Feb. 4, 1969 T. L. HARBAUGH 3,425,809

METERING DEVICE FOR SOLUBLE MATERIALS

Filed Oct. 16, 1967

Fig. 1.

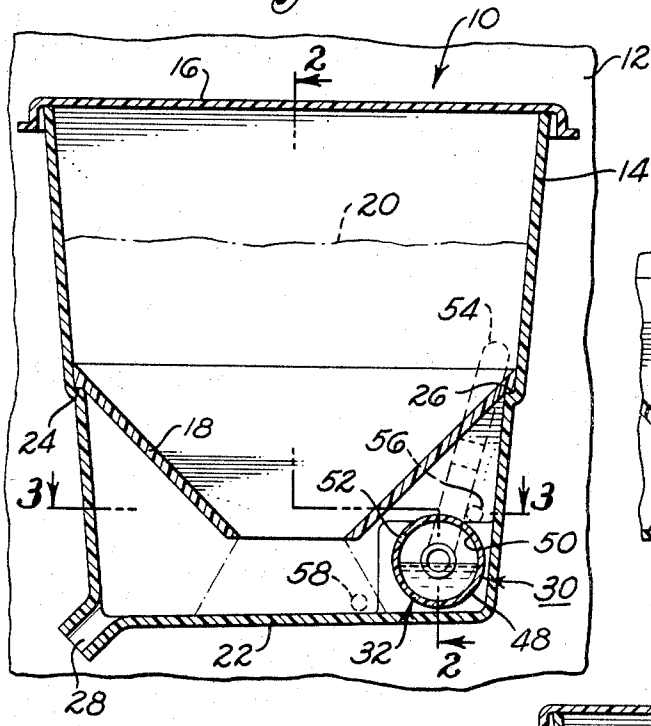


Fig. 4.

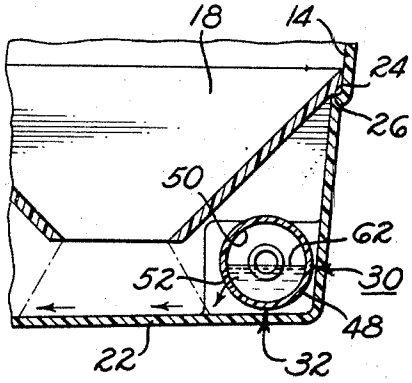


Fig. 2.

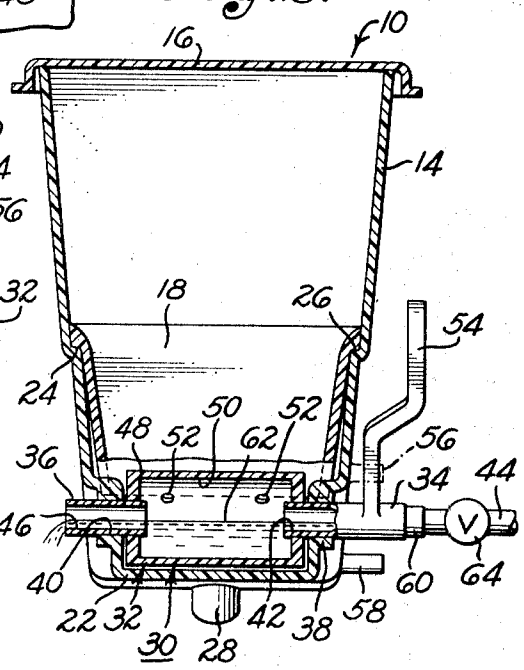
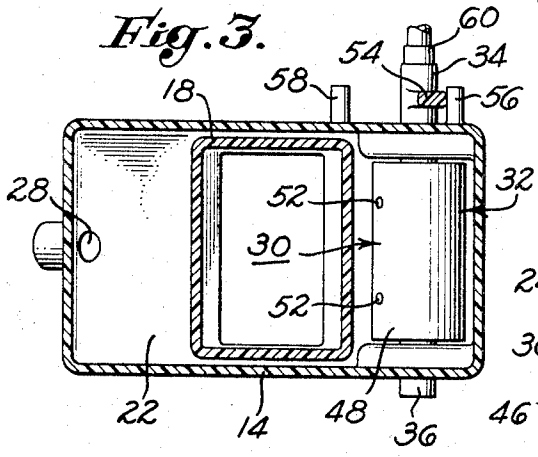


Fig. 3.



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METERING DEVICE FOR SOLUBLE MATERIALS

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U.S. Cl. 23—272.7 6 Claims
Int. Cl. B01d *11/02, 59/24*

ABSTRACT OF THE DISCLOSURE

A metering device for a soluble material. The soluble material is placed in a receptacle having an outlet for a solution of the material. A horizontal conduit for the desired solvent extends through the receptacle and is provided with a solvent inlet and an excess-solvent outlet externally of the receptacle, the conduit being rotatable about its axis. The conduit is provided within the receptacle with a radially-enlarged chamber having a discharge port for discharging solvent into the receptacle to dissolve the soluble material therein for discharge through the outlet of the receptacle. The conduit may be rotated to vary the elevation of the discharge port and thereby vary the rate at which the solvent in the conduit is discharged through the discharge port into the receptacle.

BACKGROUND OF THE INVENTION

The present invention relates in general to a metering device for soluble materials and, more particularly, to a device for dissolving at predetermined, metered rates materials soluble in various solvents. As a matter of convenience, the invention will be considered herein in connection with a device for dissolving any of various dry chlorine compounds at predetermined, metered rates for addition to the water circulated through the recirculating systems of swimming pools, without necessarily limiting the invention thereto.

As is well known, a certain minimum chlorine concentration must be maintained in the water in a swimming pool to perform such functions as inhibiting the growth of algae, controlling bacterial levels in the water, and the like. Ideally, the minimum chlorine concentration is maintained by continuously introducing a solution of the desired chlorine compound into the water flowing through the recirculating system of the swimming pool. The rate at which the solution must be introduced to maintain the minimum concentration is quite variable, depending upon the temperature of the water in the pool, the extent to which the pool is used, the amount of make-up water added to the pool, the presence or absence of a cover over the pool, and the like.

In view of such factors as the foregoing, in order to maintain the desired minimum chlorine concentration by continuously adding a solution of the desired dry chlorine compound to the water flowing through the recirculating system, it is necessary to provide a metering device which is capable of adjustment to vary the rate at which the compound is dissolved and the solution thereof added to the recirculated water.

CROSS-REFERENCE TO RELATED APPLICATION

Ser. No. 522,984, filed Jan. 25, 1966 by Robert W. Fredericks and me, now Patent No. 3,378,027, issued Apr. 16, 1968.

SUMMARY AND OBJECTS OF THE INVENTION

With the foregoing background in mind, a primary object of the invention is to provide a metering device, for metering a solution of a dry chlorine compound into

the recirculated water of a swimming pool, or for metering solutions of other materials soluble in other solvents, which is of simple construction, positive in its operation, and which is quickly and accurately adjustable to vary the rate at which the dry chlorine compound is dissolved and the solution thereof in water added to the water flowing through the recirculating system of the swimming pool.

The invention contemplates a metering device which includes: a receptacle adapted to contain a supply of the dry chlorine compound and provided with an outlet for a water solution of the compound communicating with the recirculating system of the swimming pool; a conduit connected to the receptacle and adapted to conduct water from the recirculating system of the swimming pool into the receptacle to dissolve the compound therein; and means for varying the rate of introduction of water into the receptacle from such conduit to vary the rate at which the compound is dissolved and the water solution thereof added to the water flowing through the recirculating system.

An important object of the invention is to provide a metering device of the foregoing general type wherein the conduit connected to the receptacle extends through the receptacle and is provided with a water inlet and an outlet for excess water externally of the receptacle, wherein the conduit has a discharge port within the receptacle for delivering water into the receptacle to dissolve the chlorine compound therein for discharge through the outlet to the receptacle, and wherein means is provided for varying the elevation of the discharge port within the receptacle throughout a wide range to vary through a corresponding range the rate at which the water in the conduit is discharged through the discharge port into the receptacle, thereby correspondingly varying the rate at which the chlorine compound is dissolved and the water solution thereof is added to the water flowing through the recirculating system.

Still more specifically, another important object is to provide a generally horizontal conduit, extending through the receptacle, which is rotatable about its longitudinal axis to vary the elevation of the discharge port, and thus the rate at which the water in the conduit is discharged through the discharge port into the receptacle.

Still another object is to provide the conduit within the receptacle with a radially enlarged chamber in which the discharge port is formed. With this construction, a given angular displacement of the conduit about its axis results in a large vertical movement of the discharge port to vary throughout a wide range the rate at which water is discharged into the receptacle from the conduit.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art to which the invention relates in the light of this disclosure, may be achieved with the exemplary embodiment of the invention illustrated in the accompanying drawing and described in detail hereinafter.

DESCRIPTION OF DRAWING

In the drawing:

FIG. 1 is a vertical sectional view through a metering device which embodies the invention;

FIG. 2 is a vertical sectional view taken as indicated by the arrowed line 2—2 of FIG. 1;

FIG. 3 is a horizontal sectional view taken as indicated by the arrowed line 3—3 of FIG. 1; and

FIG. 4 is a vertical sectional view duplicating a portion of FIG. 1, but illustrating another position of a metering element of the metering device of the invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT OF INVENTION

In the drawing, the metering device of the invention is designated generally by the numeral **10** and is preferably mounted in a chemical-solution storage tank which is fragmentarily illustrated at **12** and which may, for example, be similar to the storage tank **42** disclosed in the aforementioned co-pending application. As shown and described in that application, the metering device **10** within the storage tank **12** may receive water from the outlet of the recirculating pump incorporated in the water recirculating and filtering system of a swimming pool, and may discharge a solution of a suitable chlorine compound, or other chemical, into the storage tank. The inlet of the recirculating pump may be connected to the storage tank **12** to draw off the chemical solution in the storage tank. For further details, attention is invited to the co-pending application mentioned, the disclosure of which is incorporated herein by reference the same as if it were fully set forth herein.

The metering device **10** includes a receptacle **14** suitably mounted in an upper portion of the storage tank **12** and equipped with a removable cover **16**. The receptacle **14**, which is shown as rectangular in horizontal cross section, is provided therein with a hopper **18** for a supply **20** of a dry chemical, such as any desired dry chlorine compound, to be dissolved in the swimming pool water flowing through the recirculating system of the pool. The hopper **18** is spaced upwardly from the bottom wall **22** of the receptacle **14** so that the dry chlorine compound from the supply **20** will continuously be deposited on the bottom wall **22**. For convenience in cleaning the metering device **10**, the hopper **18** is removable from the receptacle **14**. When the hopper **18** is in its operating position within the receptacle **14**, a downwardly-facing peripheral shoulder **24** thereon is seated on an upwardly-facing peripheral shoulder formed on the receptacle itself.

The receptacle **14** is provided at one side thereof and at the bottom thereof with an outlet **28** for the chlorine compounds solution formed within the metering device **10** in the manner to be described. The outlet **28** communicates with the interior of the storage tank **12**, from which the solution of the chemical compound is drawn into the inlet of the recirculating pump. Preferably, the bottom wall **22** of the receptacle **14** slopes downwardly toward the outlet **28** to insure free drainage of the chlorine compound solution from the receptacle into the storage tank **12**. (It will be understood that if it is desired to add a solution of another dry chemical to the water flowing through the recirculating system of the swimming pool, another metering device **10**, not shown, of the invention may be located within an upper portion of the storage tank **12** and connected to the outlet of the recirculating pump in the same manner as the metering device **10** shown.)

Located within the receptacle **14** just above the bottom wall **22** thereof, and adjacent the higher end of such wall, is a metering means **30** of the invention for admitting water into the bottom of the receptacle at a controlled rate so as to control the rate at which the dry chlorine compound discharged by the hopper **18** is dissolved and the resulting solution thereof discharged through the outlet **28** of the receptacle into the storage tank **12**. Preferably, the metering means **30** is connected to the outlet of the recirculating pump hereinbefore mentioned.

More porticularly, the metering means **30** comprises a generally horizontal conduit **32** rotatable relative to the receptable **14** about its longitudinal axis and having inlet and outlet portion **34** and **36** journalled in suitable bearings **38** and **40** shown as formed integrally with the receptacle. The inlet portion **34** of the conduit **32** provides an inlet **42** for water from the outlet of the recirculating pump of the swimming pool, being connected to the outlet of such pump by a connecting system which includes a conduit **44** and which is fully disclosed in the aforementioned co-pending application. The outlet portion **36** of the conduit **32** provides an outlet **46** through which excess water may flow into the storage tank **12** to be mixed with the chlorine compound solution or other chemical solution therein.

The metering means **30** comprises a cylindrical metering element **48** within the receptacle **14** intermediate and interconnecting the inlet and outlet portions **34** and **36** of the conduit **32**. The metering element **48** provides a radially enlarged metering chamber **50** which interconnects the water inlet **42** and the excess water outlet **46**, the diameter of the metering chamber **50** being significantly greater than the diameter of the water inlet and the diameter of the excess water outlet.

The metering element **48** is provided therein with one or more radial discharge ports **52** communicating with the metering chamber **50** and adapted to discharge water therefrom into the bottom of the receptacle **14** to dissolve the dry chlorine compound from the supply **20** so that the resulting solution thereof may flow into the storage tank **12** through the outlet **28** of the receptacle **14**. The elevation of the discharge port or ports **52** may be varied by rotating the entire conduit **32** about its generally horizonal longitudinal axis to vahy the rate at which water in the metesing chambes **50** is discharged into the receptacle **14** through the discharge posts, thus correspondingly varying the rate at which the dry chlorine compound is dissolved and its solution discharged into the tank **12** through the outlet **28** of the receptacle. The conduit **32** may be rotated in this manner by means of a handle **54** shown as connected to the inlet portion **34** of the conduit. The handle **54** is engageable with stops **56** and **58** corresponding to the uppermost and lowermost positions of the discharge ports **52**, these ports being shown in their uppermost position in FIG. 1 and in an intermediate position in FIG. 4. When the handle **54** engages the stop **58**, the discharge ports **52** may be directed downwardly. Preferably, a swivel fitting **60** interconnects the inlet portion **34** of the conduit **32** and the inlet conduit **44** to permit rotation of the conduit **32** relative to the conduit **44**.

The water level in the metering chamber **50** is preferably maintained intermediate the top and bottom of this chamber, as indicated by the line **62**. To achieve this, a suitable valve **64** is located in the water inlet conduit **44**, this valve being so adjusted as to maintain the desired water level **62**. As shown in FIG. 2, any excess water overflows into the storage tank **12** through the excess water outlet **46**. The valve **64** may be of any suitable type. For example, it may be a bypass valve, as shown in the aforementioned co-pending application, which bypasses water into the storage tank **12** as required to maintain the level **62**.

Considering the operation of the invention, it will be noted that the discharge ports **52** may be positioned various distances below the water level **62** to discharge water into the bottom of the receptacle **14** at corresponding rates, dependent on the heads of water thereabove. Consequently, the dry chlorine compound in the bottom of the receptacle **14** is dissolved at corresponding rates, and water solutions thereof are discharged into the storage tank **12** through the outlet **28** of the receptacle at corresponding rates. If it is desired to shut off the metering means **30** this may be accomplished by positioning the handle against the stop **56** to locate the discharge ports **52** above the water level **62**, as shown in FIGS. 1 to 3 of the drawing.

The rate at which water is discharged into the receptacle **14**, and thus the rate at which the chlorine compound solution is discharged into the storage tank **12**, may be varied through a wide range by varying the elevation of the discharge ports **52**. As will be apparent, the rate at which the chlorine compound solution is discharged into the storage tank **12** will be a minimum when only portions of the discharge ports **52** are below the water level **62**. Conversely, the rate at which the chlorine com-

pound solution is discharged will be a maximum when the discharge ports **52** face downwardly so that the maximum head of water in the metering chamber **50** is available to discharge water therethrough. Numerous chlorine compound solution rates intermediate this minimum and maximum may be achieved by suitably positioning the discharge ports **52** relative to the water level **62**. The metering device **10** of the invention is quite sensitive to changes in the elevation in the discharge ports **52** relative to the water level **62** so that the rate at which the chlorine compound solution is delivered to the storage tank **12** can be controlled quite accurately.

Although an exemplary embodiment of the invention has been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiment without departing from the spirit of the invention as defined by the appended claims.

I claim as my invention:

1. In a metering device for a material soluble in a solvent, the combination of:

(a) a receptable for the soluble material;

(b) said receptable having an outlet for a solution of the soluble material in the solvent;

(c) a conduit for the solvent extending through said receptacle and having an inlet for the solvent and an outlet for excess solvent externally of said receptacle;

(d) said conduit having a discharge port within said receptacle for delivering solvent from said conduit into said receptacle to dissolve the soluble material therein for discharge through said outlet of said receptacle; and

(e) means for varying the elevation of said discharge port within said receptacle to vary the rate at which the solvent is discharged into said receptacle from said conduit through said discharge port.

2. In a metering device for a material soluble in a solvent, the combination of:

(a) a receptacle for the soluble material;

(b) said receptacle having an outlet for a solution of the soluble material in the solvent;

(c) a generally horizontal conduit extending through said receptacle and having an inlet for the solvent and an outlet for excess solvent externally of said receptacle;

(d) said conduit having a discharge port within said receptacle for discharging solvent from said conduit into said receptacle to dissolve the soluble material therein for discharge through said outlet of said receptacle;

(e) means mounting said conduit for rotation relative to said receptacle about a generally horizontal axis extending longitudinally thereof; and

(f) means connected to said conduit for rotating same relative to said receptacle about said axis to vary the elevation of said discharge port and thereby vary the rate at which the solvent in said conduit is discharged through said discharge port into said receptacle.

3. A metering device as defined in claim **2** wherein said conduit is provided within said receptacle and intermediate said inlet and said outlet of said conduit with a radially enlarged chamber in which said discharge port is formed.

4. A metering device according to claim **3** wherein said outlet of said receptacle and said conduit are located adjacent the bottom of said receptacle.

5. A metering device as set forth in claim **4** including a hopper for the soluble material within said receptacle above the bottom thereof.

6. In a metering device for a material soluble in a solvent, the combination of:

(a) a receptacle for the soluble material;

(b) said receptacle having an outlet for a solution of the soluble material in the solvent;

(c) means providing an inlet for the solvent communicating with said receptacle and an outlet for excess solvent communicating with said receptacle;

(d) a metering element mounted in said receptacle for rotation about a generally horizontal axis and provided therein with a metering chamber communicating with said solvent inlet and said excess-solvent outlet;

(e) said metering element being provided with a discharge port oriented radially with respect to said axis and communicating with said metering chamber and the interior of said receptacle; and

(f) means connected to said metering element for rotating same about said axis to vary the elevation of said discharge port and thereby vary the rate at which the solvent in said metering chamber is discharged through said discharge port into said receptacle.

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U.S. Cl. X.R.

222—193; 239—315