Jan. 3, 1956 W. P. HEARN 2,729,227

WATER DISTRIBUTING SYSTEM

Filed April 1, 1954 3 Sheets-Sheet 1

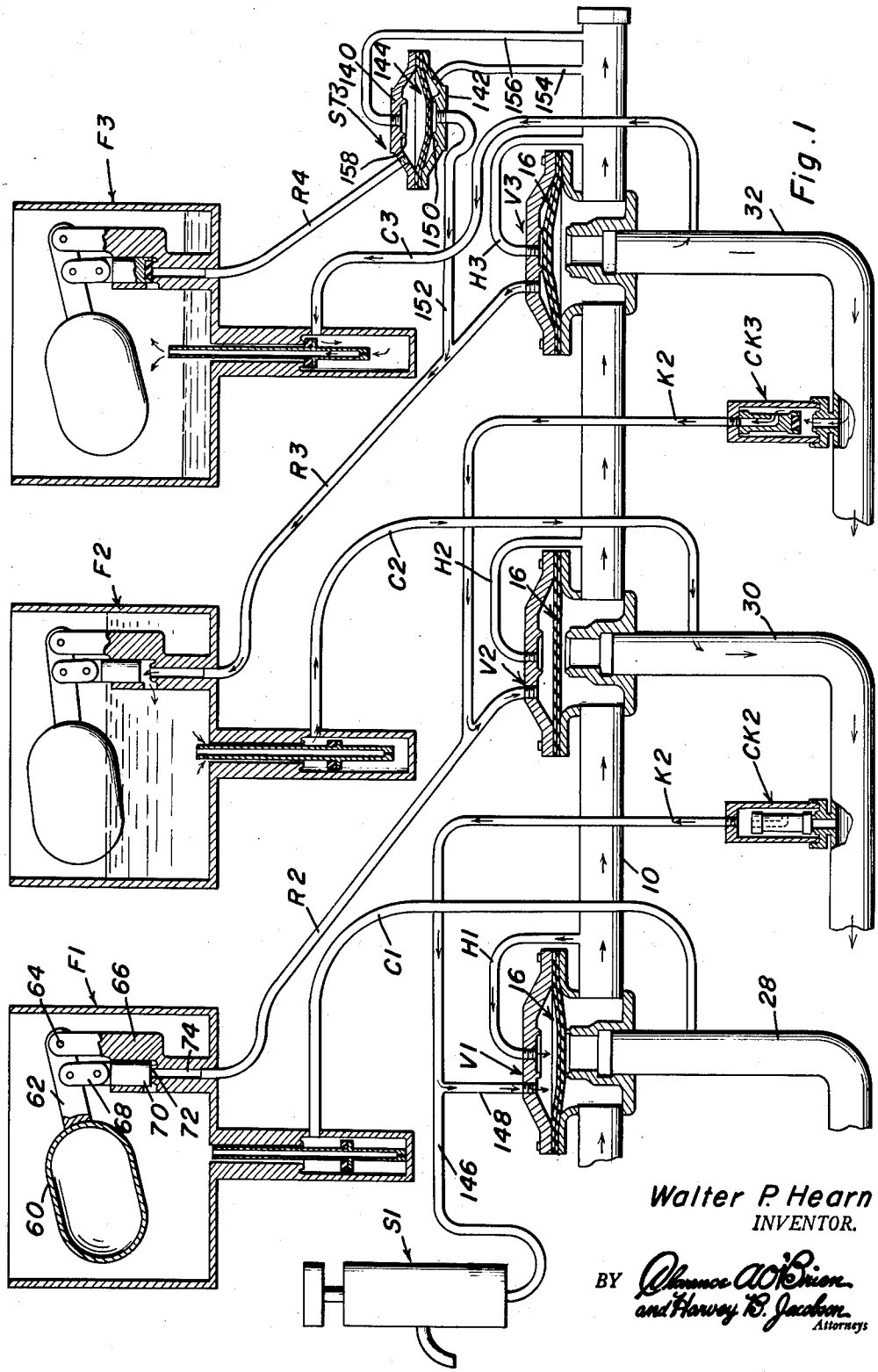

Fig. 1

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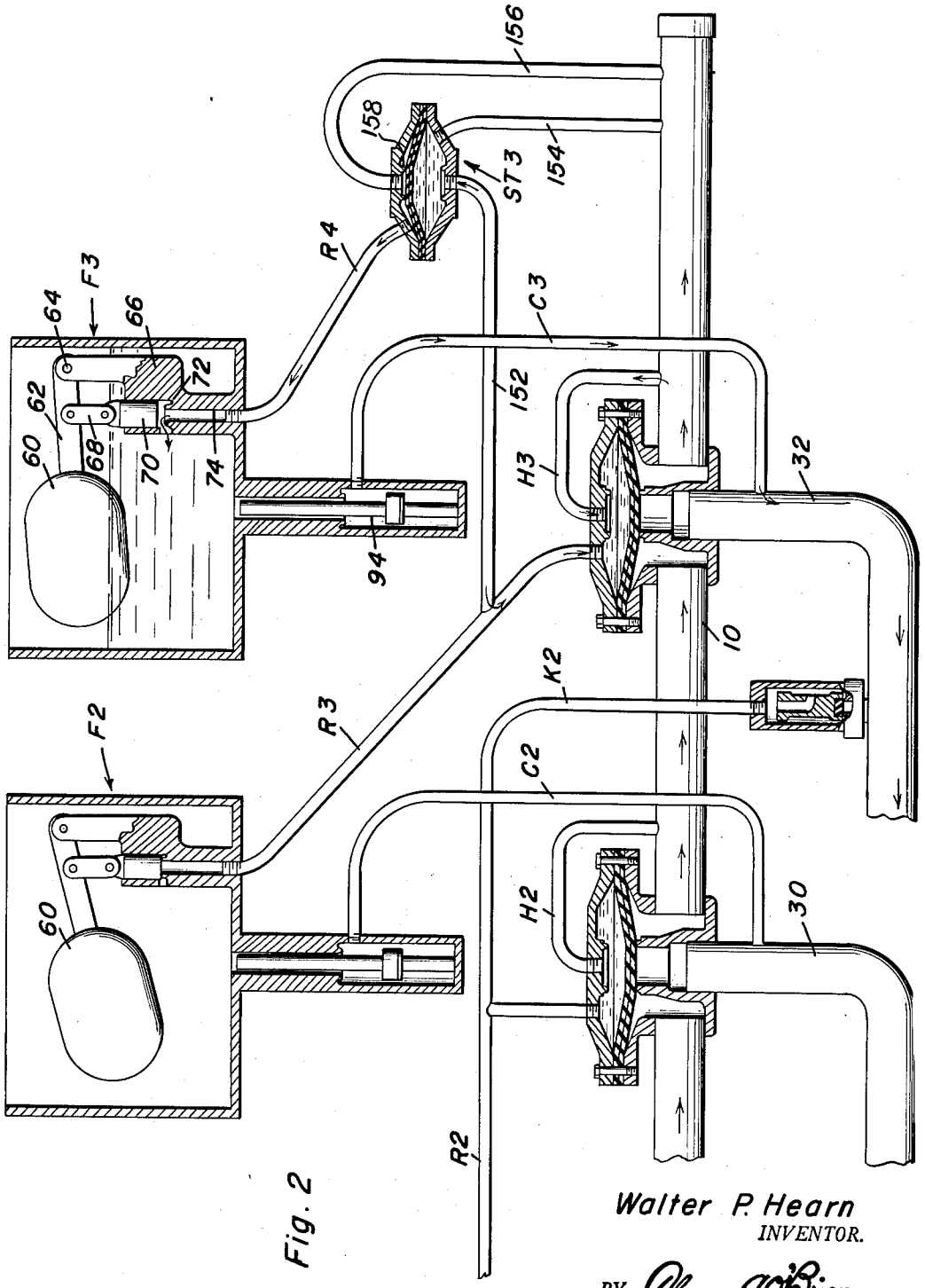

Fig. 2

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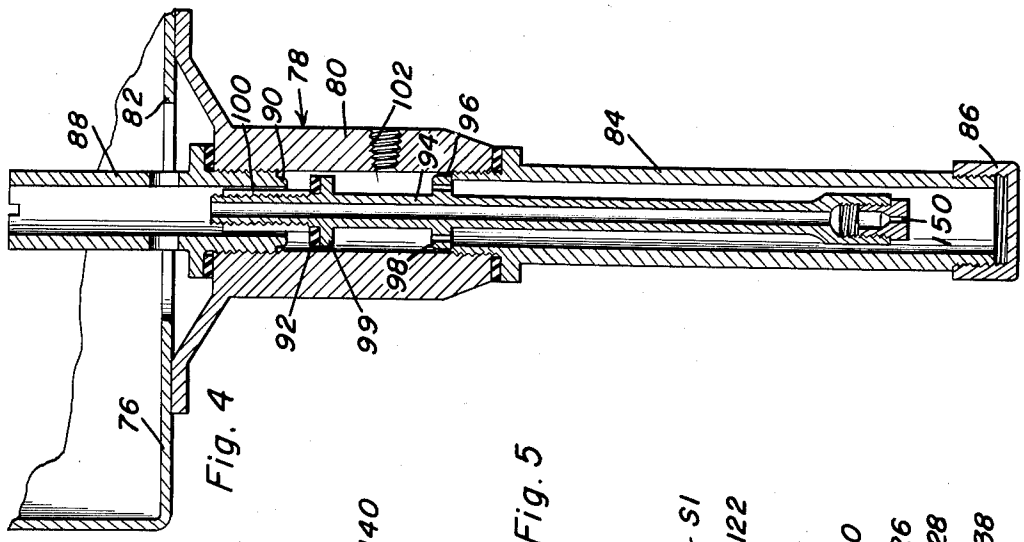

Fig. 4

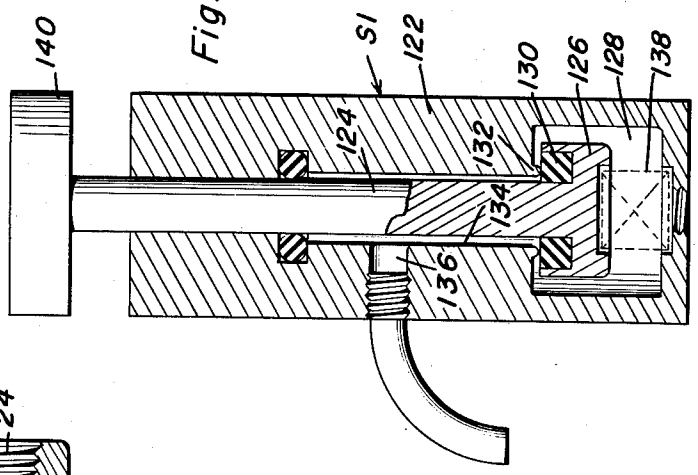

Fig. 5

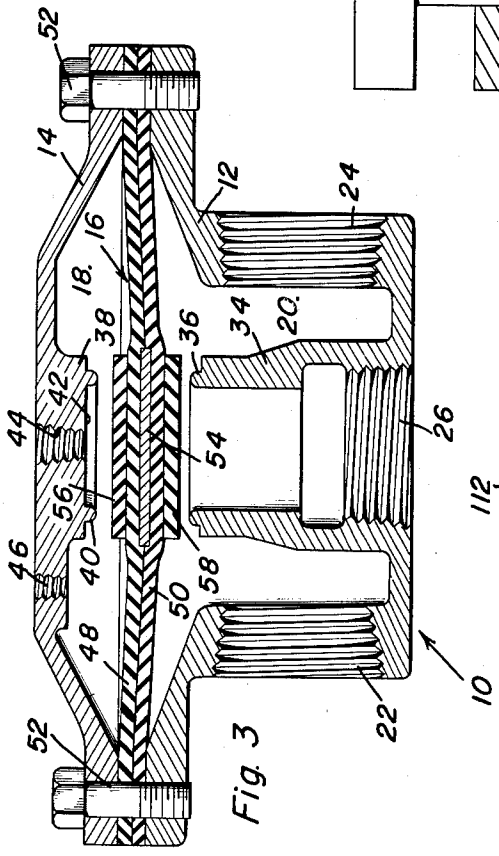

Fig. 3

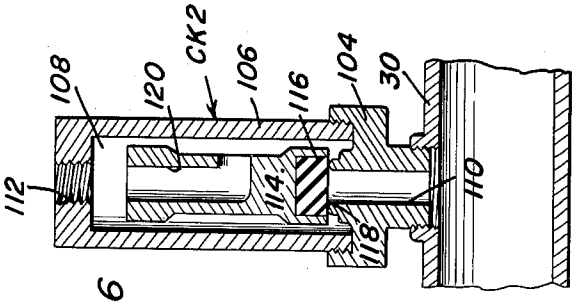

Fig. 6

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United States Patent Office 2,729,227 Patented Jan. 3, 1956

2,729,227

WATER DISTRIBUTING SYSTEM

Walter P. Hearn, Tucson, Ariz.

Application April 1, 1954, Serial No. 420,327

2 Claims. (Cl. 137—122)

This invention relates to fluid control systems and aims primarily to provide a fluid control system especially designed and adapted for structural incorporation in a wide variety of means, mechanisms, apparatus and devices, which, or parts of which, are required to function periodically or be energized, actuated, set in motion or otherwise successively influenced in accordance with a predetermined plan involving the proper timing of the controlling influence, with respect to both the starting time and the duration of functioning of each controlled device, feature or period.

Broadly contemplated, therefore, by the present invention is the provision of a novel and improved fluid control system, embracing fluid pressure supply means and a plurality of control units or devices operable in sequence by the fluid pressure and rendered automatic in the performance of their several actions by the fluid pressure flowing thereinto, and therefrom, to thereby control the discharge or delivery of fluid from said supply means at a plurality of points, places or stations, successively.

With the foregoing in view, the invention essentially resides and is more particularly concerned in the provision of a fluid control system which is in its preferred embodiment characterized by the employment of fluid pressure supply means having a plurality of discharge outlets leading therefrom, wherefrom the fluid is adapted to be discharged or delivered successively; a control unit or device for each of said discharge outlets, all of said units being interconnected for chain operation and each including means for storing energy derived from said fluid pressure and utilizing the same for actuating its succeeding unit, whereby the discharge or delivery of fluid from said discharge outlet is successively controlled or regulated as to time of occurrence and quantity and is dependent upon the flow of fluid from one outlet effecting actuation of the control unit of another outlet; and appliances or means whereby the offices of the above mentioned agencies are adjustably regulated to predeterminately control their respective actions, all of which are to be correlated in the broad aim of enhancing the efficiency of the present novel fluid control system for the various uses and purposes for which it is primarily designed and intended.

Another object of this invention is to provide a control valve mechanism particularly and specifically adapted to practice the above system in the most efficient and economical manner.

This invention is an improvement on my prior patent, No. 1,914,423, patented June 20, 1933.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a diagrammatic sectional view showing a distributing system constructed in accordance with this invention;

Figure 2 is a view similar to Figure 1 on an increased scale, showing the system at the end of its cycle of operations;

Figure 3 is an enlarged sectional view showing one of the improved valve mechanisms;

Figure 4 is an enlarged sectional view showing a preferred embodiment of timing valve mechanism;

Figure 5 is an enlarged sectional view showing details of the starting valve assembly; and

Figure 6 is an enlarged sectional view showing details of one of the control valve members.

Arid regions of the West make it necessary to irrigate gardens and lawns if such are to be enjoyed. This is customarily done either with use of a garden hose or underground pipe protruding at intervals through the surface of the ground and having a spray head attached at each such protrusion, these pipes terminating at one common point that is provided with a manually operated valve to turn the water off and on. Normally, additional manual control valves are provided for controlling flow of water to various series of sprinkling heads. Such systems require the time of an attendant and the consequent expense incurred thereby.

To obviate this disadvantage, a system such as that shown in Figure 1 is employed. This system utilizes a main fluid supply line 10 which is connected with a source of fluid under pressure and within which a series of valve members V–1, V–2 and V–3, are interposed.

Referring now more particularly to Figure 3, it will be seen that each valve member consists of a casing having a lower section 12 and an upper section 14 removably secured thereto, and that a diaphragm 16 is held between the two sections so as to divide the interior of the casing into the upper and lower chambers 18 and 20, respectively. The lower section is provided with a pair of threaded openings 22 and 24 by means of which the valve member is connected into the main supply line 10. The lower section is also provided with a third threaded opening 26 connected to one of the sprinkler lines 28, 30 or 32 (see Figure 1). This opening is formed at the lower end of a valve sleeve 34 projecting into the lower chamber 20 and terminating at its upper end in the annular seat 36 adjacent the diaphragm 16.

The upper valve section 14 is formed with a boss 38 provided with an annular seat 40 in alignment with seat 36 but on the opposite side of the diaphragm 16 therefrom. The seat 40 provides a pocket 42 in boss 38 and a threaded opening 44 communicates with this pocket and is adapted for attachment to a control line, as will be presently apparent. Another threaded opening 46 is adapted to receive another control line which communicates directly with the upper chamber 18.

The diaphragm consists of two disks 48 and 50 of resilient material, such as neoprene, natural rubber or the like, which have their marginal edge portions clamped between the upper and lower valve sections by means of suitable clamping bolts 52. Centrally disposed of and interposed between the disks 48 and 50 is a smaller disk 54 of rigid material, such as metal or hard plastic, this disk serving to impart rigidity to the central portion of the diaphragm so that the resilient valve washers 56 and 58 on opposite sides of the diaphragm will not be distorted and will properly seat against the respective valve seats 40 and 36 to reduce leakage to a minimum and assure long life thereto.

It is to be noted that the valve members thus constructed are not only simple and economical in construction, but are also endowed of long, trouble-free service.

Associated with each one of the valve members is a float tank, such as those indicated by the reference numerals F–1, F–2 and F–3. Each float tank has a float valve member 60 disposed therein which is provided with

an arm 62 pivotally attached as at 64 to a standard 66 within the tank and each arm is provided with a depending link member 68 to which is secured a valve plunger member 70 slidably disposed in a bore in the standard 66 and movable into and out of engagement with a seat 72 for controlling the passage of fluid into the chamber through the bore 74.

Referring now more particularly to Figure 4, it will be seen that the bottom 76 of each tank is provided with a timing valve assembly 78 which incorporates a cylindrical casing 80 attached to the bottom of the tank and communicating therewith through the tank opening 82 as shown. Each casing is provided with a tubular extension 84 closed by a suitable cap member 86 at its lower end and preferably threadedly engaged or otherwise removably secured to the lower end of the casing. The upper end of the casing 80 threadedly receives a valve seat member 88 provided with an annular seat 90 at its lower end which is cooperable with a resilient washer 92 provided on the timing valve member 94. The timing valve is freely movable in the casing 80 and its extension 84 in the manner shown and is provided with an annular flange 96 adapted to rest upon the upper end of the extension 84 and limit the lowermost position of the timing valve. This flange is provided with a series of apertures 98 inasmuch as it is not intended that the seating between the flange 96 and the upper end of the extension 84 function in the manner of a valve. The washer 92 seats on another annular flange 99 and is held in engagement therewith by means of a suitable internally threaded sleeve 100 engaged on the upper end of the timing valve which projects into the valve seat member 88 in the manner shown. The casing 80 is provided with a threaded aperture 102 for connection to one of the various control lines C–1, C–2 and C–3.

All but the very first of the sprinkler or discharge lines 28, 30 and 32 are provided with check valve assemblies, CK–2 and CK–3 which, as will be seen most clearly in Figure 6, incorporate the socket members 104 directly connected to the associate discharge lines and threadedly engaged with the cylinder members 106 forming a chamber 108 communicable through the bore 110 in the sockets with the associated discharge line. The upper end of each cylinder is provided with a threaded bore 112 for connection with one end of the various control lines K–2 and K–3. A check valve 114 is freely movable in each cylinder and is provided in its recessed lower end with a resilient valve member 116 for engaging on the seat 118 of the associated bore 110 and is provided with a generally L-shaped passage 120 which assures positive communication between the discharge line and the associated control line through the aperture 112 when the check valve body is raised from its seat.

Additionally, the system includes a starting valve S–1 and a stopping valve ST–3 associated with the valve members V–1 and V–3, respectively. The starting valve, as seen in Figure 5, incorporates a casing 122 having the valve actuator stem 124 slidably disposed therein which terminates at its lower end in an enlarged head 126 within the enlarged chamber 128 in the casing. The head 126 is recessed to receive an annular washer 130 cooperable with the seat 132 establishing and disestablishing connections between the bore 134 and the chamber 128, the bore being provided with a suitable discharge opening 136. The valve head 126 is normally urged to the closed position shown in Figure 5 by any suitable resilient means, such as the coil spring 138, and the upper end of the plunger is provided with a knob portion 140 which may be actuated either manually or by means of a time clock or the like.

The stopping valve ST–3 is composed of a pair of sections 140 and 142 which are identical in construction to the previously described upper sections 14 of the valves V–1, V–2 and V–3, and the stopping valve also incorporates a diaphragm member 144 identical in construction with the previously described diaphragm 16.

Normally, before the beginning of a cycle of operations, all of the diaphragm members 16 are in contact with their respective seats 36 so as to disconnect the various discharge lines 28, 30 and 32 from the main supply line 10. This position of the diaphragm is maintained by virtue of the connection of each one of the valve members with the main supply line through the holding conduits H–1, H–2 and H–3, these conduits being connected between the main supply line 10 and the threaded openings 44 in the upper section of the valve member. Thus, since the pressure on opposite sides of the diaphragm is the same, and since the effective area of the diaphragm upon which the pressure in the upper section is acting is greater than the area upon which the pressure in the lower section is acting due to the location of the valve seat 36 and the discharge line associated therewith, the diaphragms will be held in engagement with the discharge line seats 36. To start a cycle of operations, the starting valve S–1 is actuated, which bleeds water through the line 146 and connection 148 to the threaded opening 46 in the upper section of valve V–1 and reduces momentarily the pressure in the upper chamber 18 therein permitting the main line pressure in the lower chamber 20 to force the diaphragm against the seat 40 in the valve. Thus, the main line pressure acts on the entire surface area on the lower side of the diaphragm 16 while the same pressure is only acting on a relatively small area as embodied by the area of the pocket 42 on the upper side of the diaphragm. Fluid then flows to the sprinklers connected to the discharge line 28 and, simultaneously, water flows into the float valve chamber through the control line C–1 and through the metering orifice 150 in the lower end of the timing valve 94. That is, when fluid is initially forced through the control line C–1, it will raise the timing valve such that its washer 92 is in engagement with the seat 90 and permits water to enter the float tank only through the metering orifice 150 which, as will be clearly seen in Figure 4, is removably positioned in the timing valve so that various sized metering orifices may be employed to lengthen or shorten the time required to fill the float tank and thus raise the float 60 to disengage the valve body 70 from its seat 72.

When the water has reached this level in the float tank, the pressure in the upper chamber of valve member V–2 will be relieved through the relief line R–2 permitting the diaphragm 16 to unseat from the seat portion of discharge line 30. The water pressure in the discharge line 30 will then raise the check valve body 114 to permit fluid to flow through the line K–2 into the upper section of valve V–1 returning the diaphragm 16 therein to the normal position closing off the discharge line 28. The float tank F–1 will then drain back through the line C–1, the timing valve 94 falling by gravity to its lowermost position, until the float tank is emptied. The process is then repeated in the discharge line 30 until the valve member V–3 is relieved through the relief line R–3. The system is then in the position shown in Figure 1 of the drawings, wherein the discharge line 32 has just been connected with the main pressure line 10 and the float tank F–2 is draining back through the control line C–2.

The position of the diaphragm 144 in the stop valve ST–3 is normally such that the diaphragm is in engagement with the seat 150 which disconnects communication between the line 152 and the main pressure line through the conduit 154 connected to the lower chamber of the valve ST–3. The main line pressure connection 156, of course, normally keeps the diaphragm in this normal position. When the float valve of the last float tank F–3 is open, the stop valve ST–3 is relieved through the pressure relief line R–4 permitting the diaphragm to engage against the seat 158 which, through the line 152 and the relief line R–3, returns the diaphragm 16 in the valve member V–3 to its normal position closing the discharge

line 32. The diaphragm in the stop valve member remains in its upper position until such time as the relief line R–3 is open by means of the float valve in the float chamber F–2, at which time the diaphragm returns to the lowermost or normal position.

It is to be noted that the particular construction of the timing valve mechanism shown in Figure 4 is specifically adapted and designed to maintain the lower end of this valve immersed in water even though the float tank is completely dried out by evaporation. That is, the depth of the extension **84** is such as to hold a reservoir of water which will last indefinitely to maintain the metering orifice **150** submerged in water. This is particularly important in western regions of the United States wherein the water has a high alkali content. With such water, if the water is allowed to evaporate and dry in the region of the orifice, alkali deposits would very rapidly close the orifice and render the system inoperative.

What is claimed as new is as follows:

1. In an automatically operating fluid distributing system, a fluid pressure supply line, a plurality of sequentially operated valve assemblies connected in series in communication with said line, each of said valve assemblies having an outlet conduit connected thereto, a pressure responsive movable wall member disposed in each of said valve assemblies dividing the interior thereof into separate first and second fluid chambers, said supply line and fluid outlet communicating with the first of said chambers, said fluid outlet terminating in a valve seat in said first chamber and engageable with said pressure responsive movable wall, a fluid control line and said fluid line being in communication with the second of said chambers, a valve seat contained in said second fluid supply line, said valve seat being engageable by said pressure responsive movable wall including an effective area normally urging it toward a position for closing off communication between the supply line and outlet conduit in said first chamber, a fluid flow responsive flow timing control valve associated with each of said valve assemblies, a fluid line communicating each of said outlet conduits with a respective flow timing valve for actuating the latter, a starting valve in communication with the second chamber of the first in said series of valve assemblies for reducing pressure in said second chamber permitting said pressure responsive movable wall to close off communication of said supply line with said second chamber, each of the remaining valve assemblies in series having a control line in communication with their second chamber and in communication with the flow timing valve associated with the previously operated valve assembly, check valve control means in communication with the outlet conduits of the remaining valve assembly and in communication with the second chamber of a preceding valve assembly, and a fluid pressure responsive valve at the end of said fluid supply line for returning the pressure responsive movable wall of the last valve assembly in series into contact with the valve seat of the fluid outlet.

2. In an automatically operating fluid system set forth in claim 1 wherein said fluid flow responsive flow timing valve means includes a fluid reservoir, a flow control valve in said fluid reservoir in communication with the control line of a valve assembly to be subsequently operated, and a bleed valve including interchangeable orifices therein for timing the interval of fluid flow to said fluid reservoir.

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