible in the pool water, the water discharged from the hose means contacting the pool side walls and bottom for dislodging dirt therefrom.

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2. The invention as stated in claim 1 wherein said conduit includes an articulated arm assembly comprising a first rigid arm pivotally connected to said water source and a second arm shorter than the first arm and swivelly connected to the distal end thereof for 360° free rotation about said distal end, said arms being movable in substantially horizontal planes, the plane of the second arm being spaced below the plane of the first arm.

3. The invention as stated in claim 2 wherein said first arm is provided with a discharge orifice, the reactive force of water jetting therefrom urging the first arm away from its inoperative position.

4. The invention as stated in claim 2 wherein said second arm is provided with a discharge orifice, the reactive force of water jetting therefrom urging the second arm in a selected direction about the first arm distal end.

5. The invention as stated in claim 2 wherein said articulated arm assembly includes a plurality of additional rigid arms, one being pivotally connected to the second arm distal end and each being pivotally connected to an adjacent arm, the arm furthest from the water source including said leader assembly, and said arms being in adjacent zig-zag relation when the conduit is retracted to inoperative position.

6. The invention as stated in claim 5 wherein each of said pivotal connections includes a hydraulic motor constituting said force overcoming means and comprising a cylinder having one end supplied with water from said conduit and a piston slidably mounted in the cylinder as well as a spring urging the piston toward said one cylinder end and means for translating piston movement in such direction into angular movement swinging the pivotally connected arms toward adjacent relation, said spring and translating means constituting said resiliently biased means.

7. The invention as stated in claim 1 wherein said leader assembly includes a normally closed port directed toward the pool side wall when the leader assembly is being so propelled, and means including a sensing member abutable against an obstruction projecting into the pool transverse to the general direction of movement of the leader assembly for opening said port, whereupon the reactive force of water issuing therefrom urges the leader assembly away from the pool side wall.

8. In a swimming pool cleaner having a float-supported movable conduit and a flexible hose submergible in the pool water and having its upper end coupled to said conduit for receiving water therefrom, water discharging from its other end serving to dislodge dirt from the pool walls and bottom as the hose moves in sinuous random fashion in the water, said conduit being connected at its one end to a source of pressurized water at the edge of the pool and including at its other end a leader assembly adapted to substantially continuously movably contact the side wall defining the pool periphery and provided with a propulsion port communicating with the conduit interior whereby reactive force of water flowing outwardly through the port serves to propel the leader assembly along the pool side wall, the provision of:

means resiliently biasing the conduit into inoperative retracted position adjacent the pool side wall adjoining the water source;

and means actuated by the pressure of water in the conduit for overcoming the force of the resiliently biasing means.

9. The invention as stated in claim 8, wherein said conduit includes a plurality of rigid arms, one such arm being pivotally connected to said water source for swinging in a substantially horizontal plane between its inoperative position adjacent the pool side wall and its operative position projecting therefrom, a second arm being swivelly connected to the distal end of said one arm for free 360° rotation about said distal end below said plane.

10. The invention as stated in claim 9 wherein said plurality of arms includes additional arms, each pivotally

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connected to an adjacent arm, the arm furthest from the water source including said leader assembly.

11. The invention as stated in claim 10 wherein said leader assembly includes a normally closed port directed toward the pool side wall when the leader assembly is being propelled along said wall and means including a sensing member abutable against an obstruction projecting into the pool transverse to the general direction of such leader assembly movement for opening said port, whereupon the reactive force of water issuing therefrom urges the leader assembly away from the pool side wall.

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