

Dec. 16, 1969

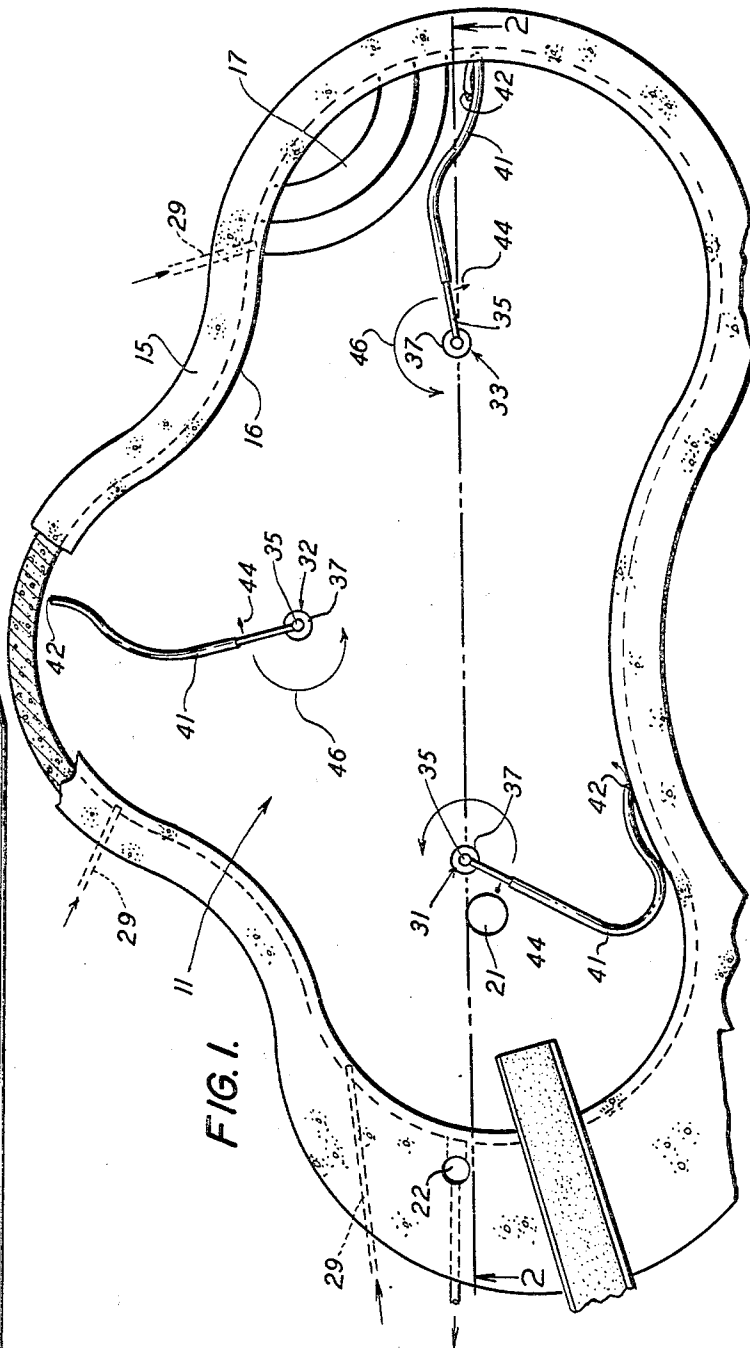
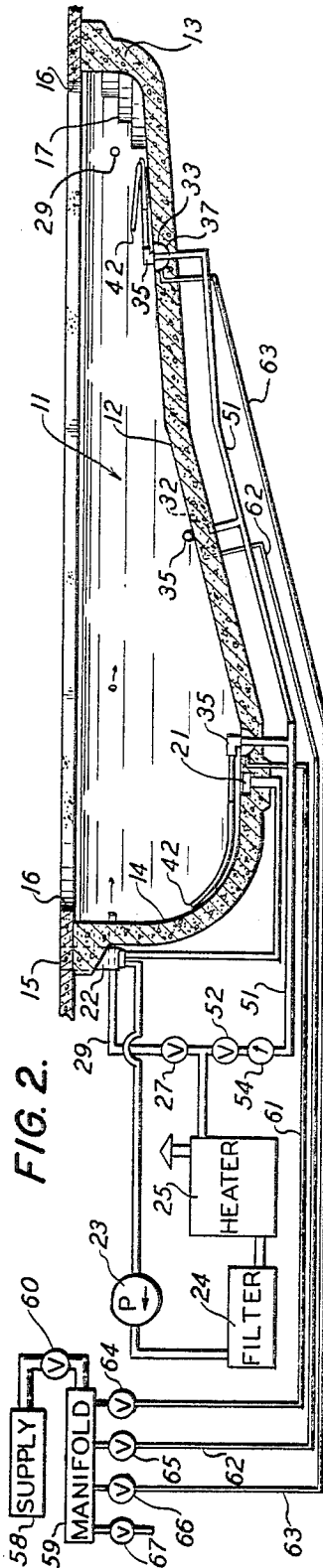
W. C. LORENZEN.

3,483,878

POOL CLEANING APPARATUS

Filed April 5, 1968

3 Sheets-Sheet 1



INVENTOR:
WALTER C. LORENZEN

BY

W. J. Gribble
ATTORNEY

Dec. 16, 1969

W. C. LORENZEN

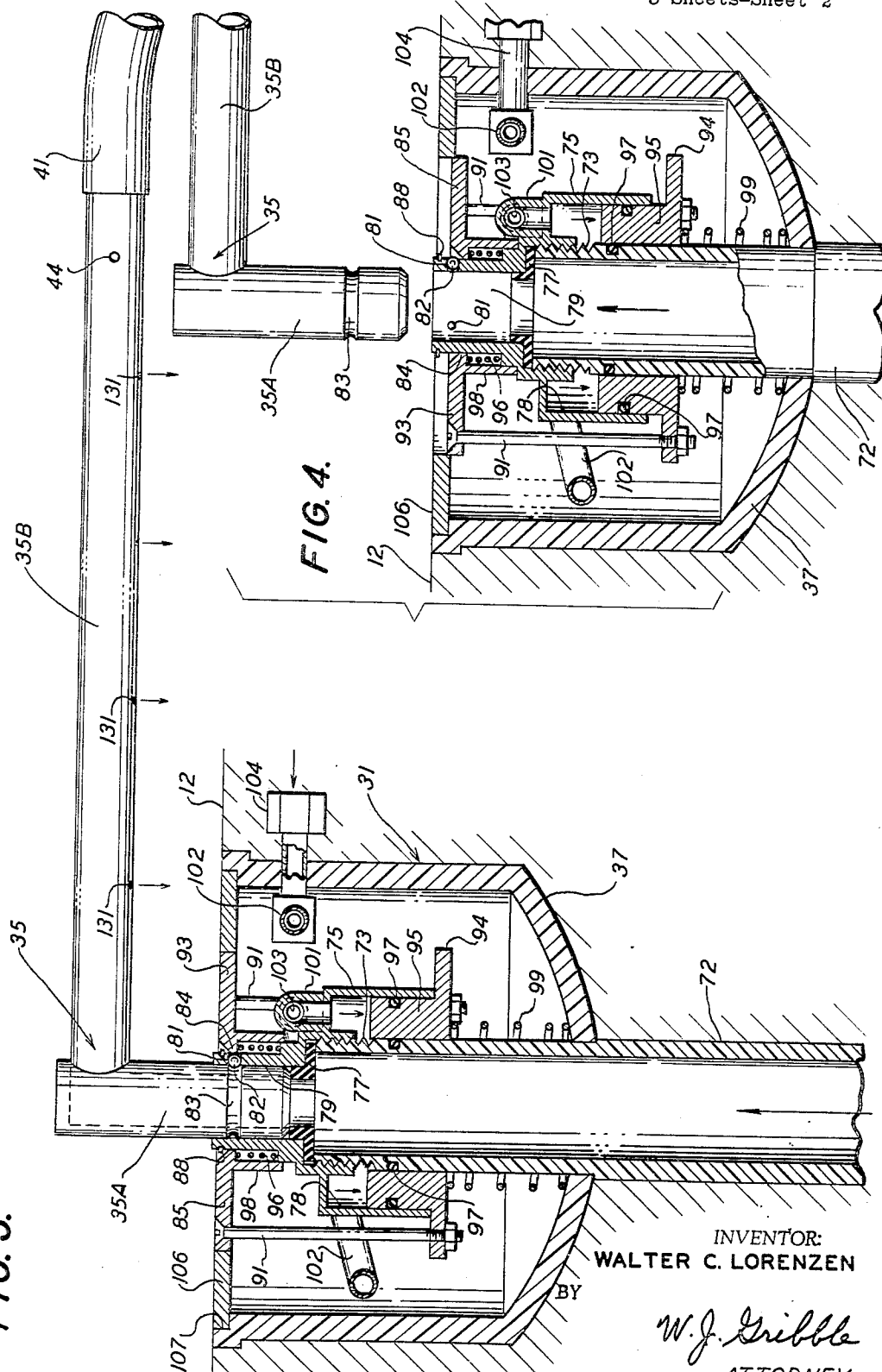
3,483,878

POOL CLEANING APPARATUS

Filed April 5, 1968

3 Sheets-Sheet 2

FIG. 3.



INVENTOR:
WALTER C. LORENZEN

BY
W. J. Gribble
ATTORNEY

Dec. 16, 1969.

W. C. LORENZEN

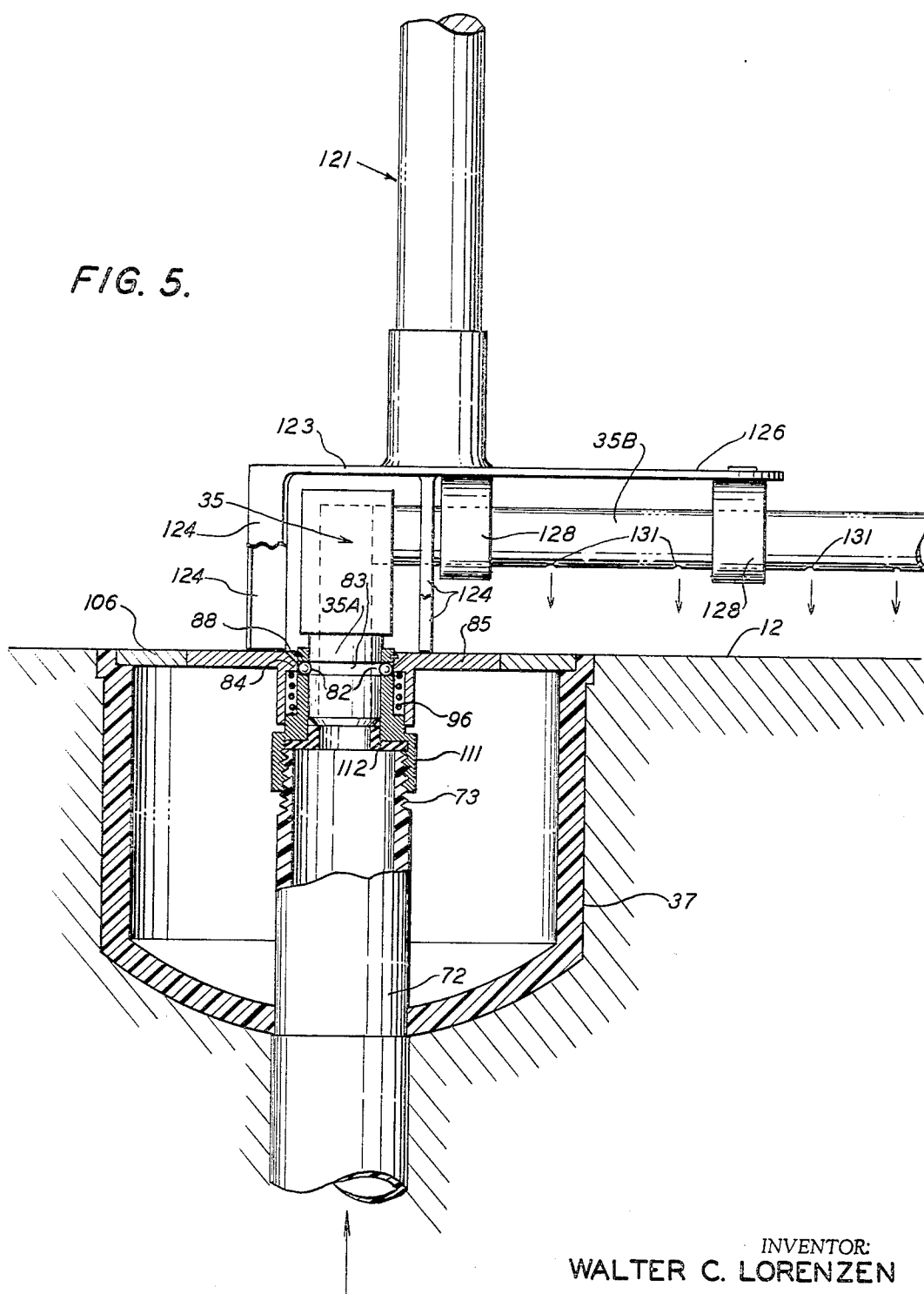
3,483,878

POOL CLEANING APPARATUS

Filed April 5, 1968

3 Sheets-Sheet 3

FIG. 5.



INVENTOR:
WALTER C. LORENZEN
BY

W. J. Gribble
ATTORNEY

1

3,483,878

POOL CLEANING APPARATUS

Walter C. Lorenzen, Hacienda Heights, Calif., assignor to
Anzen Products, Arcadia, Calif., a general partnership
of California

Filed Apr. 5, 1968, Ser. No. 719,203

Int. Cl. B08b 9/00

U.S. Cl. 134—167

4 Claims

ABSTRACT OF THE DISCLOSURE

A plurality of inlets for water under pressure placed in the pool bottom at spaced intervals and connected to the recirculation system of the pool. Each inlet has a rotating drive conduit releasably secured thereto. A jet orifice in each drive conduit rotates the conduit and a flexible tube end such that the tube end whips about the bottom and adjacent walls of the pool as a sweeping stream of water emerges from the tube end. Preferably each drive conduit is linked to the individual water inlet by a hydraulically actuated collet.

Background of the invention

One problem in maintaining the continually growing number of swimming pools is that of frequently cleaning the side walls and bottoms of the pools. Many swimming pool maintenance services offer this feature, but at a price. Several mechanical solutions to the problem have been proposed, each with its benefits and limitations. One of the prime limitations in presently existing automatic pool cleaning systems is that most suspend the cleaning apparatus from the water surface of the pool, preventing uninterrupted swimming or other pool uses and in some cases precluding use of the pool during the cleaning period. Others use apparatus which must be brought to the pool each time the pool is to be cleaned.

I have invented cleaning apparatus for swimming pools which overcomes these disadvantages in a simple and unique fashion in pools that have a recirculating water system which normally includes a return line and a pool drain. The invention contemplates cleaning apparatus that comprises a plurality of water inlets at spaced points in the bottom of the pool, each with a rotating drive conduit that is releasably secured to the inlet. The inlets may be placed within the pool in accordance with the configuration of the pool such that the flexible tubes secured to each of the drive conduits revolve about the inlet and randomly scan the major portion of the pool floor and adjacent wall areas. Each drive conduit is rotated by a small water jet orifice in the conduit wall which actuates the drive conduit when water under pressure is introduced to each water inlet. The water stream exiting from the end of each tube remote from the drive conduit washes the pool sides and bottom under water, and the conduit and tube agitate the water near the surfaces, causing flow of settled sediment to the pool drain such that the recirculation system collects the sediment at the filter. Valve means which may be remote from the pool control water flow from the recirculating water system to the inlets. Additional means provide selective releasing of each drive conduit and its related flexible tube from the water inlet. Depending upon the depth of the pool and the purposes for which it is used, it may not be necessary to remove the conduit and tubes in order fully to utilize the pool.

In a preferred embodiment the mechanism for selectively releasing the drive conduits and tubing from the water inlets comprises hydraulically or pneumatically actuated collets which couple the vertical extent of the

2

drive conduit to the water inlet. The release mechanism may be put in operation from a separate water source, such as a garden hosebib, or a small household air compressor, such as a paint sprayer.

Alternatively, the release means may comprise conventional ball lock quick release couplings that can be operated upon from the water surface by means of a long pole having suitable fittings at its bottom end.

These and other advantages of the invention are apparent from the following detailed description and drawing:

Brief description of the drawing

FIG. 1 is a plan view of a pool in accordance with the invention;

FIG. 2 is a sectional elevation schematically representing a pool in accordance with the invention and taken along line 2—2 of the pool of FIG. 1;

FIG. 3 is a sectional elevation of a preferred form of water inlet and drive conduit;

FIG. 4 is a view of the water inlet of FIG. 5, showing the drive conduit detached; and

FIG. 5 is a sectional elevation of an alternate form of release apparatus using conventional quick couplers.

FIGS. 1 and 2 show schematically a free form pool 11 having a sloping floor 12 and side walls 13, 14 of varying heights. A coping 15 at ground level surrounds the pool. The coping has an antisplash lip 16 overhanging the periphery of the pool. Steps 17 at the shallow end of the pool afford one means of egress.

The pool has a conventional deep-water drain 21 which is connected through a pool skimmer box 22 to the recirculation pump 23. In conventional fashion the flow from the pump is through a water filter 24 and a heater 25. A valve 27 controls recirculation of water through a plurality of return inlets 29 which extend through the side of the pool, as shown in FIG. 2. A secondary valve system (not shown) may be used between the pump and the main supply of water for refilling the pool after it has been drained.

The pool of FIGS. 1 and 2 has three water inlets 31, and 32, 33 located in the floor of the pool at carefully selected intervals. Each water inlet has a rotating drive conduit 35. The drive conduit is L-shaped with the short arm of the L extending downwardly into a water inlet cup 37. The long arm of the conduit L terminates in a tubing connection from which a flexible lightweight tubing length 41 extends. Each tubing length has a water outlet 42. A jet orifice indicated in FIG. 1 by small arrows 44 is located at the outboard end of each drive conduit. When the drive conduit conducts water under pressure, the orifice acts as a reaction jet, rotating the drive conduits in the direction of arcuate arrows 46. Water flow from the ends of the tubes and the agitation from the rotating and randomly moving tubes 41 agitates the water to keep suspended the sediment settled on the pool bottom and adjacent wall. The suspended sediment tends to follow the slope of the pool bottom and to collect in the pool drain 21, to be gathered by the filter of the pool recirculation system.

A conduit 51 supplies water under pressure to each of the water inlets. A valve 52 between the supply conduit and the heater or other source of water under pressure controls water inlet pressure. A pressure gauge 54 may be used in the line for pressure calibration.

As is explained in greater detail later on, each of the water inlets may have either hydraulic or pneumatic collets which hold the individual rotating drive conduits in place. FIG. 2 illustrates a hydraulically actuated collet.

A source of water under pressure 58 supplies a manifold 59 through a valve 60. Three lines 61, 62, 63 extend from individual control valves 64, 65, 66 to water inlets

31, 32, 33, respectively. A relief valve 67 is also on the manifold to relieve the pressure when valve 60 is closed. Thus, FIGS. 1 and 2 show diagrammatically a complete system for automatically sweeping sediment from the lower surfaces of the swimming pool, for instance, while utilizing the pool recirculation system as a part of the apparatus.

FIGS. 3 and 4 show a preferred form of hydraulically operated drive conduit collet which resides within water inlet cup 37 of inlet 31. The cup may be of plastic and is embedded in the pool floor. A vertical supply pipe 72 with a threaded end 73 enters the cup from the pipe's connection through pool floor 12 to supply conduit 51. A stepped cylindrical collet housing 75 threadably engages the end of the pipe. A stepped gasket 77 seals the pipe-housing joint and the end of the short arm 35A of drive conduit 35.

The collet housing has a downwardly opening cylinder or piston chamber 78 and an upwardly extending bore 79. The upward bore receives end 35A of the rotating drive collet. Near its upper end the wall of the bore has a plurality of radial cavities 81, each of which retains a locking ball 82. Each cavity is such that its ball is free to protrude slightly into bore 79 to engage an annular groove 83 in end 35A, but each ball is restrained by a circular lip 84 of a restraint ring 85 from removing outwardly from the wall. The restraint ring and locking balls comprise a conventionally operating "quick release" coupling for the downward end 35A of rotating drive conduit 35, securing the conduit releaseably to the outlet end of supply pipe 72.

A snap ring 88 in a groove in the wall of bore 79 at its top prevents removal of the restraint ring from the collet housing. The restraint ring is free to move vertically with respect to the housing except for tie rods, which may be screws 91, which pass through a flange 93 of the ring downwardly to a bottom flange 94 of a piston 95 in piston chamber 78. The screws are threadably secured to the piston flange. The restraint ring moves with respect to the collet housing against the bias of a compression spring lodged between a skirt 98 of the restraint ring and the outer wall of bore 79 sufficiently for lip 84 to clear balls 82, as shown in FIG. 4, when piston 95 is displaced. With the lock defeated by freeing the balls, rotating drive conduit 35 may be lifted from the water inlet, as is also shown in FIG. 4.

Motion of the restraint ring is accomplished in the apparatus of FIGS. 3 and 4 by the hydraulically induced displacement of piston 95, within piston chamber 78. The piston rides between the chamber wall and supply pipe 72. O-rings 97 effect a seal between the piston and the pipe and the chamber wall. A bottom compression spring 99 opposes downward motion of the piston.

A boss 101 on the top exterior of the chamber receives a connecting tube 102. The connecting tube is sealed to a nipple 103 protruding tangentially from the boss. The connecting tube coils about the collet housing within the inlet cup and connects to a fitting intruding into the cup interior. The fitting is coupled to a vertical length of control line 61 (FIG. 2) through which water under pressure is supplied at will to actuate the collet to release the rotating drive collet from the water inlet. The tube coil affords slack for removing the collet housing from the inlet cup without disconnecting the tube, except for one end. A cup lid 106 seats in a recess 107 of the cup to inhibit sediment from accumulating in the cup, since restraint ring 85 does not entirely close the cup upper opening, and also levels the floor.

The fit between the drive conduit end and the collet coupling is such that the conduit turns easily therein under the urging of the water jetting from orifice 44 in the drive conduit. The orifice is normally $\frac{1}{2}$ to $\frac{1}{4}$ inch in diameter, depending on the water pressure of the system.

As can be seen in FIG. 2, the collet will return to lock position when relief valve 67 is opened and control valve

60 closed. Therefore the collet affords easy control of removal and replacement of the rotating drive conduit and its sweeping agitator tube as desired.

In FIG. 5 an alternate quick release coupling for the rotating drive conduit is illustrated. Within water inlet cup 37, and attached to the threaded end of vertical pipe 72, is a coupling housing 111. The housing is sealed to the pipe by a stepped gasket 112 which also seals the end 35A of the rotating drive conduit. The housing has a stepped cylindrical exterior, with the largest step portion adjacent the pipe 72. The inner bore of the housing receives the drive conduit. Lock balls 82 reside in cavities in the wall of the bore in conventional fashion, and engage through the wall with an annular groove 83 of drive conduit end 35A. A restraint ring 85 about the bore wall has an inner lip 84 which normally prevents the lock balls from removing from the housing wall. A snap ring 88 in a groove at the top of the housing wall holds the restraint ring to the housing within a circling lid 106 of the water inlet cup.

A downwardly depending skirt on the restraint ring houses a compression spring 96 which is based upon the second step of the housing. The spring and the retaining snap ring cooperate to hold the restraint ring in the lock position shown in FIG. 5, while permitting vertical movement against the spring to unlock the coupling.

To unlock the quick release collet, a pole may be used, such as the pole 121 of FIG. 5. The pole may be operated from above the pool surface to release and retrieve the rotating drive conduit from its cleaning position within the water inlet. Valve 52 is closed to stop drive conduit rotation before the drive conduit is removed.

The pole has a horizontal arm 123 from which a plurality of thrust legs depend. The thrust legs 124 surround short arm 35A of the drive conduit so as to contact the upper surface of restraint ring 85. An extension 126 of the pole arm supports two or more conduit spring loop grips 128. The grips are vertically positioned to effect a grip upon the long arm 35B of the drive conduit when the thrust legs depress the restraint ring and release the lock balls from their engagement with conduit end 35A. The pole operator is then able to lift the drive conduit and its agitator tube from the water inlet. The pole must be lifted quickly to release the drive conduit before load spring 96 overcomes the inertia of the retracted restraint ring and the locking balls and relock the drive arm to the conduit end 35A.

It is advisable to agitate the water of the pool immediately adjacent the water inlet as well as the water more displaced from the inlet. Small downwardly directed openings 131 in arm 35B of the drive conduit perform this function, both in the embodiment of FIG. 5 and in the embodiment of FIGS. 3 and 4. The holes are preferred to be the diameter of a No. 60 drill bit.

The illustrative quick release collet of the inventive apparatus has been shown as hydraulically and mechanically operative. The collet may also be actuated manually and pneumatically. The rotating drive conduit may be restored to the water inlet by a pole similar to pole 121 of FIG. 5. Such a pole may be equipped with spring loops for grasping the drive conduit that are spring actuated so as to time the release of the conduit with respect to the time the legs open the collet. Magnetic grasping means, either permanent magnets or electro-magnets, may be used to facilitate maneuvering the drive conduit into position and releasing the conduit within the collet.

I claim:

1. Pool cleaning apparatus for use in pools having a recirculating water supply system and comprising a plurality of water inlets at spaced points in the pool bottom, a rotating drive conduit releasably secured to each water inlet, a jet orifice in each drive conduit adapted to cause rotation of the submerged drive conduit when water flows from the inlet, a flexible agitator tube secured to each drive conduit to revolve about the water inlet and ran-

5

6

domly scan the pool floor and pool wall area adjacent the inlet, means for controlling water flow from the recirculating water system to the water inlets, and means for selectively releasing a rotating drive conduit and its related agitator tube from the water inlet.

2. Apparatus in accordance with claim 1 wherein the means for releasing each drive conduit comprises a fluid actuated collet.

3. Apparatus in accordance with claim 1 wherein the means for releasing each rotating drive conduit comprises a ball lock quick release coupling adapted releasably to grip the inlet end of the rotating drive conduit, a spring-loaded restraint ring about the coupling, a manually manipulatable pole adapted to bear against the restraint ring, and means on the pole for gripping the drive conduit to elevate it from the coupling.

4. Pool cleaning apparatus for use in pools having a recirculating water supply system with a pool return spout and a pool drain and comprising a plurality of water inlets recessed at spaced points in the pool bottom, a rotating drive conduit releasably secured to each water inlet, a water jet orifice in each rotating drive conduit adapted to

induce rotation of the submerged drive conduit when water flows from the inlet, a flexible agitator tube secured to each drive conduit to revolve therewith about the water inlet and randomly scan the pool floor and pool wall area adjacent the water inlet, a water outlet at the end of each agitator tube remote from the drive conduit, valve means for controlling water flow to the water inlets, and means fluid actuated for selectively releasing each rotating drive conduit and its related agitator tube from the water inlet.

References Cited

UNITED STATES PATENTS

2,736,578	2/1956	Rafferty	285—277 X
2,887,124	5/1959	Mehl	285—277 X
2,921,802	1/1960	Canner	285—277 X
2,975,791	3/1961	Pansini	210—169 X
3,261,371	7/1966	Vernon	15—1.7 X
3,298,715	1/1967	Stehle	285—277 X

REUBEN FRIEDMAN, Primary Examiner
T. A. GRANGER, Assistant Examiner