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J. C. DAWSON
APPARATUS FOR ADDING MEASURED AMOUNTS OF
ONE OR MORE FLUIDS TO OTHER FLUIDS

3,245,585

2 Sheets-Sheet 1

FIG. 1

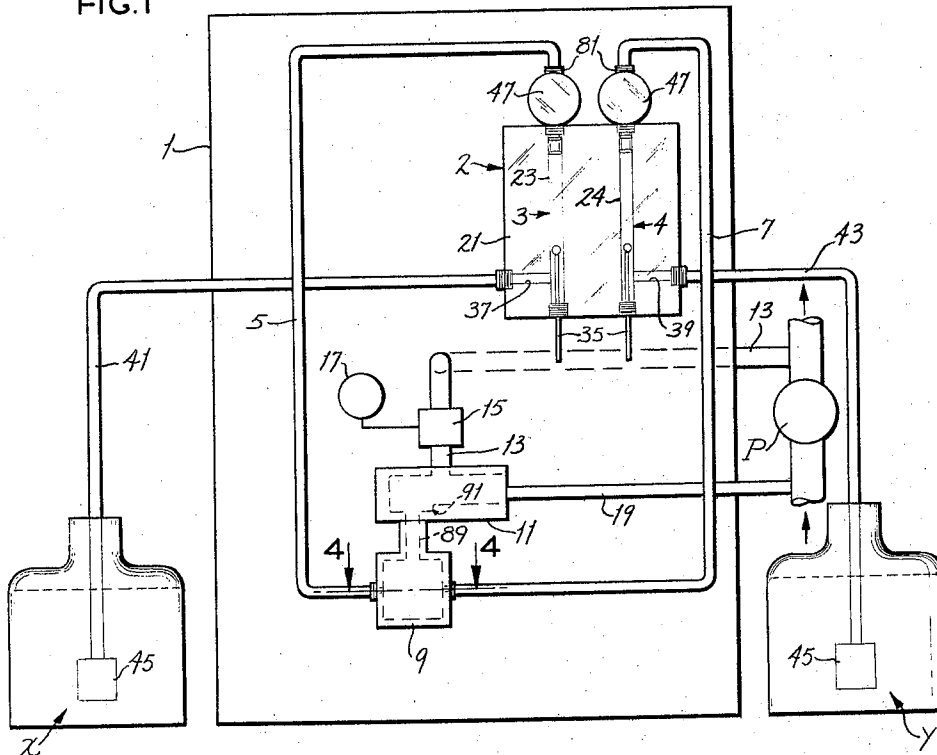
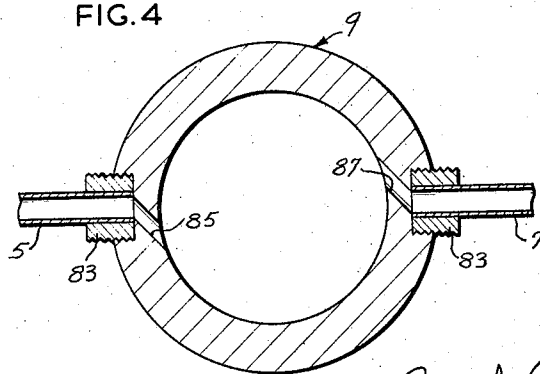


FIG. 4



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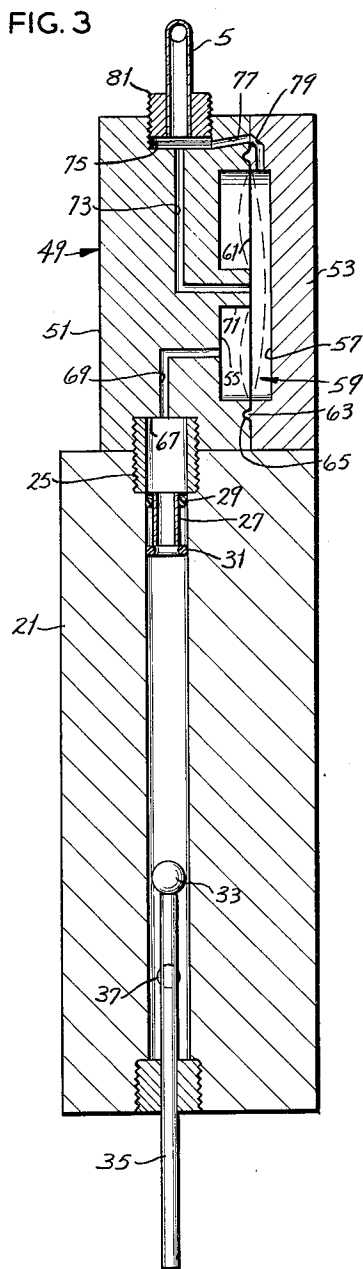
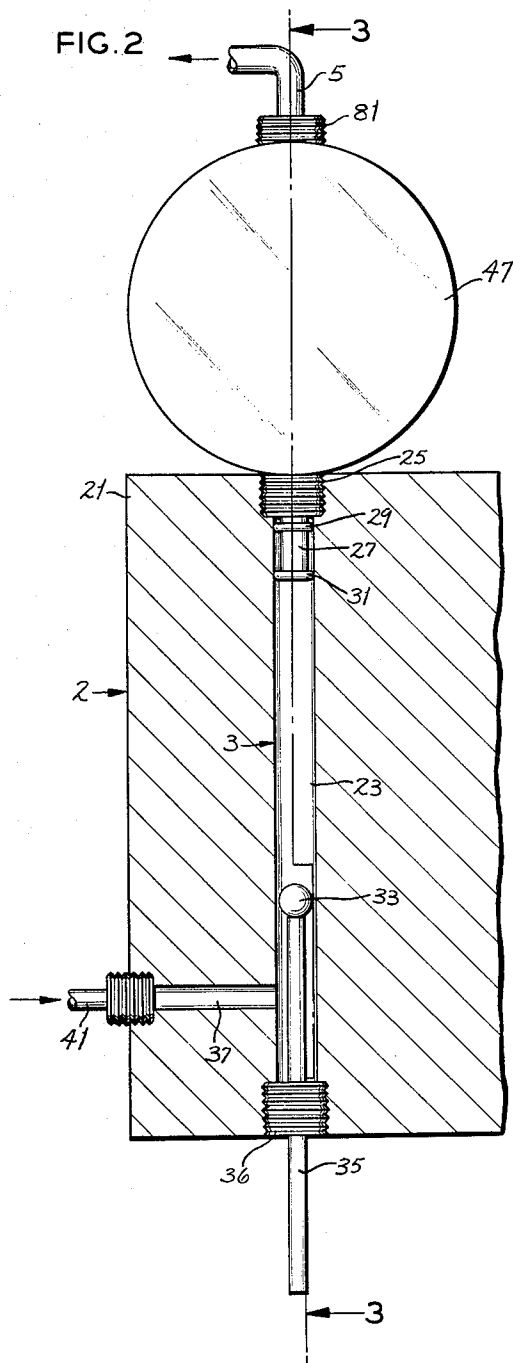
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1

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APPARATUS FOR ADDING MEASURED AMOUNTS OF ONE OR MORE FLUIDS TO OTHER FLUIDS

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This invention relates to dispensing apparatus, and more particularly to apparatus for adding measured amounts or dosages of one or more fluids to other fluids.

Briefly, the invention comprises means for delivering a measured amount of fluid to a stream or flow of another fluid at predetermined intervals.

Among the several objects of this invention may be noted the provision of apparatus of the class described for adding a measured dosage or amount of liquid such as liquid disinfectant, for example, to a stream or flow of another liquid, such as water, for example, at predetermined intervals for preventing contamination of the water, such as is necessary in swimming pool circulating systems, for example; the provision of apparatus such as described which may be used to mix together two or more measured dosages of liquids and then add them to a flow of another liquid; the provision of apparatus of the type described wherein the liquid or liquids to be added to a system are drawn by suction into the system; and the provision of apparatus such as described which is economical in construction and reliable in operation. Other objects and features will be in part apparent and in part pointed out hereinafter.

The invention accordingly comprises the constructions hereinafter described, the scope of the invention being indicated in the following claims.

In the accompanying drawings, in which one of various possible embodiments of the invention is illustrated,

FIG. 1 is a front elevation of the apparatus set up to mix together and add measured dosages of two liquids to a flow of another liquid;

FIG. 2 is an enlarged fragmentary view of FIG. 1;

FIG. 3 is a section taken on line 3—3 of FIG. 2; and

FIG. 4 is an enlarged section taken line 4—4 of FIG. 1.

Corresponding reference characters indicate corresponding parts throughout the several views of the drawings.

While this invention is not limited to the addition of liquid disinfectants to swimming pool circulatory systems, it will be described herein with reference to such a system for exemplary purposes.

Inasmuch as the water in swimming pools is always subject to contamination from bacteria, the need for the use of disinfectants has long been recognized. Two generally approved types of disinfectants for swimming pool water are chlorine and bromine. Chlorine may be applied in several forms, such as a powder which has it in a combined form, or in a gaseous state. While chlorine is used extensively, it produces a strong odor in the pool and may cause skin and eye irritation if not applied to the water in proper amounts. The equipment normally used for adding bromine to pool water is usually safer and easier to operate and maintain than a chlorine gas feeding machine, for example. Moreover, the bromine residuals are more stable than chlorine residuals. Furthermore, bromine, when in pool water, does not irritate the eyes or nasal passages and improves the clarity of the water. Accordingly, the use of bromine as a pool water disinfectant has become increasingly popular. However, pure bromine on the skin results in burning and blistering. Accordingly, while the use of bromine by swimming pool operators is gaining in popularity since the bromine, once in the water, is in many ways more desirable than chlorine, the bromine must be handled

with extreme care before being added to the water. In order to eliminate this hazardous situation, a system has been devised wherein two different solutions are provided in separate containers. One solution contains bromine in a combined form and the other solution acts as a liberating agent for the combined bromine. The two single solutions are relatively non-corrosive as compared to elemental bromine or elemental chlorine. When mixed together, these two solutions liberate the combined bromine in the form of microparticle droplets of elemental bromine. These droplets, when introduced into the recirculatory system of a swimming pool, quickly dissolve. Heretofore, one type of apparatus for combining the two solutions and delivering them to a recirculatory system comprised two independently driven pumps, each of which was adapted to pump solution from different containers to a common discharge conduit. A timer was employed to energize the pumping units at predetermined intervals. This apparatus often proves unsatisfactory because the motors driving the pumps do not always run at exactly the same speed, thus causing more of one solution to be delivered into the recirculatory system than the other solution. Moreover, the timing mechanisms as well as the mechanical pumping equipment require constant inspection and repair which are too complicated for the average person having a residential pool.

According to this invention, not only does the apparatus insure that the proper amounts or dosages of solutions are added to a recirculatory system, but the apparatus is also simple to adjust and generally trouble-free in operation.

Referring now to the drawings, a mounting plate or board upon which the liquid dispensing apparatus of this invention is secured is generally indicated at 1. The apparatus comprises a master dispensing unit 2 having a plurality of individual measuring and dispensing units 3 and 4 connected by lines or conduits 5 and 7 to a mixing chamber 9. The mixing chamber is connected to an alternate vacuum-pressure chamber 11. A line 13 connected at one end with water under pressure is connected at its other end with chamber 11. A solenoid control valve 15 controlled by timer 17 is located in line 13. A suction line 19 is connected to the outlet of chamber 11. As will be made apparent, line 13 may be connected to the outlet side of the pump P of a swimming pool circulation system, while line 19 may be connected to the inlet side of such a pump. Containers of two liquids, such as bromine in a combined form and a liberating agent for example, are indicated at X and Y respectively.

More particularly, the master measuring and dispensing unit 2 comprises a block 21 having two cylinders 23 and 24 bored therein. The cylinders 23 and 24 are identical and a description of one will suffice for both. A fitting 25 is threaded into the upper or outlet end of each cylinder. Placed within each cylinder below fitting 25 is a sealing member 27 having rings 29 and 31 thereon. Ring 31 constitutes a seat for a valve member 33. Valve member 33 is vertically movable in its respective cylinder. The valve member is heavier than the liquid which passes through cylinder 23 so that it will move downwardly by gravity. An adjusting rod 35 extends upwardly through a sealing fitting 36 at the lower end of each cylinder. Rod 35 is adjustable upwardly and downwardly for varying the lowermost portion of valve member 33 and thereby varying the size of the dosage delivered from each cylinder. Inlet ports 37 and 39 extend laterally from the lower end portions of the cylinders 23 and 24, respectively. Inlet 37 is connected by a conduit or line 41 to the liquid in container X and port 39 is connected by line 43 to the liquid in container Y. Filters 45 are located on the ends of lines 41 and 43.

Valve member 33 also serves as a piston and is

adapted to rise in its cylinder from an initial position in the lower end of the cylinder in response to suction above the valve member. The valve members have a relatively loose fit in the cylinders so that the valve members, without undue impedance, are adapted to sink to the lower ends of the cylinders under the gravity bias of their weight when the suction source above the valve member is stopped. This is because the weight of the volume of the liquid in the cylinder displaced by each valve member is less than the weight of the valve member. Accordingly, the weight of the volume of the liquid in each cylinder displaced by the respective valve member is such in relation to the weight of the valve member that the valve member tends to move toward the inlet end of the cylinder.

Check valves 47 are connected to the outlet ends of cylinders 23 and 24. Each valve 47 includes a body 49 having two circular members or parts 51 and 53 secured together in face-to-face relation. The inside faces of parts 51 and 53 are provided with aligned recesses 55 and 57, respectively, which together form a chamber 59. A diaphragm 61, which may be of any conventional impermeable diaphragm material, extends across chamber 59 and is clamped between parts 51 and 53. The diaphragm thus makes compartments of recesses 55 and 57. A ring-shaped ridge 63 on part 53 mates with a groove 65 in part 51 to clamp the diaphragm securely in position.

Fitting 25 extends into an inlet 67 in part 51 of valve 47. A passage or port 69 leads from inlet 67 to the recessed portion 55 of chamber 59. A post 71 located approximately in the center of recess 55 extends toward diaphragm 61. Post 71 has a substantially flat side on its outer end, and has a passage or port 73 therein extending to an outlet 75. A passage or port 77 extends from outlet 75 to the inside face of part 51, where it is aligned and in registration with a passage or port 79 in part 53 extending to the recessed portion 57. Thus the recessed portion 57 is in constant communication with outlet 75 through the passage formed by ports 77 and 79. The operation of the check valves 47 will be described in connection with the operation of the complete apparatus. It suffices to say at the present that check valve 49 opens to permit flow from inlet 67 to outlet 75 upon the presence of suction at outlet 75, while the valve closes to prevent back flow when said suction is discontinued.

Tubes 5 and 7 are connected to the outlets 75 of valves 47 by fittings 81. Tubes 5 and 7 are approximately equal in length so as to have substantially the same frictional resistance. Tubes 5 and 7 are connected at their lower ends with mixing chamber 9 by fittings 83. As shown, chamber 9 is generally cylindrical and has inlet ports 85 and 87 connected with lines 5 and 7, respectively. Ports 85 and 87 are so located that liquids sucked into the chamber are directed in generally tangential directions with respect to the inside periphery of the chamber. In this manner the liquids form a swirling action which enhances mixture of the liquids.

An outlet 89 of mixing chamber 9 is connected to an inlet 91 of alternating vacuum-pressure chamber 11. Suction tube 19 is connected to the outlet of chamber 11. For reasons to be made apparent hereinafter, the cross-sectional area within the inside periphery of tube 19 is less than the cross-sectional area enclosed with the inside periphery of chamber 11.

Tube 13 also has a greater flow capacity than tube 19 so that there will always be more liquid delivered to chamber 11 than can be withdrawn therefrom when valve 15 is open. The timer 17 may be a conventional mechanism adapted to open a solenoid valve for a predetermined period and then close the valve for another predetermined period. For example, when the cylinders 23 and 24 are of such a size that two milliliters, for example, will be forced through each cylinder by valve mem-

bers 33 upon movement of the latter from rods 35 to seats 31, it has been found that the apparatus works efficiently if the solenoid valve is closed for a period of about two seconds. Thus, if it were desired to deliver four milliliters of liquid to a circulatory system once every minute the timer is set so that the valve 15 is open for 58 seconds and then closed for 2 seconds. The purpose of opening and closing valve 15 will be made apparent during a description of the operation of the apparatus, which is as follows:

Assuming that all lines in the system are fully primed, that tube 13 is connected to the outlet side and tube 19 to the inlet side of the pump P of the circulatory system of a pool, water is forced through tube 13 to valve 15 and suction is applied to tube 19, which pulls water from chamber 11. Since more water is being supplied to chamber 11 than can escape through line 19, there is pressure exerted in chamber 11 and, through conduit 89, transmitted to mixing chamber 9 and lines 5 and 7 to valves 47. The pressure thus exerted in chambers 11 and 9 operates as a back pressure, preventing flow of fluid from the chamber 9 back to chamber 11 while valve 15 is open. This back pressure is transmitted through the inlet 75 of each valve and ports 77 and 79 to recessed portion 57 and the right-hand side of diaphragm 61 as viewed in FIG. 3. The diaphragm is thus pressed to the broken-line position on the left as viewed in FIG. 3 so as to fit tightly against port 73 and maintain the latter closed. The back pressure from outlet 75 is also transmitted through port 73 to the portion of the diaphragm pressed against the port. However, since the pressure on the right-hand side of the diaphragm is applied over a much larger area, the pressure applied on the portion of the left-hand side of the diaphragm aligned with port 73 does not unseat the diaphragm. The total force applied to the right-hand side of the diaphragm is always much greater than the force applied to the left-hand side of the diaphragm during back-pressure conditions.

When solenoid valve 15 is closed by timer 17, the suction applied by line 19 is exerted on the liquid in chamber 11. This suction force is also exerted in the mixing chamber 9 and through lines 5 and 7 to valves 47. The suction in the outlet 75 of each valve 47 is transmitted to recessed portion 57 of chamber 59 through ports 77 and 79. This causes the diaphragm 61 to be sucked to the right as shown in broken lines in FIG. 3. Suction is also created in passage 73, and this suction is transmitted to the recessed portion 55, port 69, inlet 67 and the respective cylinder 23 or 24. The liquid and valve member 33 in each cylinder are pulled upwardly by the suction in the cylinder. As the valve member rises, a measured dose of liquid is forced out the upper end of the cylinder and through the respective valve 47. Inasmuch as the system is fully primed, an equal dosage of liquid is delivered to mixing chamber 9 through each of lines 5 and 7 and the liquids are mixed together. Thus an amount of liquid equal to the total amount of liquid discharged from both cylinders 23 and 24 is delivered into mixing chamber 9. Similarly, an amount of mixed liquids equal to the total amounts discharged from cylinders 23 and 24 is sucked from chamber 11 into line 19.

Upon rising to the upper ends of the cylinders 23 and 24, the valve members 33 engage the seats formed by rings 31 to cut off delivery. Upon such cut-off, the suction in line 19 can no longer pull liquids from chamber 11 since the system is fully primed. The timer 17 is set so that valve 15 will be opened shortly after valve members 33 become seated upon rings 31. Upon opening of valve 15, water is fed through line 13 into chamber 11 and out line 19 where it flushes the measured dosages of mixed liquids from the latter into the circulatory system of the swimming pool.

Inasmuch as more water is being delivered to chamber 11 than can be withdrawn by suction line 19, a back pressure is exerted against the mixture of liquids in chamber 9

which prevents such liquids from being drawn into alternating pressure-vacuum chamber 11. During the period that valve 15 is open the liquids in chamber 9 react to release elemental bromine in the form of microparticle droplets. The back pressure is transmitted through lines 5 and 7 to the inlet 75 of each valve 47 as set forth above. This back pressure causes the diaphragm 61 in each valve to snap to its left-hand broken line position such as shown in FIG. 3. The respective valve member 33 then sinks down toward the upper end of rod 35. When diaphragm 61 is pressed to its broken line left-hand position, as shown in FIG. 3, a small amount of liquid is forced through port 69 into the upper end of the respective cylinder. This small amount of liquid forces the valve member 33 off seat 31 and thus prevents the valve member from sticking to seat 31. When the valve member 33 reaches the upper ends of the adjusting rod 35, the apparatus is ready for the next operation. Thus when the valve 15 is again closed by timer 17, additional dosages of liquid will be delivered to mixing chamber 9 and into suction tube 19.

While check valves 47 are shown as being located only adjacent the outlets of cylinders 23 and 24, it will be understood that additional check valves could be placed at other points in the flow system to prevent back flow. For example, if desired, check valves could be placed in lines 41, 43, 13 and 19.

It will thus be seen that this apparatus is adapted to deliver automatically and effectively measured dosages of liquids to a flow of another liquid. As mentioned previously, this apparatus is not limited in its application to the addition of disinfectants to a swimming pool circulatory system, but may be used in many other situations. For example, the apparatus may be used to add a liquid fertilizer to irrigation water and there are many other industrial applications where this apparatus could be employed to add measured dosages of one or more liquids to other liquids.

While I have shown two cylinders being employed for the addition of two liquids to a third liquid, it will be understood that the apparatus may be used when it is desirable to add merely one liquid to another liquid or it may be used where it is desired to add many liquids, such as twenty, for example, to a flow of another liquid.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As various changes could be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of measuring units each having an inlet and an outlet, conduit means connected to each inlet for supplying fluids thereto, each unit receiving a different fluid, movable metering means operatively carried within each measuring unit for delivering a measured dosage of fluid through the respective outlet upon the application of suction to such outlet, the metering means being directly acted upon by and responsive to the flow of the particular fluid passing through and being measured by the measuring unit, a mixing chamber, lines connecting the outlet of each unit to said mixing chamber, said mixing chamber having an outlet, means for intermittently applying suction to said chamber outlet, said metering means being adapted to eject a single charge of a measured quantity of fluid upon each intermittent application of suction, and means for preventing the flow of one fluid into another when suction is not applied to said chamber outlet.

2. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of measuring units each having an inlet and an outlet, means for supplying a plurality of fluids to the inlets with

each unit receiving a different fluid, each measuring unit including means for delivering a measured dosage of fluid through the respective outlet upon the application of suction to such outlet, a mixing chamber, lines connecting the outlet of each unit to said mixing chamber, said mixing chamber having an outlet, means for intermittently applying suction to said chamber outlet, and a plurality of valve means for preventing the flow of one fluid into another when suction is not applied to said chamber outlet, there being at least one valve means for each measuring unit, each of said valve means having an inlet and an outlet, the valve means inlet being connected to a respective measuring unit outlet, each of said valve means including a diaphragm adapted to place said valve means inlet in communication with said valve means outlet when suction is applied to said valve means outlet, said diaphragm blocking communication between said valve means inlet and said valve means outlet when the pressure on the outlet side of the valve is greater than the pressure on the inlet side of the valve.

3. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of measuring units each having an inlet and an outlet, conduit means connected to each inlet for supplying fluids thereto, each unit receiving a different fluid, movable metering means operatively carried within each measuring unit for delivering a measured dosage of fluid through the respective outlet upon the application of suction to such outlet, the metering means being directly acted upon by and responsive to the flow of the particular fluid passing through and being measured by the measuring unit, a mixing chamber, lines connecting the outlet of each unit to said mixing chamber, said mixing chamber having an outlet, means for intermittently applying suction to said chamber outlet, said metering means being adapted to eject a single charge of a measured quantity of fluid upon each intermittent application of suction, means for preventing the flow of one fluid into another when suction is not applied to said chamber outlet, and adjusting means for varying the size of the dosage delivered from each measuring unit.

4. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of measuring units each having an inlet and an outlet, means for supplying a plurality of fluids to the inlets with each unit receiving a different fluid, each measuring unit including means for delivering a measured dosage of fluid through the respective outlet upon the application of suction to such outlet, a mixing chamber, lines connecting the outlet of each unit to said mixing chamber, said mixing chamber having an outlet, means for intermittently applying suction to said chamber outlet, means for preventing the flow of one fluid into another when suction is not applied to said chamber outlet, said means for intermittently applying suction to said chamber outlet including a second chamber connected to said mixing chamber, a line connected to said second chamber for supplying a fluid under pressure to said second chamber, a control valve in said line for supplying fluid under pressure to said second chamber, means for intermittently operating said valve between an opened and closed position, and a line for applying suction to said second chamber, the fluid delivered under pressure to said second chamber when said control valve is open, creating a back pressure in said mixing chamber and preventing the application of suction thereto.

5. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of measuring units each having an inlet and an outlet, means for supplying a plurality of fluids to the inlets with each unit receiving a different fluid, each measuring unit including means for delivering a measured dosage of fluid through the respective outlet upon the application of suction to such outlet, a mixing chamber, lines connecting the outlet of each unit to said mixing

chamber, said mixing chamber having an outlet, means for intermittently applying suction to said chamber outlet, and a plurality of valve means for preventing the flow of one fluid into another when suction is not applied to said chamber outlet, there being at least one valve means for each measuring unit, each of said valve means having an inlet and an outlet, the valve inlet being connected to a respective measuring unit outlet, and each of said valve means including a diaphragm adapted to place said valve means inlet in communication with said valve means outlet when suction is applied to said valve means outlet, said diaphragm blocking communication between said valve means inlet and said valve means outlet when the pressure on the outlet side of the valve is greater than the pressure on the inlet side of the valve, said means for intermittently applying suction to said chamber outlet including a second chamber connected to said mixing chamber, a line connected to said second chamber for supplying a fluid under pressure to said second chamber, a control valve in said line connected to said second chamber, means for intermittently operating said valve between an opened and closed position, and a line for applying suction to said second chamber, the fluid delivered under pressure to said second chamber when said control valve is open creating a back pressure in said mixing chamber and preventing the application of suction thereto.

6. Apparatus for mixing together and adding measured dosages of a plurality of liquids to the circulatory system of a swimming pool comprising a plurality of measuring units each having an inlet and an outlet, means for supplying a plurality of liquids to the inlets of said units, each unit receiving a different liquid and being adapted to deliver a measured dosage of liquid through its outlet upon the application of suction to its outlet, said measuring unit being responsive to and actuated by the momentum of the particular liquid passing through and being measured by it, a mixing chamber, lines connecting the outlet of each unit to said mixing chamber, means for intermittently applying suction to said chamber for withdrawing a mixture of liquids therefrom, and means for preventing the flow of one liquid into another when suction is not applied to said chamber.

7. Apparatus for mixing together and adding measured dosages of a plurality of liquids to the circulatory system of a swimming pool comprising a plurality of measuring units each having an inlet and an outlet, means for supplying a plurality of liquids to the inlets of said units, each unit receiving a different liquid and being adapted to deliver a measured dosage of liquid through its outlet upon the application of suction to its outlet, said measuring unit being responsive to and actuated by the momentum of the particular liquid passing through and being measured by it, a check valve connected to each unit for preventing the flow of liquid therethrough when suction is not applied on the outlet side thereof and for permitting the flow of liquid therethrough when suction is applied on the outlet side, a mixing chamber, lines connecting each check valve to said chamber, and means for intermittently applying suction to said chamber to draw a measured amount of liquid from each measuring unit and to draw an amount of liquid from said mixing chamber equal to the total amount of liquid withdrawn from said measuring units.

8. Apparatus for dispensing a measured dosage of fluid comprising first and second conduits, a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder

is filled with fluid, and means for intermittently applying suction to said outlet to draw fluid from said cylinder and to draw said valve member toward said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member upon termination of the application of suction, moving toward said inlet end of the cylinder.

9. Apparatus for dispensing a measured dosage of fluid comprising a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, means for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with fluid, a check valve connected to said outlet, said check valve having a diaphragm therein adapted to permit the flow of liquid therethrough from said outlet when the suction is applied on the outlet side of said check valve and adapted to prevent the flow of liquid therethrough when the pressure on the outlet side of said check valve is greater than the pressure in said cylinder, and means for intermittently applying suction to the outlet side of said check valve for drawing fluid from said cylinder and for moving said valve member towards said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member, when said diaphragm prevents the flow of fluid through said check valve, moving toward said inlet end of the cylinder.

10. Apparatus for dispensing a measured dosage of fluid comprising first and second conduits, a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with fluid, and means for intermittently applying suction to said outlet to draw fluid from said cylinder and to draw said valve member toward said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, said valve member upon termination of the application of suction, moving toward said inlet end of the cylinder, and an adjusting rod extending into the cylinder adjacent the inlet end of the latter for varying the distance through which the valve member may move in the cylinder.

11. Apparatus for dispensing a measured dosage of fluid comprising first and second conduits a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with fluid, and means for intermittently applying suction to said outlet to draw fluid from said cylinder and to draw said valve member toward said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, said valve member upon termination of the application of suction, moving toward said inlet end of the cylinder, said means for intermittently applying suction to said outlet

including a chamber in communication with said cylinder, a line connected to said chamber for supplying fluid under pressure to said chamber, a control valve in said line, and means for intermittently opening and closing said control valve for permitting and stopping, respectively, the flow of fluid under pressure into said chamber, and a line for applying suction to said chamber.

12. Apparatus for dispensing a measured dosage of fluid comprising a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, means for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with fluid, a check valve connected to said outlet, said check valve having a diaphragm therein adapted to permit the flow of liquid therethrough from said outlet when the suction is applied on the outlet side of said check valve and adapted to prevent the flow of liquid therethrough when the pressure on the outlet side of said check valve is greater than the pressure in said cylinder, means for intermittently applying suction to outlet side of said check valve for drawing fluid from said cylinder and for moving said valve member towards said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member, when said diaphragm prevents the flow of fluid through said check valve, moving toward said inlet end of the cylinder, said means for intermittently applying suction to said outlet including a chamber in communication with said cylinder, a line connected to said chamber for supplying fluid under pressure to said chamber, a control valve in said line and means for intermittently opening and closing said control valve for permitting and stopping, respectively, the flow of fluid under pressure into said chamber, and a line for applying suction to said chamber.

13. Apparatus for dispensing a measured dosage of liquid disinfectant into the circulatory system of a swimming pool comprising first and second conduits a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying liquid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with liquid, and means for intermittently applying suction to said outlet to draw liquid from said cylinder and to draw said valve member toward said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member, upon termination of the application of suction, moving toward said inlet end of the cylinder, and a check valve connected to the outlet end of the cylinder for preventing the back flow of liquid through the check valve into the cylinder.

14. Apparatus for dispensing a measured dosage of liquid disinfectant into the circulatory system of a swimming pool comprising first and second conduits, a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying liquid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward

said inlet when said cylinder is filled with liquid, and means for intermittently applying suction to said outlet to draw liquid from said cylinder and to draw said valve member toward said outlet, said valve member, upon moving to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member upon termination of the application of suction, moving toward said inlet end of the cylinder, a check valve connected to the outlet end of the cylinder for preventing the back flow of liquid through the check valve into the cylinder, said means for intermittently applying suction to said outlet including a chamber, a line for supplying water under pressure to said chamber, a line for applying suction to said chamber, the flow capacity of said line for applying suction being less than the flow capacity of the line for applying water under pressure to said chamber, and a control valve in said line for delivering water under pressure to said chamber, said control valve being adapted to open and close said line intermittently for controlling the flow of water under pressure to said cylinder.

15. Apparatus for dispensing a measured dosage of fluid comprising first and second conduits, a cylinder having an upper end and a lower end, an inlet adjacent one end and an outlet adjacent its other end, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat at its outlet end, a valve member movable in the cylinder, the weight of the volume of the fluid in the cylinder displaced by the valve member being such in relation to the weight of the valve member that the valve member tends to move toward the inlet end of the cylinder, a check valve having an inlet and outlet, said check valve inlet being connected to said cylinder outlet, said check valve having means for placing said check valve inlet in communication with said check valve outlet to permit suction to pull said valve member from said inlet toward said seat, thereby forcing out fluid through the cylinder outlet, said means in said check valve blocking communication between said check valve inlet and said check valve outlet when the pressure is greater on the outlet side of the check valve than on the inlet side of the check valve, thereby causing the valve member to move to the inlet end of the cylinder.

16. Apparatus for mixing together and dispensing measured dosages of a plurality of fluids comprising a plurality of cylinders each having an inlet adjacent one end and an outlet adjacent the other end, a valve member in each cylinder movable between said inlet and outlet and biased toward said inlet, a plurality of lines, each having a connection to a different inlet, for supplying a different fluid to each cylinder, a plurality of check valves each of which is connected to a different cylinder outlet, each of said check valves being adapted to open when suction is applied to the outlet side of the check valve and adapted to close when the pressure on the outlet side of the check valve is greater than the pressure on the inlet side of the check valve, a mixing chamber, a plurality of lines connecting said check valves to said mixing chamber, said chamber having an outlet, and means for intermittently applying suction to said chamber outlet to draw fluid therefrom, said check valves, when suction is applied to said chamber outlet, opening to permit fluid within each of said cylinders to be sucked therefrom, the valve member within each cylinder being sucked from said cylinder inlet to said cylinder outlet, said valve member upon reaching said outlet closing the latter.

17. Apparatus for dispensing a measured dosage of fluid comprising a cylinder, first and second conduits, an inlet adjacent one end of the cylinder and an outlet adja-

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cent the other end of the cylinder, said inlet being connected to the first conduit and said outlet being connected to the second conduit in such a manner that the entire flow of fluid passing through said first and second conduits passes through said cylinder, means operatively associated with the first conduit for supplying fluid to the cylinder at its inlet end, said cylinder having a valve seat adjacent its outlet end, a valve member movable in said cylinder and adapted to move toward said inlet when said cylinder is filled with fluid, a check valve connected to said outlet, said check valve having a diaphragm therein adapted to permit the flow of liquid therethrough from said outlet when the suction is applied on the outlet side of said check valve and adapted to prevent the flow of liquid therethrough when the pressure on the outlet side of said check valve is greater than the pressure in said cylinder and means for intermittently applying suction to the outlet side of said check valve for drawing fluid from said cylinder and for moving said valve member towards said outlet, said valve member, upon moving

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to the outlet end of the cylinder, being engageable with said valve seat to cut off flow from the outlet end of the cylinder, and said valve member, when said diaphragm prevents the flow of fluid through said check valve, moving toward said inlet end of the cylinder.

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