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Hechler, IV.

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[54] **ANTI-BACK-SIPHONING WATER SUPPLY VALVE AND MIXER**

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Related U.S. Application Data

[62] Division of Ser. No. 333,309, Feb. 16, 1973, abandoned.

[52] **U.S. Cl.** **137/218**

[51] **Int. Cl.**..... **F16k 45/00**, F04f 7/02, G05d 11/02

[58] **Field of Search** 137/217, 218; 239/310, 239/318, 414

[56] **References Cited**

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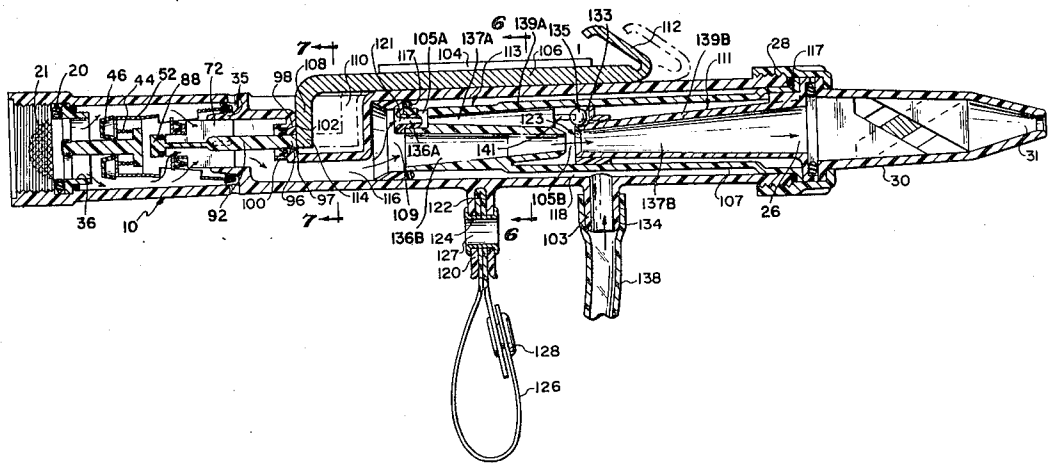
Primary Examiner—Henry T. Klinksiek

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[57] **ABSTRACT**

A low cost portable mixer-dispenser device connectable to a garden hose and supplied with potable water from a municipal water dispensing system in which a non-contamination safety back flow check valve located at the inlet of a water chamber along with a vent valve therebeyond coacts therewith to vent the chamber to atmosphere at a point upstream of a solution mixing chamber. A manual dispensing valve is located at the outlet of the water chamber and the closure and venting of the water chamber occurs when the pressure on the municipal water supply drops to a predetermined low gauge pressure below which maximum degradation of the dilution ratio of the solution is not tolerable for an aspirating jet pump that is located between the manual valve and a dispensing nozzle, thereby serving a dual function of protecting the supply system against contamination and preventing operation if water pressure becomes inadequate to maintain in a proper mixture ratio.

18 Claims, 8 Drawing Figures



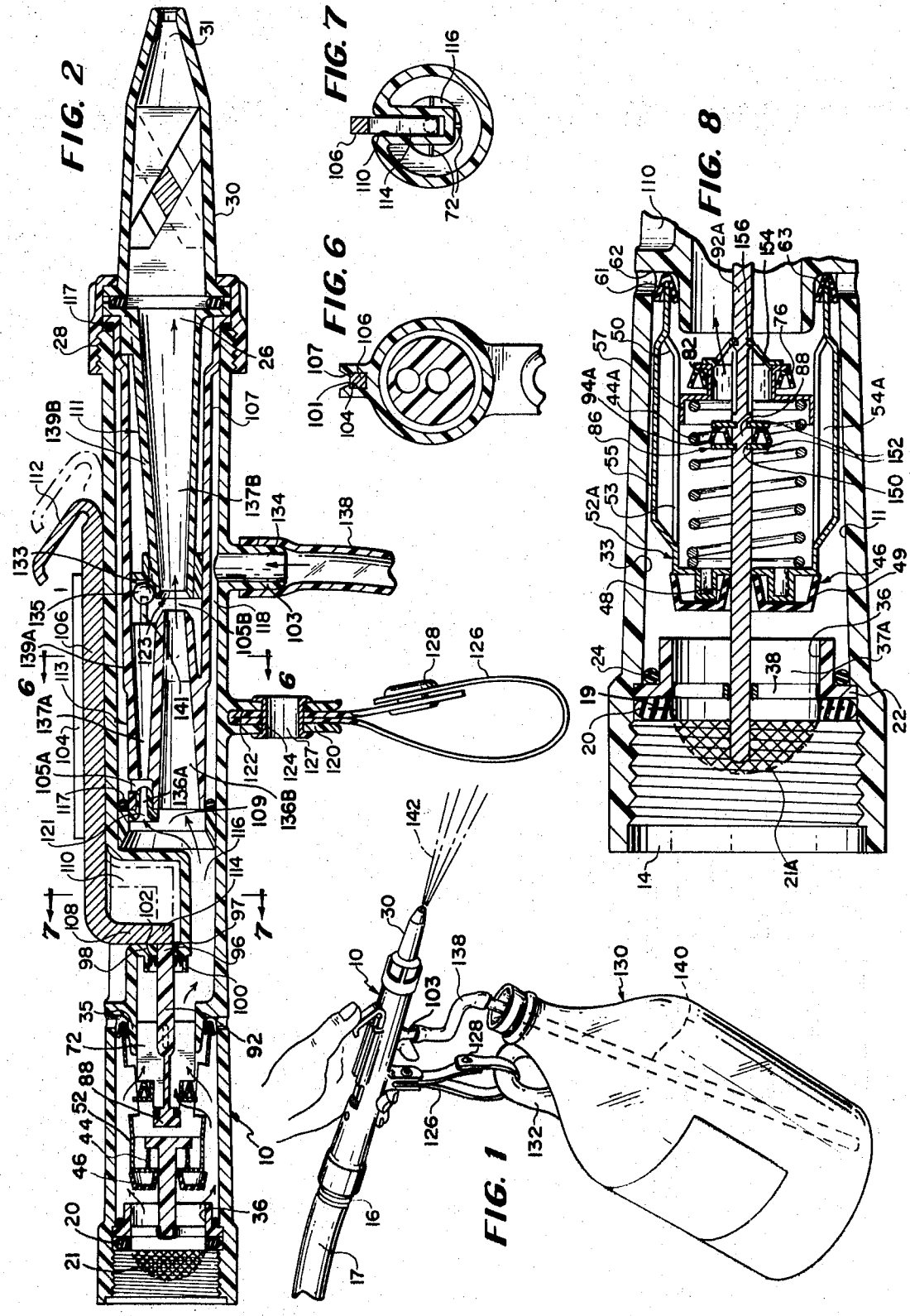

FIG. 2
FIG. 7
FIG. 6
FIG. 8
FIG. 1

FIG. 3

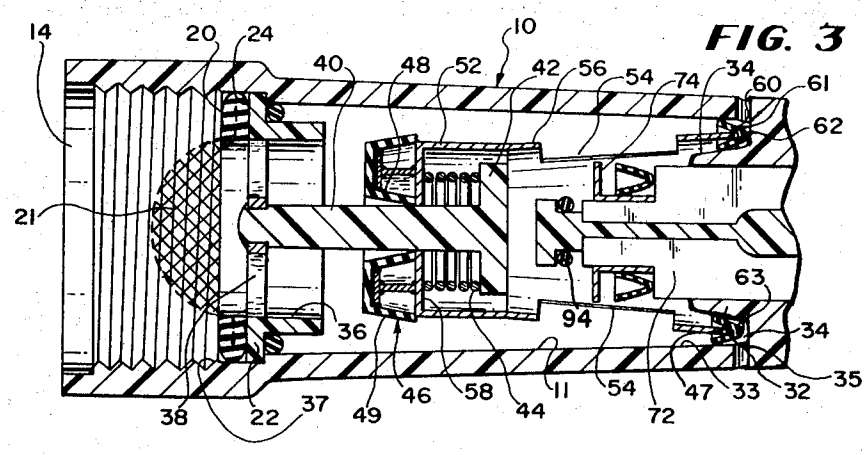


FIG. 4

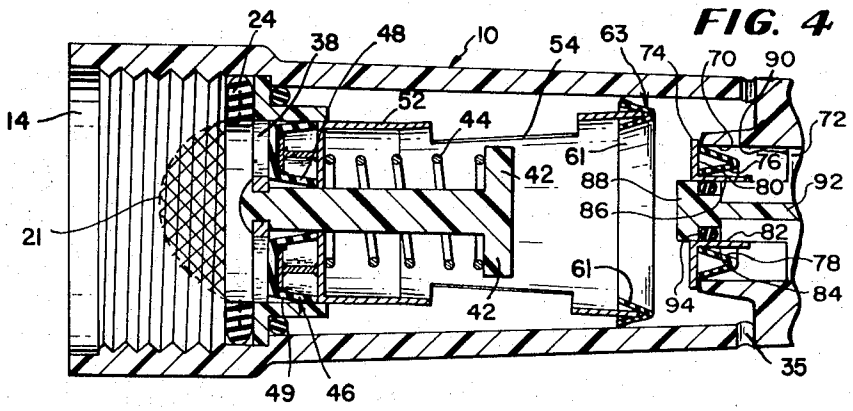
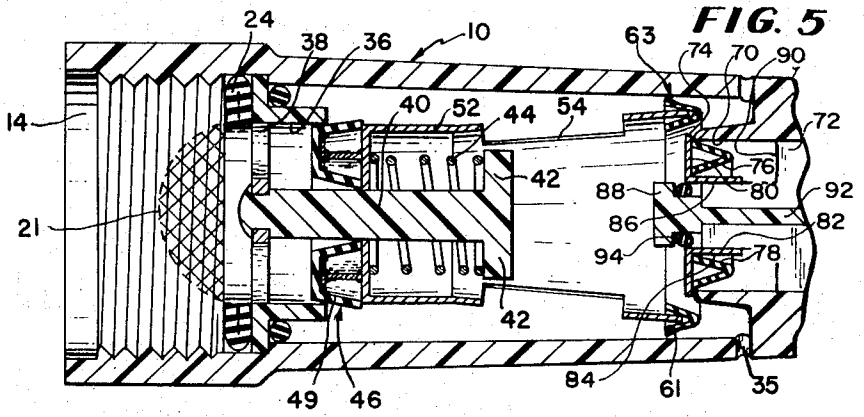


FIG. 5



ANTI-BACK-SIPHONING WATER SUPPLY VALVE AND MIXER

This is a division, of Application Ser. No. 333,309 filed Feb. 16, 1973, now abandoned.

BACKGROUND OF THE INVENTION

In increasing numbers of states, anti-back siphoning devices must be installed at a valve outlet of a potable water distribution system if the valve outlet level from which the water will flow is not above a potential flood level. This requirement in the codes of a few states generally operates to protect the rest of the states on nationally merchandised products. Where valves are used in such devices the performance test generally employed for acceptable protection involves placing a .050" wire in all check valves which are in the path of reverse flow, if there is no adequate vacuum breaker per se, in the pure water line leading from the valve outlet. Most valve devices fail and very few, if any, have passed this test.

Although fertilizers and pest control chemicals can be sprayed into open air without a vacumm breaker but with only a constantly open minimum air gap siphon sprayer at the outlet end of a hose, the handling of the chemical supply along with the nozzle is a deterrent and critical proportioning deficiencies and irregularities are involved.

Vacuum breakers, required in an endeavor to prevent back-flow contamination of a municipal potable water system, one sometimes used with dilution mixing-dispensing devices located at the end of a garden hose that utilize both the water and its pressure to mix and dispense fertilizer or pest control solutions. As the designation vacuum implies, however, a back flow stops flow and vents to atmosphere when the municipal water supply drops to zero pounds gauge pressure. Contaminating flow back into the municipal supply line may or may not occur.

On the other hand, vacuum breakers are generally located upstream well ahead of flow control valves so that theoretically there can be no back-flow of solution into the municipal supply. However, some mixtures may have already moved back past the check valve before a vacuum gauge pressure occurs or the vacuum breaker operates. Other vacuum breakers are made of an elastomer that can deteriorate and permit dangerous leakage even with the potable water open to atmosphere.

SUMMARY OF PRESENT INVENTION

A safety back flow cut-off valve, preferably a slide valve, is located where the potable water enters a potable water chamber whose supply outlet to the mixing chamber is controlled preferably by a two-stage manually opened and closed valve. A vent valve between the two valves opens the chamber to atmosphere to drop the chamber pressure to atmospheric pressure when opened. The cut-off valve is urged to its closed position by a spring exerting an effort in the range of 3 to 10 pounds and the venting valve is coupled therewith to open immediately following initial closure of the cut-off valve.

With this arrangement a unitized gun type device can be provided to mix and dispense a mixture which includes a safety back flow check valve, a flow control valve, mixing chamber and dispensing nozzle. The gun

is connected to the outlet of a potable water supply hose and a predetermined ratio solution is produced and dispensed under a minimum loss of water supply pressure yet, as a matter of safety, the flow of water and venting of the potable water chamber to atmosphere can sequentially be made when the water gauge pressure drops too low to provide a dilution ratio. This is accomplished regardless of whether or not the pressure may drop further to a point where back-siphoning might otherwise occur. A further safeguard is present wherein the volume of water under pressure in the supply hose continues a positive flow of a hydraulically solid supply to provide a time interval within which the safety components can be activated to avoid danger before it occurs. For instance a 150 foot garden hose subjected to 70 p.s.i.g. stores approximately one half gallon of water to provide an operational time lapse for valve actuation before a flow back potential is reached.

The gun serves as a carrying member and a nozzle-directing handle with a concentrate bottle flexibly hung thereto without burdening the movement of the handle for spray purposes other than to support the dead weight of the bottle. This support is a close distance of a few inches so that the gun never gets below the bottle contents when set down. Further, the lift height of the concentrate is negligible and insignificant within ounces for the concentrate because it is aspirated only a short height directly to the jet pump concentrate inlet.

The jet pump preferably is a two-stage jet pump in which converging walls leading to a jet nozzle converts pressure on the water to jet flow energy and the jet is directed into a mixing chamber having a larger flow area than the nozzle where water molecules transfer energy to and entrain molecules of the solution in relation to the differential in sizes to provide a predetermined proportioning ratio and then passing the mixture through expanding walls to convert the energy back to pressure for dispensing through a dispensing nozzle having a flow area substantially less than the water flow area ahead of the jet pump where the water is above a predetermined low pressure.

With great efficiency a substantially constant dilution ratio can be provided with jet pumps in tandem as where the first stage ratio is 1 to 5 and the output of this is supplied to the second stage at a ratio of 1 to 5 to provide a 1 – 25 dispensing solution. This ratio can be maintained rather accurately over the expected range of municipal water pressures, particularly with the supply solution close to the level of the gun.

Moreover, with a ball check in the diverging walls of the first stage to protect against any drain of diluted flow back to the concentrate supply and to maintain priming, any back-flow tendency that may be residual in the compartment will be negligible for the mixture remaining in the compartment because below a certain working water supply pressure the aspirating effect will decline to a negligible gauge pressure well before the water supply pressure drops to zero gauge. Then with the first stage mixing chamber closed any back flow at atmospheric pressure through the first stage before zero gauge is prevented. Accordingly, for plural advantages, the safety factor can be related to a critical low water pressure. The safety cut-off for everything can be resolved at the lowest pressure flow for acceptable proportioning of the jet pump mixer. Thereby any potable water pressure below a desired mixing efficiency will

not be permitted to continue to flow. This is accomplished by a positive closure of the inlet valve. With this shut-off action of the inlet valve the water chamber is vented to atmosphere while there is still inlet pressure in the potable water supply hose that would prevent back flow into the hose at atmospheric pressure even if there is possible leakage at the closed inlet valve, and back flow of diluted solution in the concentrate supply will be inhibited.

IN THE DRAWINGS:

FIG. 1 is a perspective view of the device embodying the invention as manipulated in use and operation;

FIG. 2 is a longitudinal section through the gun-handle portion of equipment shown in FIG. 1;

FIG. 3 is an enlargement of the valve portion of the sectional view of FIG. 2 with the valves disposed in full liquid flow positions;

FIG. 4 is a view similar to FIG. 3 in which the valves are in full no-flow positions;

FIG. 5 is a view similar to FIGS. 3 and 4 in which the valves are at an intermediate stage of operation;

FIG. 6 is a section taken on lines 6—6 in FIG. 2;

FIG. 7 is a section taken on line 7—7 in FIG. 2; and

FIG. 8 is a view similar to FIG. 3 showing a simplified modification of the dual flow and the dual action vent valves.

DESCRIPTION OF A PREFERRED EMBODIMENT

Referring now to FIG. 1 in further detail, a unitary housing **10** molded of a plastic is shown having an elongated compartment **11** therethrough with its inlet end **12** comprising a coarsely threaded three-fourths inch opening **14** receiving the outlet fitting **16** of a garden hose **17** whose end **18** seals against a washer **20** having the marginal edge **19** of a screen member **21** embedded therein supported by a flanged insert **22**, engaging a housing shoulder **24.** The outlet end **26** of the housing is externally threaded with an unconventional thread **28** which prevents standard water garden connections used with gardening equipment being reversely or improperly made. Only an intended outlet fitting such as a spray nozzle **30** can be attached that is open continuously for discharge to atmosphere as at **31.**

Spaced from its inlet end **12** the compartment **11** is internally provided with an axial circular flange **32** (FIG. 3) extending towards the inlet **14** and concentric with and radially spaced from the interior wall **33** of the housing to define a ring valve port **34** terminating in radial apertures **35** open to atmosphere.

The flanged insert **22** internally defines a cylindrical port **36** of an inlet slide valve **37** construction having a spider **38** at its inlet supporting a valve guide **40** having a head **42** thereon supporting an almost fully compressed long compression spring **44** at one of its ends whereby its effort at the other end varies very little with its working movement. A U-shaped V-ring valve **46** is reciprocably mounted on the guide **40** with the inner wall **48** thereof sliding in sealed relation on the guide **40** while the outer wall **49** slidably engages the cylindrical wall of the port **36.**

A semi-conical cup-shaped valve member **52** having flow openings **54** in its walls **56** has its base **58** reciprocably mounted also on the guide **40** where, on its outer side, it supports the edges of the seal **46** with its bottom directed towards the inlet **14** while on its inner side it engages the other end of the compression spring **44** for it to urge the closure of the inlet valve **46.** The rim **47** of the valve member **52** is continuous and circular to receive in adhered relation an elastomer V-ring **60** thereon internally of its bight in a position so that the spread walls **61** thereof slidably engage as a valve member **63** the walls **33** and **62** of the ring valve port **34.**

As shown in the sequence steps of FIGS. **3–5,** the wall **56** serves to direct substantial flow of water from the inlet port **36** against the valve member **63** and its length is such that when the inlet valve **46** is closed, resting against the spider **38,** the vent valve member **63** is fully open; and when the vent valve member **63** is fully closed as when engaging the wall **62** beyond the vent openings **35,** the inlet valve **46** is wide open. The spacing of the entrance edges of the inlet and vent ports in relation to the length of the wall **56** is such that the inlet valve **46** begins to seal the inlet port **36** before the vent valve **63** begins to open so that in their concerted coacting movement preferably momentarily both valves are closed at the same time during their transition.

It is preferred also that the inlet and vent ports **36** and **34** substantially have the same flow area and the spring **44** exerts a valve closing effect from 3 to 5 pounds, but, if there is a substantial differential it would be with the vent area being the larger for stable conditions. Thereby, with the inlet valve **46** closed and atmospheric pressure present in the compartment **11** the inlet valve will not open until the inlet pressure opens the inlet valve **46** and in doing so initiates closure of the vent valve **63.** Thereafter, with no outlet from the compartment open to atmosphere, the pressure upon the vent valve **63** will drive it to its fully closed position and will thereby overcome any tendency of the inlet valve to be drawn back against a full opening by virtue of the reduced pressure of the high rate of flow passing between the valve and the seat. The spring then supplies the means for urging the inlet valve to close when pressure in the compartment drops below a predetermined pressure. Until then the vent valve holds the inlet valve fully open for full flow operation. In fact, given substantially equal pressures on opposite sides of the inlet valve, the inlet valve **46** is held open by the pressure differential across the vent valve **63.** Then as water inlet pressure happens to decrease to a predetermined gauge pressure the opening of the vent valve and closure of the inlet valve can be accomplished by the spring **44.**

The vent valve **63** thereby serves as a safety pressure relief to atmosphere when the compartment pressure drops enough for the spring **44** to initiate closure of the inlet valve **46** and therewith initiate the opening of the vent valve **63** while gauge pressure still exists in the inlet compartment. Atmospheric pressure is then sure to take over and prevail in the compartment **11** while some gauge pressure still exists at the inlet valve and the inlet valve **46** is further closed to the extent urged by the spring against the decreasing inlet pressure.

As the input pressure varies, so long as the force developed by pressure against the vent valve exceeds that of the spring force, the inlet valve will remain fully open.

As the pressure diminishes to a point less than the force exerted by the spring, the spring **44** sequentially closes the inlet valve and opens the vent valve. This closing pressure can be predetermined and is at a positive gauge pressure and preferably above that which would be reached at or shortly before the municipal water pressure and flow drops to a point that is inade-

quate to provide acceptable aspiration of the concentrate and proper proportioning of the mixture of liquids in the mixing chamber as herein described.

Manual control of the flow of water through the compartment is provided by a dual valve arrangement having a low opening effort followed by equalization and a final low effort full opening. Thus, a partial flow, full flow or no-flow operation well within the thumb strength of a housewife is provided to assure adequate working action of a pump jet syphoning device that provides a desired amount of different solutions of proper proportions for various tasks including cleaning detergents.

For this purpose the inside wall of the cylindrical flanged member **32** internally provides a larger cylindrical port **70** (FIGS. **4–6**) which receives a radially vaned guide **72** carrying a flanged valve sleeve member **74** supporting a V-ring valve seal member **76** thereon with the edges of the sides **78** of the seal resting against the radial flange **80**, to close it as guided by the vanes **72**.

The inside face **82** of the wall **84** of the flanged member **32** also provides a cylindrical port **86** with which a smaller area valve **88** cooperates sequentially with the larger area valve member **76**. The smaller valve member **88** is preferable an integral part of a single molding which includes the radial guide vanes **72** reduced in their radial dimension at **90** to radially and axially support the sleeve member **74** loosely with a lost motion relationship on the integral stem **92** which in turn terminates forwardly in the smaller valve head **88** having a circumferential groove around it also receiving a V-ring or an O-ring valve seal **94**. An O-ring may provide some frictional effect to assist in closing the large valve. The inner end **96** of the stem **92** reciprocably extends in an axial direction through an opening **97** (FIG. **1**) in a cross wall portion **98** of the housing having a molded cup shape **100** carrying a V-ring **102** seal therein which seals the stem as exposed to atmosphere at its inner end in a recess **110**.

In the assembly of the two valves **74** and **88**, the stem **96** has the V-ring **102** slipped thereon with the sides of the V-ring disposed towards the valve head **88** and the flanged member **74** in place against the ends **90** of the vanes **72**. Thereupon the seal ring **94** is installed and the assembly slipped into its working position as shown in FIG. **3** and then pushed home to the position shown in FIG. **4** with the vanes **72** seating the seal **102**.

In operation, the dual valve manually opens sequentially. The stem **96** is moved towards the inlet **14** to open the small valve **88** against water pressure in the compartment **11**, only nominal effort being required due to the smallness of the valve area exposed to the pressure. Upon its opening and water flow the pressures are essentially equalized on both sides of the larger valve **76** whereupon it can be easily moved manually to its wide open position by continued movement of the valve stem. Thereafter the valves can be held open manually with little sustained effort and when released the pressure upon the stem **92** at the seal **102**, even at low pressures is enough to urge closure of the valves when manually released.

Referring to FIG. **8** a modification is shown in which a "feel" of opening the larger valve **74** is assured by eliminating the valve guide **40** and spacer **43** of FIG. **4** and extending the spring **44**. The extended spring **44A** is much longer and is of such initial length that its change of effort in its working length is greatly minimized to provide an action equivalent to that performed by the spring **44** in FIG. **4** when both valves **44** and **76** are wide open.

The small valve **88** is integrally formed with an elongated guide rod which also serves as a push rod **92A** which is slidably supported at its opposite ends. The inlet end is slidable in a spider **38A** and its other end is slidably supported on the housing for manual actuation as later described. The cup member **52A** is slidably mounted upon the rod **92A** at its inlet end with the V-ring seal **46** carried on the end wall **58** thereof.

The wall **56A** of the cup member **52A** is longitudinally slotted and elements thereby formed adjacent each slit **50** are alternately offset radially inwardly and outwardly to provide radially spaced longitudinal guides **53** and **55**. Otherwise, the cup **52A** if molded can be molded to the shape shown. The guides **55** slidably engage the inner wall **33** of the housing **10** in guided relation while the inner guides **53** guide the flange member **74A** modified to carry a cylindrical flange **57** to be slidably guided by the inner guides **53** in its excursion. The guides **53** also prevent the spring **44A** from buckling. The spaces **64** made at the slits **50** by the radially spaced guides provide full flow openings **54**. The spider in this instance slidably supports the push rod **92A** and the screen **21A** is arched to accommodate the excursion of the push rod **92A**.

In this embodiment the push rod **92A** is initially of uniform diameter throughout and machined to provide spaced circumferential grooves **150** receiving segmented C-spring **152** washers supporting a V-ring seal **94A** between them cooperating with the cylindrical port **82** as supported concentrically by a third C-spider spring **154** received in a third circumferential groove **156** and provided with diverging radiating fingers **83** terminally notched to engage the downstream edge of the wall of the cylindrical port with flow openings between them. In doing this each finger **83** preferably is quarter turned to present itself edgewise to the flow of water through the valve port **82** and the notch can be made in the stamping of the fingers. Preferably the shaft can be relieved without loss of necessary beam strength where it passed through the port **82** for assured full flow of water therethrough.

For manual actuation of the valves a longitudinal channel **104** is formed in the wall of the housing **10**, has a narrow opening **101** (FIG. **6**) with convergingly tapered walls **107**, to laterally receive a push rod **106** that is pressed in a radial direction and snapped into longitudinal sliding supported relation with its L-shaped end **108** reciprocably received in a recess **110** molded for that purpose ahead of the wall **98**. The front end of the push rod is reversely formed to provide a thumb handle **112** which transmits actuating pressure in a direction holding the rod **106** in the channel **104**. The inner end **114** of the L-shaped portion **108** engages the end of the valve stem **96** or push rod **92A**. The full flow passage **116** from the valves is U-shaped as indicated in FIG. **5** around the recess **110** to the forward part of the compartment which removably receives dual mix jet pumps operating in tandem.

The arrangement of the jet pumps **111** and **113** is within a unitizing shell **115** for ready change for different chemicals and proportions. The exterior closely follows the substantially cylindrical compartment **118** area in the housing as sealed at opposite ends with re-

spect thereto by O-rings **117** to provide a minimized space or reservoir **107** for a chemical concentrate. The inlet to the jet pumps for the water is at **109** and the concentrate is aspirated to the concentrate compartment **118** through the depending nipple **103** from a concentrate bottle **130** by a disconnectable flexible hose **138** and dip tube **140** that minimize the height of the lift for the concentrate.

Each pump includes a tapering converging throat **136** spaced a short distance from a mixing chamber **137** to provide a gap **105** that leads through diverging walls **139** to the outlet end **26** of the housing **10.**

The second stage jet pump **111** extends the length of the housing compartment and is off-set radially an appreciable distance from the axis thereof to accommodate other elements. Along the side of the converging throat **136A** of jet pump **111** is the primary jet pump **113** with a converging entrance **121** for water, a jet gap **105A** for concentrate and a mixing chamber **137A** with diverging walls **139A.** The gap **105A** of the primary jet pump is in communication with the space **118** to aspirate concentrate and the outlet of its mixing chamber is in communication with the throat of the gap **105B** of the secondary jet pump **113.** A first dilution proportioning is accomplished in the first jet and the final mixture proportioning is accomplished in the second stage, thereby providing a high degree of constancy and accuracy above 10 p.s.i.g. of water pressure. A ball **135** is disposed at the outlet of the primary jet pump where it normally resides in a cavity **133** during operation but enters the tapered space **123** as guided by cage pins **141** to serve as a back flow check valve if there is any tendency for back flow of mixture through the primary jet pump **113.**

Thereby the concentrate is diluted and mixed with one proportion, and that mixture further diluted and mixed for discharge at the outlet of the housing. The action of the jet pumps provide a quite accurately proportional mixture for dispensing through a fixed but interchangeable, spray nozzle on the front end for operation at water pressures which generally are well above approximately 5 p.s.i.g. Below this pressure the spring **44** is set to actuate the valves **46** and **63** as for the anti-back-flow purposes already described. The nozzle can be rotated as sealed by an O-ring **63** when held by a flange nut **65** threaded as already mentioned to a non-conventional thread **28.**

For the purpose of assisting the constancy of the mixture ratio a depending stud **120** is provided which is cross kerfed at **122** and apertured at **124** to receive the free end of a flexible looped hanger strap **126** secured thereto by a grommet **127.** The strap at its free ends has a snap fastener **128** for receiving and supporting a conventional bottle **130** or container of concentrate solution by and close to the handle **132.**

The hanger **126** releasably engages the handle **132** of the bottle in supporting relationship and on the nipple **103** leading to the chamber **107,** a flexible tube **138** of fixed length is connected between the nipple and a dip tube **140** in the bottle **130.**

As shown in FIG. **1,** the assembly is manipulated by one hand, either right or left, with the fingers around the housing **10** used as a handle and the thumb is disposed in place to operate the flow valve push rod **106.** With the flexible hose **17,** hanger **126** and tube **138,** a person can manipulate, aim and direct the spray **142** in any direction without moving the bottle other than conveniently to carry it with the operator as the operator moves from place to place.

Ease of cleaning, servicing, storing and the use of the device are apparent from the description set forth in the preferred embodiment and the Summary of the Invention.

The phrase "gauge pressure" employed herein means a pressure above atmospheric pressure sometimes specifically referred to as positive gauge pressure.

From the drawings the description relating thereto and the appended claims, it will be appreciated that a jet pump having two or more stages provides for better accuracy and control of the dilution ratios as well as an extended range of such ratios with respect to variations in water supply pressures; the energy transfer process never creates any negative pressure than is needed to draw the concentrate into the device and the variation of ratio with pressure changes is negligible over a wide range of input pressures; the use of the diverging energy converter provides pressurized output capable of an exceptionally good swirl-nozzle spray pattern; wide open energy transfer chambers along with full flow larger tubing and fittings are not easily clogged by wettable powders nor unduly restrictive to the passage of viscous concentrates; and the very high turbulence created by the energy transfer process within the energy converters assures homogenous blending of the output spray solution.

According, the advantages of the spray device are:

a. Maintenance of a practically constant dilution ratio regardless of variations in input pressure;
b. Wide specification limits are provided for water pressures from 10 to 100 p.s.i.g. and water temperatures as high as the material of the parts will permit, with the preferred materials used being polypropylene or the like, anodized aluminum, and synthetic seal materials.
c. Quick change construction of matched jet pump and nozzle enable **1** to **7** gallons per minute dispensing; mixture ratios up to 20:1 with a single stage jet pump and up to 200:1 with two stage jet pumps; any cone spray to to 30° and utilize a mixture of any viscosity concentrate capable of flowing.
d. A thumb operated hydraulically powered valve for instant and exact control of two different flow rates;
e. Automatic flow cut-off whenever input pressure is insufficient for satisfactory operation;
f. Extra large concentrate tubing and ports;
g. A slim-line gun dispenser that is easy to grip with a balancing hing like suspension of concentrate container below for short lift;
h. Corrosion resistant construction throughout;
i. Larger mouth, one-gallon container with open mouth or vented cap can be used for suspension including original shipping containers with concentrate already in them;
j. Extra large valve ports assure insignificant pressure loss through valves up to 7.5 gal. per min. flow with a housing approximately one inch in diamter.

What is claimed is:

1. In a safety device for potable water supply and distributing system having a manually valved outlet;

a housing defining a flow compartment connected releasably to the outlet having an inlet port, an out-

let and a valve port opening to atmosphere disposed intermediate the inlet and outlet;
an inlet valve closing against the inflow of potable water at the inlet;
a vent valve in communication with said opening and opening inwardly to vent the compartment to atmospheric pressure;
means interconnecting and coordinating said valves to open one while closing the other; and
resilient means under pressure coacting with the interconnecting means to close said inlet valve when the opening force of supply water upon the inlet valve and the closing forces of water pressure in said compartment upon the vent valve drops below a predetermined gauge pressure.

2. The device defined in claim **1** in which said valves are slide valves closing cylindrical ports.

3. The device defined in claim **1** in which the valves and ports have substantially the same areas exposed to the pressure in said compartment.

4. The device defined in claim **1** in which said resilient means closes said inlet valve when the combined atmospheric pressure on the vent valve and the resilient means urging the opening of the vent valve exceeds the positive gauge opening pressure of the water supply upon the inlet valve.

5. The device defined in claim **1** in which said resilient means closes said inlet valve when the closing pressures upon the inlet valve of the resilient means and the pressure in the compartment exceeds the opening pressure upon the inlet valve.

6. The device defined in claim **1** including a jet mixing pump in said outlet establishing in operation a back pressure in the compartment upon the inlet valve.

7. The device defined in claim **6** in which the inlet pressure and compartment pressure vary proportionately and said resilient pressure is a varying pressure diminishing with closure movement of the inlet valve.

8. The device defined in claim **6** in which the compartment back flow closing pressure upon the inlet valve is dropped to atmospheric pressure by the opening of said vent valve immediately following the initial closure of the inlet valve.

9. The device for use at the dispensing end of a watering hose having a resilient expansible wall under water pressure;
a housing secured to the dispensing end having a compartment passage therethrough to a dispensing end and a lateral opening in communication with the atmosphere;
an inlet valve adjacent said end opening with the flow of water under pressure into said compartment;
a vent valve closing said lateral opening under said pressure in the compartment;
means urging closure of said inlet valve at a predetermined low gauge pressure;
means interconnecting said inlet valve and vent valve to open said vent valve upon closing of said inlet valve; and
aspirating means in said compartment adjacent to the outlet of said compartment actuated by the flow of water through said compartment above said predetermined gauge pressure upon the water.

10. The device defined in claim **9** in which water pressure in said compartment upstream to said aspirating means exerts an opening pressure upon the inlet valve substantially equal to its closing pressure exerted upon said vent valve when closed, said vent valve being directly exposed to the path of flow of water through the compartment.

11. The device defined in claim **9** including an outlet means at said dispensing end having an unconventional thread thereon for interchange of specific attachments that are continuously open to atmosphere.

12. In a device of the class described the combination of a housing defining a water chamber having a water inlet connectable to a pressurized potable water supply and an outlet;
a manual valve controlling outflow of water under pressure through said outlet;
a back flow check valve opening said inlet in response to a predetermined rise in pressure differentials between the chamber and water supply pressure when the manual valve is closed; and
means for venting the chamber directly to atmosphere when the pressure in the chamber drops to a predetermined low gauge pressure and the manual valve is open.

13. The device defined in claim **12** in which said means is a safety relief valve venting to atmosphere and connected to said back flow check valve for positive coaction between them to open one while closing the other.

14. The device defined in claim **13** in which the pressure flow area of the venting valve exposed to the chamber may be substantially greater than that of the check valve.

15. The device defined in claim **12** in which said venting means includes a resilient element urging said back flow check valve to its closed position to determine a gauge pressure at which the back flow check valve will open.

16. The device defined in claim **12** in which the valves are slide valves with cylindrically walled ports.

17. A device of the class described comprising an elongated housing having a wall with an inwardly offset wall portion between a water chamber and a mixing chamber including an axial flange defining a vent valve port and a cylindrical main valve port interconnecting the two chambers;
a flanged sleeve means at the inlet of the water receiving chamber defining a cylindrical inlet port;
reciprocating valve members slidably received in said ports;
means interconnecting the vent port valve member and the inlet port valve member for coaction in which one valve is closed while the other is opening with momemtary overlapping of their closing;
resilient means interengaging the inlet port valve and main port valve urging the closure of both and the opening of the vent port valve.

18. The device defined in claim **17** including a jet pump in the mixing chamber, said water chamber being open continuously to atmosphere through the jet pump when said main port valve is open;
said jet pump including a converging energy converter, and a diverging energy converter with an energy transfer chamber between them;
a nozzle mounted on the outlet end of the housing.

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