May 25, 1954 R. B. ESSELMAN 2,679,260

LIQUID CONTROL

Original Filed March 5, 1951 2 Sheets-Sheet 1

Fig. 1.

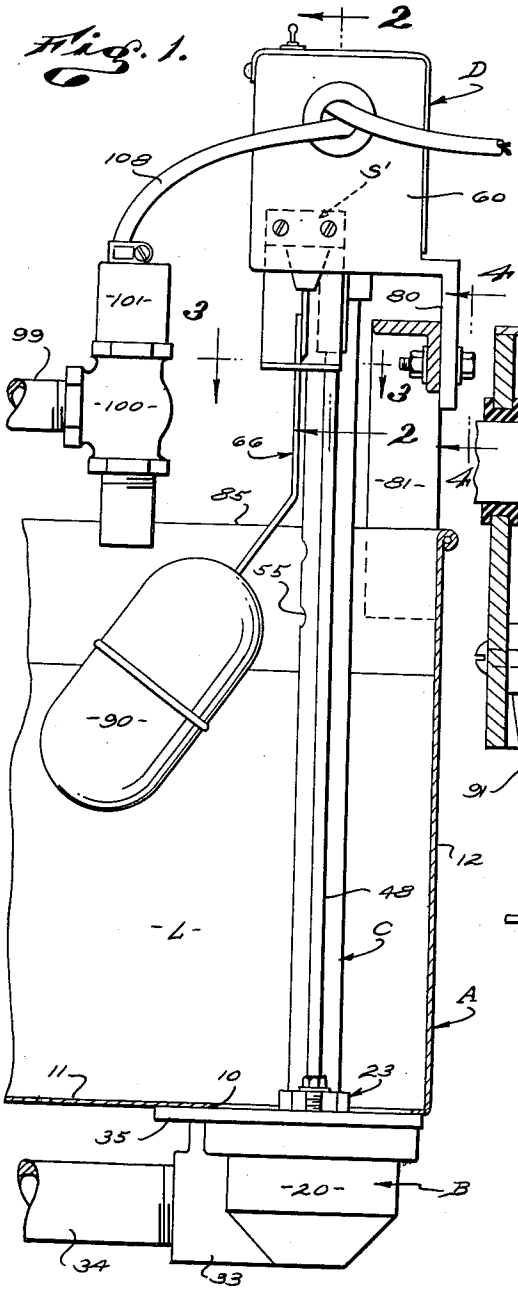


Fig. 2.

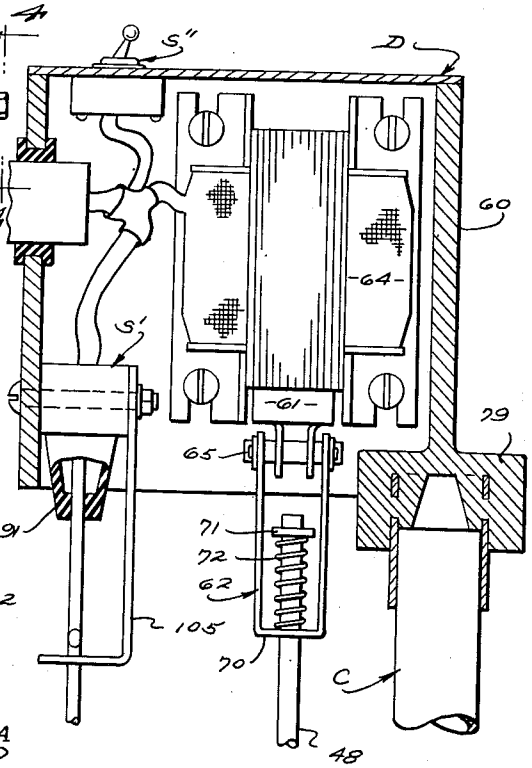


Fig. 4.

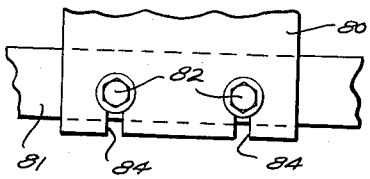
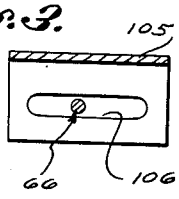


Fig. 3.



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Fig. 5.

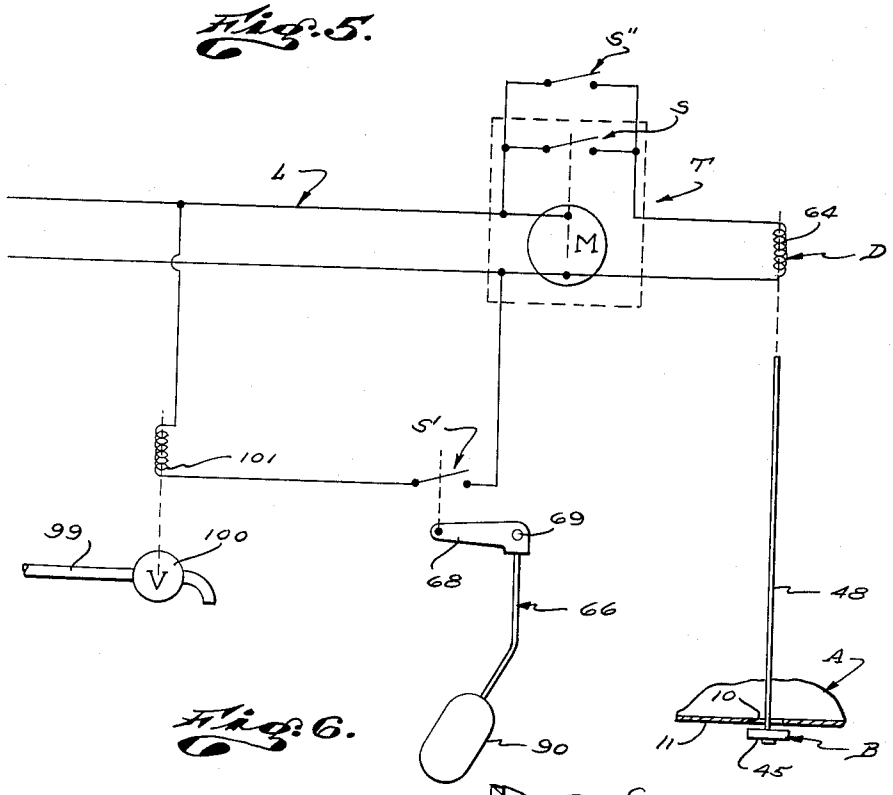
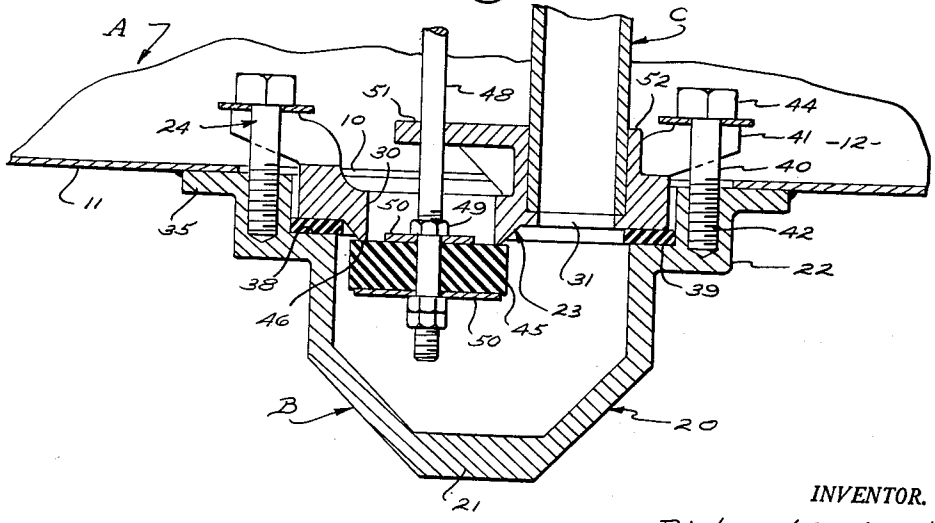


Fig. 6.



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LIQUID CONTROL

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11 Claims. (Cl. 137—412)

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This invention relates to a liquid control suitable for controlling liquid handled by a tank or like container, and it is a general object of the invention to provide a simple, effective, dependable valve operating mechanism forming a unit, with parts of the valve detachable from the container and the remainder of the valve and having electrical operating parts maintained above the level of liquid in the container.

This application is filed as a division of application Serial No. 213,986, filed March 5, 1951, entitled "Control for Liquid Container".

The mechanism as provided by the present invention is applicable to a liquid container and may, for example, be applied to an open topped tank or like vessel. The mechanism of the invention provides an operating mechanism combined with parts of a drain valve adapted to control flow through a drain opening provided in the bottom of the tank. The drain valve involves a bowl-like body fixed to the bottom of the carrier to depend therefrom. A head is engaged with the body and is releasably supported on an upwardly facing shoulder in the rim portion of the body and is sealed therewith by a washer. Two fluid passages are provided through the head, one an outlet passage communicating with the bottom of the tank and the other an overflow opening. The valve proper is a disc-shaped member in the body cooperating with a downwardly facing seat provided on the head and surrounding the outlet opening. A stem carries the valve and is guided by a projection provided on a boss that projects up from the head. A tubular standard projects up from the head and is carried by the boss in communication with the overflow opening of the head. An overflow inlet opening is provided in the standard at a point of maximum liquid level in the tank. Operating means for the stem is provided at the upper end of the standard and involves a housing fixed on the standard and also releasably held by a supplemental support that is located on the tank. A shiftable element is provided in the housing and has a normal up position and an actuated down position. A resilient coupling is provided between the shiftable element and the stem. The coupling involves a stop on the stem, a yoke-type link or bracket slidable on the stem and attached to the shiftable element, and a spring acting under compression between the stop and the link. The shiftable element is a core to be operated by a coil which is under control of a switch operated by a suitable timing device. A manually operable switch is provided for operating the coil independently of the timer. A fluid supply line is provided and is under control of an electrically actuated valve and a float controls the actuator so that when the tank is drained to a predetermined level fluid is supplied to it. The supply valve closes when the liquid reaches the maximum level in the tank.

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It is a general object of this invention to provide a mechanism of the general character referred to, characterized by a unitary assembly of electrical elements normally releasably held in operating position above the tank, so that it is accessible and can be easily and quickly detached for purpose of removal when it is desired to effect replacement, repair, or cleaning.

Another object of the invention is to provide a mechanism of the general character referred to in which there is a simple, practical, improved arrangement and combination of parts including electrical elements operating the inlet and drain valves.

It is another object of the invention to provide a mechanism of the general character referred to having a simple, effective, dependable operating means including a coil actuated core and a coupling connecting the core with the stem of the valve and providing for overtravel of the core after the valve has been closed.

It is a further object of the invention to provide a practical and compact unitary structure including drain valve parts, operating means for the drain valve, and a float control for an actuator operating an inlet valve, which elements form a simple, unitary structure having the electrical elements clear of the liquid being handled.

The various objects and features of my invention will be fully understood from the following detailed description of a typical preferred form and application of the invention, throughout which description reference is made to the accompanying drawings, in which:

Fig. 1 is a sectional view of a portion of a tank showing the mechanism of the invention applied thereto. Fig. 2 is an enlarged sectional view taken substantially as indicated by line 2—2 on Fig. 1. Fig. 3 is an enlarged view taken as indicated by line 3—3 on Fig. 1. Fig. 4 is an enlarged view taken as indicated by line 4—4 on Fig. 1. Fig. 5 is a diagrammatic view illustrating the circuit provided by the invention, and Fig. 6 is an enlarged detailed sectional view taken as indicated by line 6—6 on Fig. 1.

The mechanism of the present invention is adapted to be applied to a suitable liquid carrier

or vessel such as a tank A, and it is such as to control flow of fluid to the tank from a supply line 99 and from the tank through an opening 10 in the bottom 11 thereof. The particular tank illustrated in the drawings is of simple or conventional form and has a side wall 12 projecting up from the edge of the bottom to a point somewhat above the level of liquid L to be normally maintained in the tank.

The mechanism provided by the present invention involves, generally, a drain valve B located at or carried by the bottom of the tank A and serving to control flow or passage of fluid through the opening 10. A standard C is carried by and projects upwardly from the drain valve B and supports an operating means D which is located at the upper end of the standard and at a point above the level of the liquid L.

The drain valve B, as provided by the present invention, involves, generally, a body 20 having a bowl portion 21 and a rim portion 22. The valve B further includes a head 23 carried by the body 20 and releasable means 24 normally securing the head on or in connection with the body. The head of the drain valve is characterized by a drain opening 30 that provides communication between the interior of the tank and the bowl 21 of the head, and by an overflow opening 31 that provides communication between the standard C and the bowl of the body, as hereinafter described. In the particular case illustrated the bowl 21 of the valve body 20 has a lateral outlet extension 33 from which fluid drained from the tank can be discharged or delivered to a drain line 34, as shown in Fig. 1 of the drawings.

In the particular case illustrated the body 20 of the drain valve has a mounting flange 35 at the upper periphery of the rim portion 22 and the flange 35 may be secured to the bottom 11 of the tank, as by welding, or the like. In the particular arrangement illustrated the flange 35 is applied to the bottom or lower side of the bottom 11 and as a result the bowl portion of the body depends below the bottom 11 of the tank. Through this arrangement all of the fluid or liquid carried in the tank can be drained into the body of the valve for discharge therefrom.

The head 23 of the valve is preferably a unit, say, for example, a casting, and it is supported in the rim portion 22 of the body 20. In the preferred arrangement an upwardly facing shoulder 38 is provided in the rim portion of the body and a suitable seal or washer 39 is provided between the peripheral portion of the head 23 and the shoulder 38, as shown in the drawings.

The releasable means 24 connecting the head 23 and body 20 is shown as involving screw fasteners. In the case illustrated there are two screw fasteners at diametrically opposite points and each involves a bolt 40 engaged with a bifurcated lug 41 projecting upwardly and outwardly from the head and is threaded into an opening 42 provided in the rim portion 22 of the body. The bifurcated lugs 41 project up from the head 23 occurring within the rim portion of the body and they project laterally to overlie the portions of the rim in which the openings 42 occur. The bolts 40 are vertically disposed and their heads 44 are at their upper ends so that they are readily accessible from the interior of the tank.

The valve proper, 45, is a disc-like element located in the bowl portion 21 of body 20, and it is normally engaged with a seat 46 projecting downwardly from the head 23 and surrounding the outlet opening 30. The valve 45 which may be of any suitable material that will effectively seal with the seat 46 is carried by a stem 48 and it is preferred that the valve be adjustably secured on the stem. In the case illustrated spaced nuts 49 are threaded on the lower end portion of the stem 48 and washer-like plates 50 are carried on the stem at opposite sides of the valve where they are retained by the nuts.

The stem 48 projects vertically from the valve to a point above the level of liquid L in the tank and its lower end portion is slidably supported by a guide 51 shown projecting from a boss 52 that projects upwardly from the head 23 at the drain opening 31.

The standard C is a tubular support carried by the boss 52 provided on head 23 to be in communication with the overflow opening 31 provided in the head 23. The standard projects upwardly to a point well above the level of liquid L and at the point where it is desired to maintain the level of liquid the standard is provided with an overflow opening 55. In practice a plurality of openings can be provided in the standard at or above this point to assure drainage through the standard rather than overflow of liquid from the tank. The lower end portion of the tubular standard is tight or fixed in the boss 52, and as a result the standard not only forms a support for the operating means D, as will be hereinafter described, but it also forms a drain or overflow duct that prevents flooding of the tank.

The operating means D is shown as involving a housing 60 supported by and fixed on the upper end of the standard C, a vertically shiftable element 61 and a connecting means 62 between the shiftable element 61 and the upper end portion of the valve stem 48.

The housing 60 is shown as including a casting having a boss 79 that holds or tightly receives the upper end of the standard C. The housing has a downwardly projecting skirt 80 that cooperates with a supplemental support 81. The support 81 is in the nature of a bracket fixed to the upper edge portion of the wall 12 of the tank and carries one or more screw fasteners 82 received by downwardly opening notches 84 provided in the skirt 80.

Through the construction provided when the fastening means 24 is released and the fasteners 82 loosened, the unit formed by the valve head 23, the valve 45, stem 48, the standard and the operating means D can be freely lifted away from or clear of the valve body, the tank and the bracket 81 on the tank. It is to be understood that the supplemental support formed by the bracket 81 can be used or not, as circumstances require, since the standard C may be of such construction and formation as to be an adequate support for the means D under most circumstances.

It is to be observed that in accordance with the general construction and arrangement provided by the invention the standard projects not only above the level of liquid in the tank but actually above the upper edge 85 of the tank, and as a result the operating means D is located well above and clear of liquid in the tank so that it is not affected or contaminated thereby.

The operating means D involves a vertically shiftable element 61 and a means for operating the element 61. The element 61 is connected with the stem 48 by the connecting means 62 and is in the form of a core. A coil or winding 64 fixed in the housing 60 surrounds the core and is provided for operating the core. The coil is adapted

to be energized from a power line L under control of a switch S. The coil and core cooperate to form an electrical actuating means for the drain valve.

Switch S, as shown in the diagram, Fig. 5, is incorporated in or as a part of a timer T which includes a constantly operating timer motor M. The coil 64 is connected in parallel with the motor M and the switch S controlling the coil is normally closed so the coil is normally energized and the core 61 held up so the valve operated by stem 48 is normally closed. The motor M is such as to operate or open switch S at suitable or predetermined time intervals and for suitable or predetermined periods of time.

When switch S is opened the core drops and the stem 48 opens the valve. The valve stays open until the switch S is closed by the motor M causing the coil 64 to be energized and the core to be lifted.

A normally open, manually operable switch S'' is connected in parallel with switch S so that if circumstances so require the coil 64 can be energized or held energized independently of the operation of switch S by motor M.

A fluid supply line 99 is provided and is arranged to deliver fluid into tank A, preferably adjacent the control D. An inlet valve 100 controls flow through line 99 and is operated by an electrical actuator 101 under control of a float 90. The circuit to the actuator 101 is carried by a flexible line 108 of suitable length and is controlled by a switch S' operated by the float.

The float 90 is carried by a lever 66 pivotally supported by or in the housing 60 which also carries the coil 64, core 61, switch S' and switch S'', and other electrical elements, as desired. The lever 66 is shown as carried by a pivotal support 69 and as having a projecting arm 68 for operating the switch S'.

The lever 66 depends from the housing 60 into the tank so the float is located in the tank. The parts are related so that the valve 100 is open when the float 90 is down. When liquid in the tank elevates the float to a predetermined level switch S' is closed and actuator 101 is energized so that valve 100 is closed.

The housing 60 is preferably a downwardly opening box-like element or structure and the switch S' and the float carrying lever 66 are preferably mounted in the case so that a protective guard or shield 91 of rubber, or the like, may be arranged to project from the switch and engage around the lever to effectively protect the switch against exposure to moisture.

Further, a guide 105 for lever 66 preferably depends from within the housing to a point where it serves to effectively guide the pivotal movement of the lever 66. The guide 105 is shown depending from the switch S' and as having a slot 106 in which the lever 66 operates.

From the foregoing description it will be apparent that the control means D includes not only the coil and core that operate the valve stem 48, but also the switch controlling the inlet valve and the float mechanism operating that valve. Further, other electrical elements may be carried by the housing as desired. The switch S'' is shown carried by the housing and, if desired, the timer M and switch S may also be carried by the housing.

The connecting means 62 is shown as including a pivotal pin 65 carried by element 61 and pivotally holding a yoke-like bracket 70 which is slidably engaged with stem 48. The bracket

70 engages the stem 48 below a stop 71 provided on the stem and a compression spring 72 is carried on the stem between the stop and the bracket. This construction provides for a cushioning of the action and the element 61 may over-travel or move beyond a position that effects closing of the drain valve. The element 61 is preferably in line with the valve stem. However, through the connecting means 62 a certain amount of movement may occur between the parts so that there is no danger of parts binding or becoming stuck.

It will be apparent that with the mechanism just described the timer M causes the switch S to be opened at predetermined intervals so that the element 61 is operated to open the drain opening 30. When the level of liquid in the tank drops below the predetermined level the switch S' is closed by action of float 90, causing the valve 100 to open and pass fluid into the tank. It will be apparent that with the mechanism that I have provided various actions can be obtained, as circumstances may require.

By providing a drain valve of substantial capacity and by providing a timer causing the drain valve to be held open a predetermined length of time, the inlet valve may operate in conjunction with the drain valve so that the desired draining and flushing action is obtained, and there may be some overlap in the action of the valves so that they are both open for a time.

Having described only a typical preferred form and application of my invention, I do not wish to be limited or restricted to the specific details herein set forth, but wish to reserve to myself any variations or modifications that may appear to those skilled in the art and fall within the scope of the following claims.

Having described my invention, I claim:

1. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening, a supply valve controlling the supply line, and a single control means including a first electrical actuating means adapted to operate the drain valve, a second electrical actuating means adapted to operate the supply valve, a switch controlling said first actuating means, a timer controlling only said switch, a switch controlling said second actuating means, and a float controlling only the last mentioned switch.

2. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening, a supply valve controlling the supply line, and a control including a first electrical actuating means adapted to operate the drain valve, a second electrical actuating means adapted to operate the supply valve, a switch controlling the first mentioned actuating means, a switch controlling the second actuating means, and two switch actuators adapted to operate independently of each other, one a timer controlling the switch for the actuating means of the drain valve, and the other a float controlling the switch for the actuating means of the supply valve.

3. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening and having an operating stem, a supply valve controlling the supply line, and a control means including a first electrical actuating means adapted to operate the drain valve and including a coil actuated core, means yieldingly coupling the core

to the stem, a second electrical actuating means adapted to operate the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means, and a float controlling only the last mentioned switch.

4. In combination with a liquid supply line and a tank having a drain opening, a drain valve adapted to control the opening and including an overflow standard and an operating stem, a supply valve controlling the supply line, and a control including a first electrical actuating means operating the drain valve, a second electrical actuating means operating the supply valve, a switch adapted to control the first actuating means, a timer controlling said switch, a switch adapted to control the second actuating means, and a float controlling the last mentioned switch, the first actuating means, the switches and the float being carried by the standard.

5. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening and including a body fixed to the tank, a head, a standard projecting up from the head, a stem guided by the head, and means releasably coupling the head to the body, a supply valve controlling the supply line, and a control including a first electrical actuating means adapted to operate the stem of the drain valve, a second electrical actuating means adapted to operate the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means, and a float controlling the last mentioned switch, the first actuating means, the switches and the float being carried by the standard.

6. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening and including a body fixed to the tank, a head, a standard projecting up from the head and a stem guided by the head, and means releasably coupling the head to the body, a housing carried by the standard above the tank, a supply valve controlling the supply line, and a control including a first electrical actuating means operating the stem of the drain valve, a second electrical actuating means operating the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means, and a float controlling the last mentioned switch, the first actuating means, the switches and the float being carried by the housing.

7. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening and including a body fixed to the tank, a head, a standard projecting up from the head, a stem guided by the head, and means releasably coupling the head to the body, a housing carried by the standard above the tank, means releasably coupling the housing to the tank, a supply valve controlling the supply line, and a control including a first electrical actuating means operating the stem, a second electrical actuating means operating the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means and a float controlling the last mentioned switch, the first actuating means, the switches and the float being carried by the housing.

8. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening, a supply valve controlling the supply line, and a control including a first electrical actuating means operating the drain valve, a second electrical actuating means operating the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means, and a float means operating the last mentioned switch, the float means including a pivoted lever carrying the float and carrying a switch operating arm and a flexible shield engaging the lever and shielding the last mentioned switch.

9. In combination with a liquid supply line and a tank having a drain opening, a drain valve controlling the opening, a supply valve controlling the supply line, and a control including a first electrical actuating means operating the drain valve, a second electrical actuating means operating the supply valve, a switch controlling the first actuating means, a timer controlling said switch, a switch controlling the second actuating means, and a float means controlling the last mentioned switch, the float means including a pivoted lever carrying the float and carrying a switch operating arm and a guide cooperatively related to the lever.

10. A control for a tank having an outlet opening including, a drain valve having a body carried by the tank and defining a fluid receiving chamber, a head engaged with the body separating the tank and the chamber and having a passage therethrough between the tank and chamber, a valve member controlling flow through said passage, and a stem operating the valve member, a standard carried by the head and projecting upwardly therefrom to the upper portion of the tank, and operating means for the stem carried by the upper end portion of the standard including, a core, a link connecting the core and stem and a coil operating the core.

11. A control for a tank having an outlet opening including, a drain valve having a body carried by the tank and defining a fluid receiving chamber, a head engaged with the body separating the tank and the chamber and having a passage therethrough between the tank and chamber, a valve member controlling flow through said passage, and a stem operating the valve member, a standard carried by the head and projecting upwardly therefrom to the upper portion of the tank, and operating means for the stem carried by the upper end portion of the standard including, a core, a link connecting the core and stem, a coil operating the core, and a switch controlling the coil.

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