Sept. 2, 1947. W. H. FREYGANG 2,426,603

LAWN SPRINKLER

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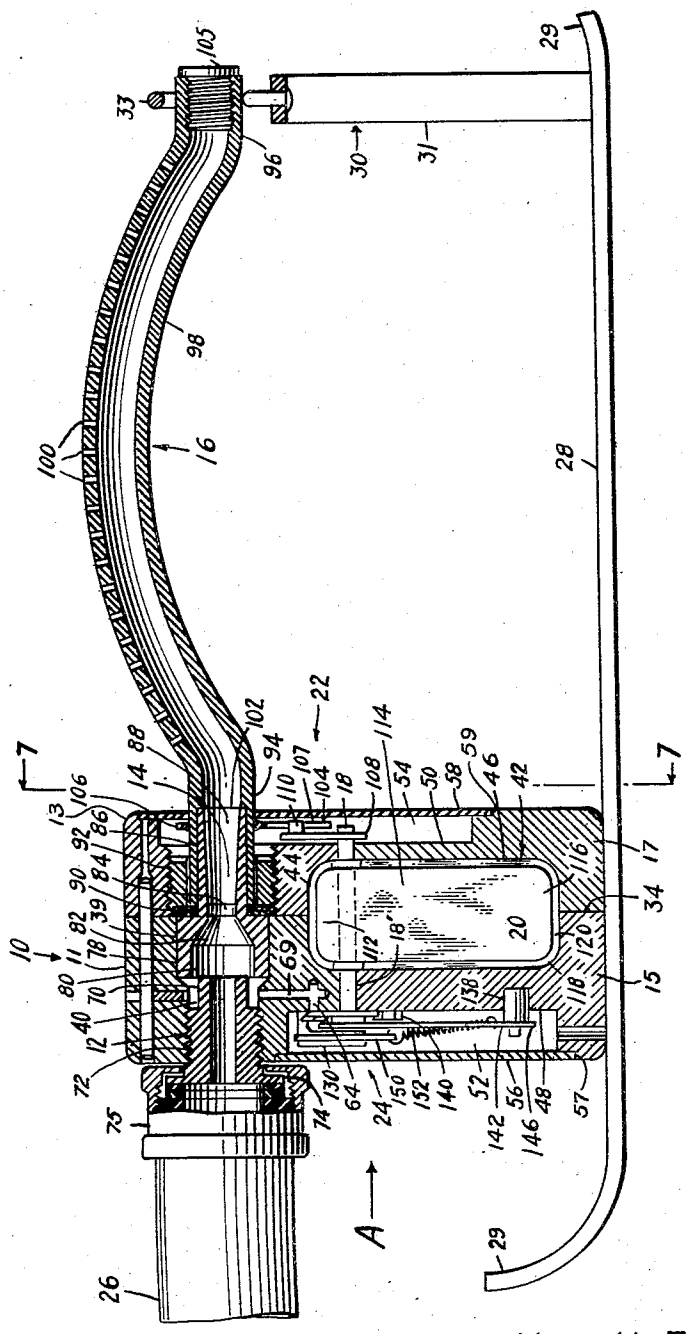


Fig. 1

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Fig. 2

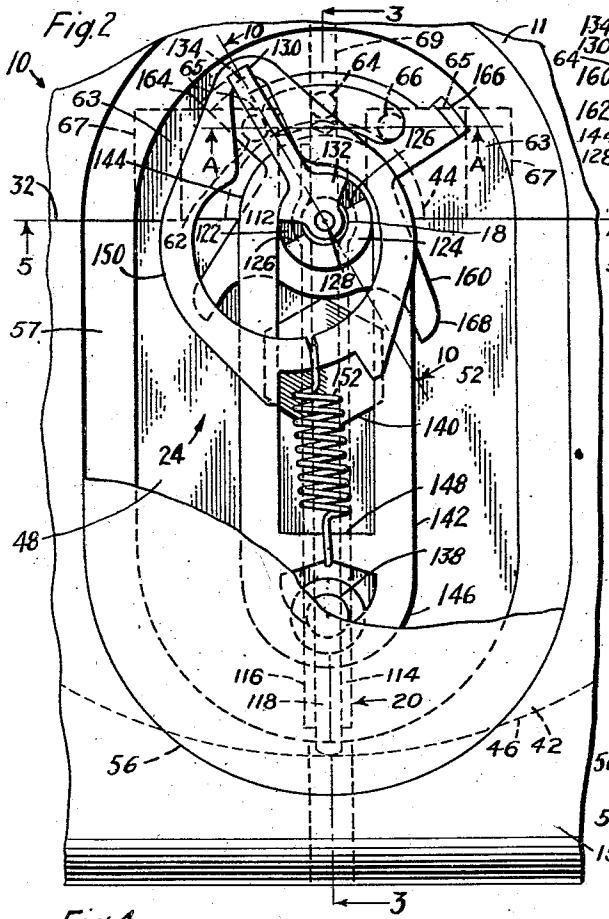


Fig. 3.

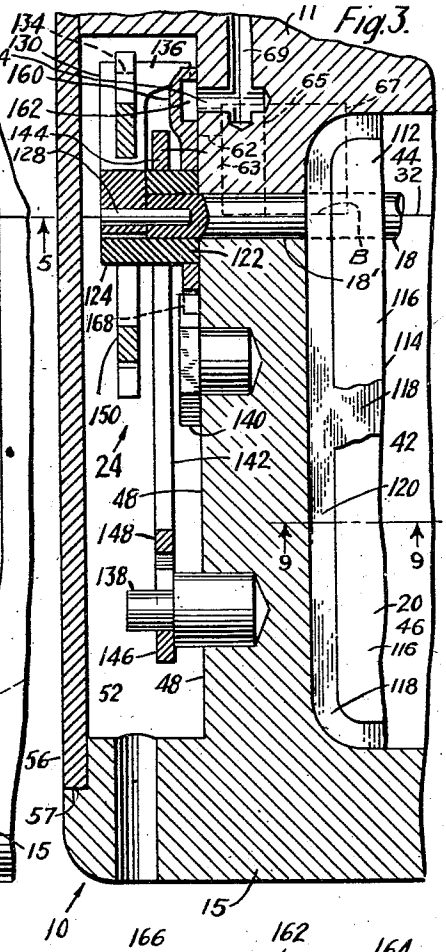


Fig. 4.

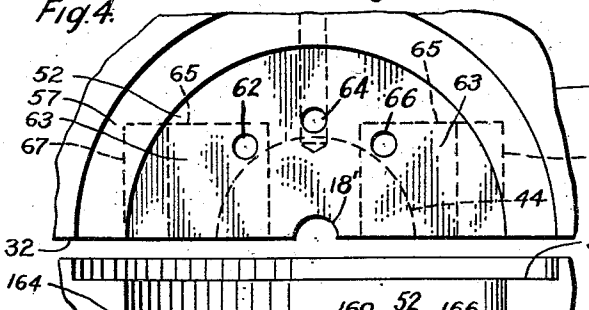


Fig. 5.

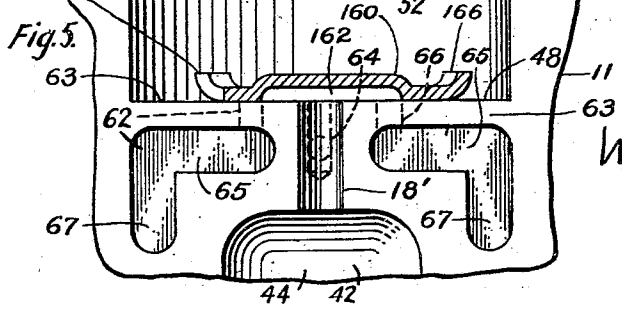
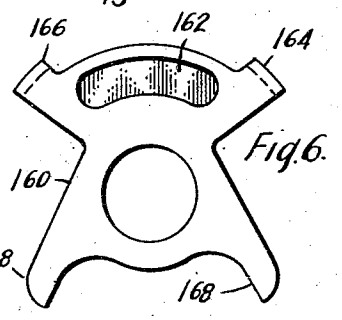


Fig. 6.



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Fig. 7.

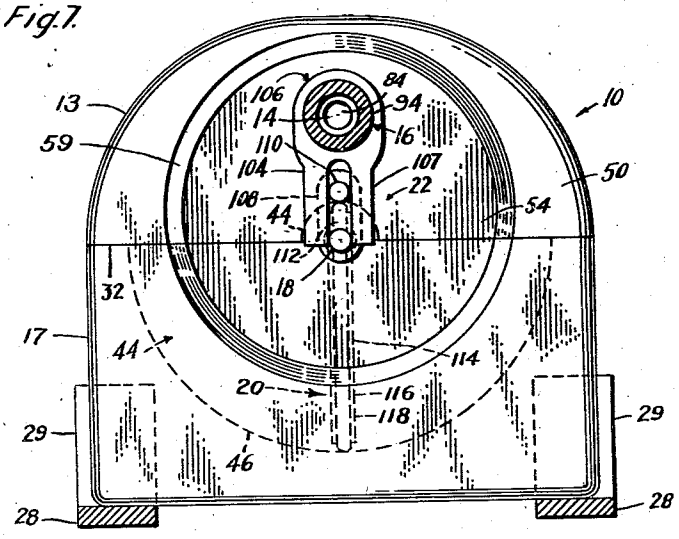



Fig. 10.

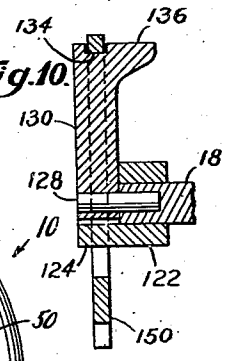



Fig. 8.

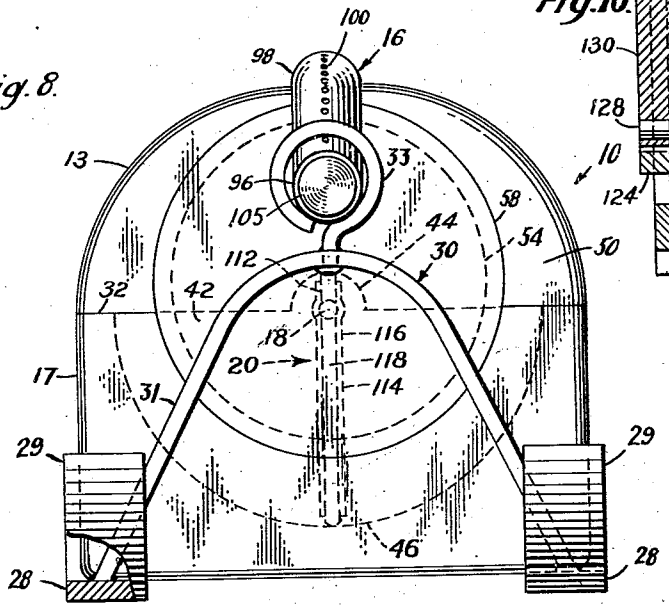
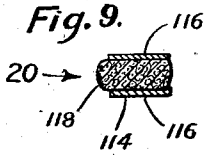



Fig. 9.




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# UNITED STATES PATENT OFFICE

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## LAWN SPRINKLER

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Application December 7, 1944, Serial No. 567,017

4 Claims. (Cl. 299—64)

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This invention relates to sprinklers or similarly acting means for expelling liquid, and particularly to devices of such character employing movable distributors.

More specifically, the invention comprises a device of the above indicated character in which a distributor or dispensing element has oscillating or reverse stroke movement.

Among the objects of the invention is to provide means whereby the liquid to be distributed is adapted to create air or other gas pressure for operating the movable distributor.

Another object is to provide a device of the above indicated character which so employs the gas or air as to avoid difficulties such as corrosion or other chemical action or fouling, attending the former use of liquid pressure for operating a movable distributor.

Another object is to provide a more uniformly acting and dependable distributor for ensuring continuous even distribution of the liquid, and to avoid stoppage or intermittent action of the distributor whereby to prevent undue concentration of the liquid in any of the directions in which it is to be distributed.

Another object is to provide a device of the above indicated character that is simple and durable in construction, economical to manufacture, and effective in its operation.

Other and further objects of the invention will be obvious upon an understanding of the illustrative embodiment about to be described, or will be indicated in the appended claims, and various advantages not referred to herein will occur to one skilled in the art upon employment of the invention in practice.

A preferred embodiment of the invention has been chosen for purposes of illustration and description and is shown in the accompanying drawings, forming a part of the specification, wherein:

Figure 1 is a side view, partially in elevation and partially in section, of a sprinkler device constructed in accordance with one form of the invention.

Figure 2 is an enlarged fragmentary view, taken in the direction of an arrow A, showing a valve and control mechanism employed in the device.

Figure 3 is a view taken substantially along the line 3—3 of Figure 2.

Figure 4 is a view of a portion of the structure as seen above the line 5—5 of Figure 2, but with parts removed.

Figure 5 is a bottom plan view of the structure of Figure 4, taken on the line 5—5 of Figure 2;

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Figure 5 also being a view of the lower side of the upper left-hand part of the casing 10, as seen in Figures 1 and 3. Figure 5 also has superposed thereon a section taken along the line A—A of Figure 2, showing a valve member.

Figure 6 is a detail rear view of a valve member shown in front elevation near the top of Figure 2.

Figure 7 is a view, taken substantially along the line 7—7 of Figure 1, with the cover 58 removed.

Figure 8 is an end elevation, taken from the right of Figure 1.

Figure 9 is a fragmentary sectional view, taken substantially along the line 9—9 of Figure 3, of a vane structure embodied in the invention.

Figure 10 is a fragmentary sectional view, taken substantially along the line 10—10 of Figure 2, of an arm and ring structure included in the device.

Referring to the drawings, and particularly to Figure 1, the device shown comprises, in general, a casing 10, an injector 12, a Venturi tube 14, a distributor or dispensing element 16, a shaft 18, an air operated motor or vane 20, slip motion means 22 connecting the shaft 18 to the distributor 16, a valve mechanism 24 associated with the shaft 18, a supply conduit or hose 26, base elements or runners 28 on which the casing 10 rests, and supporting means 30 on the elements 28 for the distributor 16. The shaft 18 extends through a hole 18' in a side wall 48 of the casing 10.

The base elements 28, see also Figure 8, disposed in parallel laterally spaced relation to each other, are of flat strap formation having upwardly rounded ends 29 adapting the elements as runners whereby the device may be dragged from one location to another, as by pulling on the hose 26.

The supporting means 30 comprises a strap-like lower member 31 of inverted substantially U-shape secured, at its lower ends, as by welding to the runners 28, and supports an eyelet 33, secured thereto as by welding and operating as a loose fit bearing, holding means or support around a portion of the distributor 16.

The casing 10, which in this instance is constructed of die-cast metal, but which may be composed of other materials, is shown as comprising four main body parts 11, 13, 15 and 17, respectively, which are separated along and defined by horizontal and vertical lines 32 and 34, respectively, see also Figures 7 and 8, which are connected, as by dowel pins and screws, to render the body a tightly assembled unit facilitating its manufacture and assembly and the mounting of the other elements therein. One longitudinal

half of the hole 18' is in the body part 11, and the other half in the body part 15.

The casing body unit, in the position shown, is provided with an upper horizontal through bore 39, enclosing the injector 12, the Venturi tube 14 and other parts to be described, and forming a compartment 40 around the injector 12 communicating with the Venturi tube 14.

A chamber 42, formed by the casing body unit for enclosing the vane 20, has semi-cylindrical upper and lower portions 44 and 46 of small and large radius, respectively, about the axis of the shaft 18 in parallel offset relation to the axis of the bore 39, and defined axially of the shaft by the side wall 48 and a side wall 50 of the casing 10 having outer side recesses 52 and 54, respectively, which are provided with covers 56 and 58, removably secured in rabbets 57 and 59, respectively, as by screws, extending into the casing body.

A series of three ducts 62, 64 and 66, see Figures 2, 3, 4 and 5, is provided in the side wall 48, in which the outer ends of the ducts are equally spaced from each other on an arc about the axis of the shaft 18, and the central duct 64 of which is on a vertical line through the axis of the bore 39 and the shaft 18. The central duct 64 communicates with the compartment 40 at the injector 12, and the ducts 62 and 66 communicate with the chamber 42 at opposite sides of the vane 20 near the ends of the strokes of the vane.

Each of the ducts 62 and 66 extends from its entrance in the recess 52, through a partition 63 into a recess of substantially L-shape formed by channels 65 and 67, the channels 67 of which extend to the plane of the line 32 over the chamber portion 46 at opposite sides of the chamber portion 44. The lower end of each of the channels 67, as viewed in Figure 5, forms a passage B into the vane chamber 46, as indicated in Figure 3. The duct 64 enters the body part 11 from the recess 52, between the channels 65, and communicates with a branch duct 69, which extends to, and completes the communication of the duct 64 with, the compartment 40.

The injector 12 Figure 1, has an inner jet end 70 in the compartment 40 of the bore 39, and a screw threaded body portion 72 which engages a threaded portion of the bore 39, to position and hold the injector in the casing. An outer end flange 74 on the injector body portion 72 constitutes an element of a coupling 75 for attachment to the supply conduit 26.

The Venturi tube 14 has an enlarged inner end head 78 providing an inner recess 80 of larger diameter than the outer diameter of the jet 70 close to the jet, and constituting an inlet for liquid from the jet and for air from the duct 64. The recess 80 communicates with a conical recess 82 converging from the recess 80 to a constricted passage 84 from which an outlet end length 86 of the tube extends, in this instance, through the outlet end of the bore 39, and from the casing 10. The length 86 is provided with a conduit opening 88 divergingly tapering from the constricted passage 84 to the outer end of the tube, and constitutes a journal on which the distributor 16 is mounted for reciprocable rotatable, or oscillating movements about the axis of the Venturi tube. A gasket 90 is held against the head 78 about the tube 14 by a nut 92 having screw threaded cooperation with the casing 10 in the bore 39 and being loosely disposed about the distributor 16 to provide for the rotation thereof.



The distributor 16, in this instance, is a pipe, or length of standard tubing, having alined inner and outer end sections 94 and 96, respectively, and a main intermediate body or length 98 arched or bowed along a gradual arc or curve, and provided with one or more sets or series of apertures 100 which extend radially or otherwise through the side wall of the pipe, as at the greater arc side of the arch. The inner end section 94, in this instance, is reamed to accurately rotatively fit the Venturi tube 14, and to provide an annular shoulder 102 abutting the outer end of the tube. The outer end section 96 is tapped to receive an end closure or screw 105.

A sheet-like arm 104, Figures 1 and 7, has an apertured end 106 secured to the distributor pipe about the latter, and a longitudinally forked or slotted portion 107 extending radially from the pipe in the recess 54 between the casing side wall 50 and the cover 58. The shaft 18 carries a fixed radial arm 108 in the recess 54 from which arm a pin or roller 110 extends into the slot of the arm 104, forming with the latter a slip connection whereby oscillating movement of the shaft 18 is translated into similar movement of the distributor 16.

The vane 20, fixed to the shaft 18, has a short upper paddle section 112 in the chamber portion 44 of small radius and a long lever or main paddle section 114 in the chamber portion 46 of large radius, and is provided with rigid side plates 116 between which a body or bodies 118 of yieldable material, such as leather, provides a wiping and sealing margin 120 entirely around the perimeter of the vane against adjacent inner surfaces of the chamber 42.

The shaft 18, at its end in the recess 52, has fixed thereto a sleeve 122 having an outer end length cylindrical half portion 124 providing axial surfaces or shoulders 126. A stub shaft or pinion 128 projects from the end of and is coaxial with the shaft 18 for movement therewith and relative thereto. A radial arm 130, fixed to the shaft 128, has side shoulders 132, and a slot 134 at its outer end, and an outer end portion 136 extending axially of the shaft toward the side wall 48. The shoulders 132 are disposed peripherally about the axis of the shaft 18 and the pinion 128 to be engaged by the shoulders 126 on the sleeve 122. A pin 138 protrudes from the side wall 48 on the vertical line through the center duct 64 and the shaft 18, and a stop 140 also protrudes from this wall at a location between the shaft 18 and the pin 138.

A flat sheet frame-like member 142 has a rounded upper end 144 slip fitting the sleeve 122, a lower rounded end 146 disposed around the pin 138, and a cross portion 148 near the end 146.

A flat sheet element 150 of ring-like shape is linked about the outer end of the arm 130, in the slot 134 thereof, and about the sleeve 122, and is connected by a spring 152 to the cross portion 148 of the member 142.

A flat disc-like valve body 160 is rotatively slip fitted on, and about, the sleeve 122, between the frame 142 and the side wall 48 in close sliding side face engagement with the wall 48, and has a closed end arcuate recess or channel 162 centered on an arc through the axis of the ducts 62, 64 and 66. The channel 162 is of such arcuate length that, when the valve body 160 is oscillated about the axis of the shaft 18, it alternately effects communication between the center duct 64 and the side ducts 62 and 66 respectively.

The valve body 160 has upper radially and axially projecting portions 164 and 166 spaced from each other peripherally of the body for alternate engagement with the portion 136 of the arm 130, and lower radially projecting portions 168 for alternately engaging the stop 140.

In operation, when liquid, such as water under pressure, is supplied from the conduit 26, and passes through the injector 12, and through the Venturi tube 14 to the distributor 16, a vacuum or suction effect is created by the water in the compartment 40.

At the beginning of the action, the vane 20 will be at one side or the other of the center of its stroke, as determined by the position of the valve body 160 which cannot connect the center duct 64 to both side ducts 62 and 66 at the same time and which therefore must be in a position to locate the vane 20 at one side of the center of its stroke as above stated.

With the suction started, the vane 20 will first move to the other side of the center of the stroke. When the vane 20 so moves, it turns the shaft 18 with it, which transmits the motion through the arm 106, the pin 110 and the arm 104 to the distributor 16.

Simultaneously, or during such movement, the shaft 18 carries the sleeve 122, one of the shoulders or surfaces 126 of which engages one of the shoulders 132 on the arm 130, to turn the latter with the shaft. During this movement, the valve body 160 is stationary to continue to connect the center duct 64 to the side duct 62 or 66 which effects the shaft movement.

When the arm 130 is moved only slightly beyond the center of its stroke, the spring 152 moves the arm with a snap action through the remainder of its stroke in advance of the movement of the shaft 18 relative to the latter, so that the portion 136 engages one of the projecting portions 164 or 166 on the valve body 160 to reverse the position of the body and its channel 162. This action sets up the suction line represented by the duct 64 and either of the ducts 62 or 66 for effecting the reverse movement of the vane 20 and does this before the latter has reached the end of its previous stroke which, by reason of the inertia of the vane will be completed by the time the suction is effective in the opposite direction. The above described sequence of operation will then be repeated alternately in opposite directions so long as the water is supplied. When the suction is occurring through either of the ducts 62 or 66, the other of these ducts is open to the atmosphere, whereby the suction is effective to cause movement of the vane 20.

From the foregoing description it will be apparent that a device of the character set forth has been provided in which the motor or means for moving the distributor is maintained free from the water or other liquid being distributed; that such motor is therefore not subject to clogging or other fouling or effects from the liquid; that the action of the device is more reliable; that the life of the device has been extended; that the results sought by the distribution are attained more effectively; and that further advantages of manufacture, cost, assembly, operation and other factors have been provided.

As various changes may be made in the form, construction and arrangement of the parts herein, without departing from the spirit and scope of the invention and without sacrificing any of its advantages, it is to be understood that all matter herein is to be interpreted as illustrative and not in any limiting sense.



It is also to be understood that the following claims are intended to cover all the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim:

1. In combination, a casing including a portion having a bore for conducting a liquid and a portion forming an air chamber, an injector jet for the liquid in a compartment of the bore, a Venturi tube in the bore for receiving liquid from the jet and air from the compartment, a liquid dispensing pipe reversibly rotatable about its longitudinal axis and adapted to receive liquid from said tube, a reversible stroke air operated device in said chamber, means for transmitting the motion of said device to said pipe, said casing having a main duct communicating with said compartment and branch ducts communicating with said chamber, and valve means for connecting said main duct alternately to said branch ducts.

2. In combination, a casing including a through bore for conducting a liquid and an air chamber, said casing having side walls adjacent to the bore inlet and outlet, respectively, an injector jet for the liquid in a compartment of the bore next to said inlet, a Venturi tube in the bore for receiving liquid from the jet and air from the compartment, a liquid receiving pipe connected to said tube and journaled in the casing adjacent to said outlet and including a portion exteriorly of the casing having liquid dispensing apertures, a shaft journaled in the casing, a reversible stroke air operated vane fixed to said shaft in said chamber, means for transmitting to the pipe the motion of the shaft derived from the vane, said inlet end side wall having a center duct connecting with said compartment and ducts at opposite sides of said center duct communicating with the chamber near the ends of the strokes of the vane, respectively, a valve body movable for connecting said center duct alternately to said side ducts, said body being movable by said shaft to a center position, and means for reversibly operating said body in advance of the shaft from said position.

3. In combination, a casing including a liquid conducting through bore and an air chamber having side walls adjacent to the bore inlet and outlet respectively, an injector jet for the liquid in a compartment of the bore next to said inlet, a Venturi tube in the bore for receiving liquid from the jet, a liquid receiving pipe journaled on the tube including a portion outside the casing at the outlet end of the bore and having liquid dispensing apertures, a shaft journaled in said side walls offset from said bore, a reversible stroke air operated vane on said shaft in said chamber, means for transmitting rotative movement of the vane and the shaft to the pipe, said inlet end side wall having a center duct communicating with said compartment and ducts at opposite sides of said center duct communicating with the chamber near the ends of the strokes of said vane, respectively, a valve body over said ducts movable for connecting said center duct alternately to said side ducts, said body being movable by said shaft to a center position, and means including spring means for reversibly operating said body in advance of the shaft from said position.

4. In combination, a casing including a liquid conducting through bore and an air chamber about an axis in parallel offset relation to the bore axis having side walls adjacent to the bore inlet and outlet, respectively, an injector jet for the liquid in a compartment of the bore having an outer end conduit coupling portion, a Venturi tube in the bore for receiving the liquid from the jet and extending from said compartment toward the outer end of the bore, a liquid receiving pipe journaled on the tube and including an arched portion outside the casing having liquid dispensing side apertures and a closed outer end, a shaft journaled in said side walls on said offset axis, a reversible stroke air operated vane fixed to, and extending radially from, said shaft, slip motion means for transmitting rotative movement from the shaft to the pipe, said inlet end side wall having a center duct communicating with said compartment and air ducts at opposite sides of said center duct communicating with said chamber at positions near the ends of the strokes of said vane, respectively, a valve body



over said ducts pivotally movable about the shaft axis relative thereto and adapted to connect said center duct alternately to said side ducts, said shaft having means for moving and releasing said valve body, and means including spring means for reversibly operating said body in advance of the shaft from a center position to which the body is moved by the shaft.

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