July 7, 1964 B. T. POWERS ETAL 3,140,011

DETERGENT DISPENSING UNIT

Filed Jan. 26, 1961 2 Sheets-Sheet 1

Fig. 1

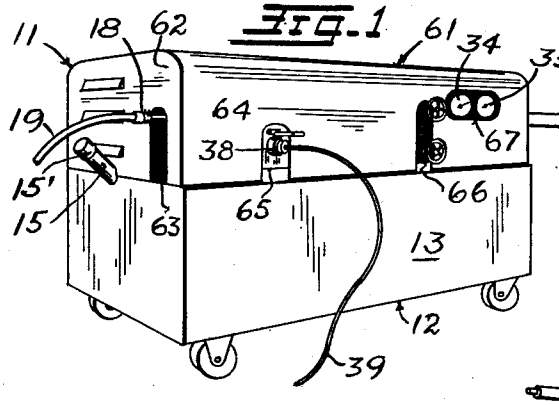
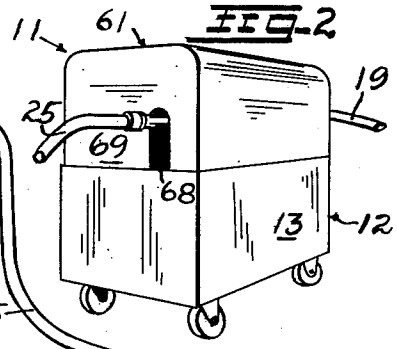


Fig. 2



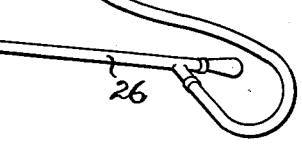


Fig. 3

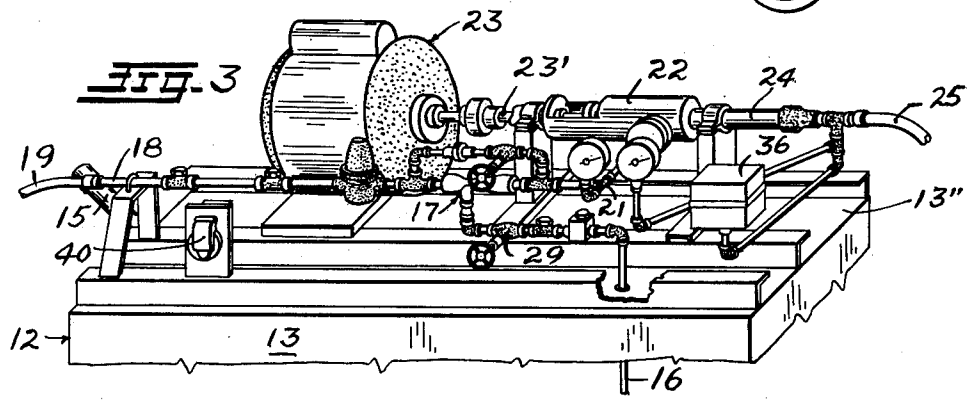
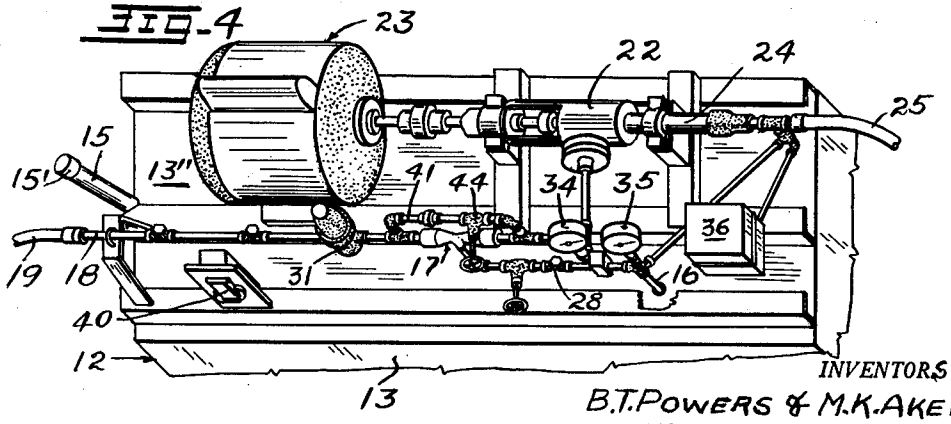


Fig. 4



INVENTORS
B.T. POWERS & M.K. AKERS
BY
Henry N. Young
ATTORNEY

July 7, 1964 B. T. POWERS ETAL 3,140,011

DETERGENT DISPENSING UNIT

Filed Jan. 26, 1961 2 Sheets-Sheet 2

FIG. 5

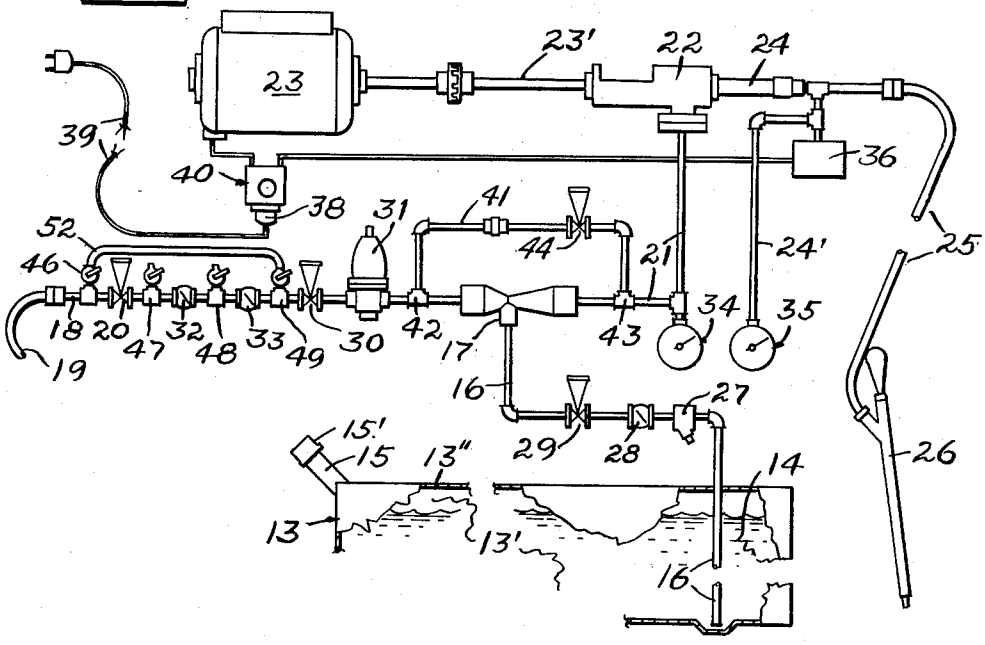


FIG. 6

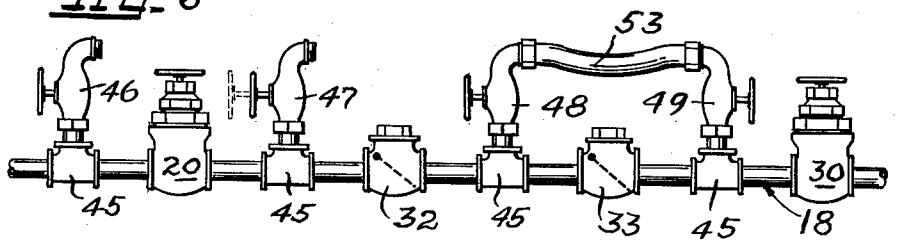
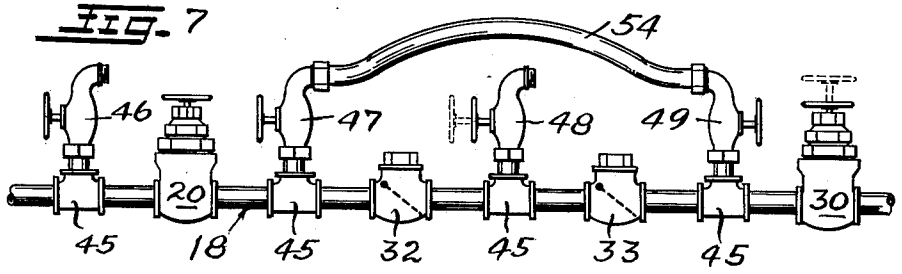


FIG. 7



INVENTORS
B. T. POWERS & M. K. AKERS
BY Henry N. Young
ATTORNEY

United States Patent Office 3,140,011 Patented July 7, 1964

3,140,011

DETERGENT DISPENSING UNIT

Bernerd T. Powers, San Francisco, Calif., and Merle K. Akers, 121 16th Ave., San Francisco, Calif.; said Powers assignor to said Akers

Filed Jan. 26, 1961, Ser. No. 85,111
12 Claims. (Cl. 222—25)

The invention relates to a unit which is particularly designed for a variable proportioned charging and pressure delivery of a carrier liquid with a detergent material to be applied therewith.

Understanding that liquid-borne detergents of different strengths are used extensively in domestic and industrial cleaning operations in different concentrations, a particular purpose is to provide an improved unit for variably charging water, or other liquids, with a detergent, and effecting a pressure discharge of the charged liquid at a desired point of use therefor.

Another object is to provide a movable detergent-discharging unit which is arranged to deliver a detergent-charged carrier liquid therefrom at a super-atmospheric pressure, whereby surface-cleaning operations may be completely effected and completed solely by the application of a jet of the charged liquid against work surfaces to be treated.

An added object is to provide and effect a delivery of a charged or uncharged carrier liquid at a preferred regulated and relatively high pressure.

A further object is to provide a dispensing unit of the character described which is arranged to utilize water received at normal supply pressures from a piped domestic or industrial supply as a carrier for a material to be applied therewith.

Yet another object is to provide a unit of the character described including means for periodically and independently testing the operativeness of certain valves of the unit which are designed to prevent back-flow into a liquid-supply system providing potable water as the carrier liquid.

A still further object is to provide a unit of the character described which is adaptable for its general use in mixing non-aqueous solvents and/or other carrier liquids with other than detergent materials.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth or be apparent in the following description of a typical embodiment thereof, and in the accompanying drawings, in which,

FIGURE 1 is a perspective view of a typical floor-mounted embodiment of the present dispensing unit as viewed generally from an upright corner thereof.

FIGURE 2 is a perspective view of the unit as viewed from the corner thereof which is diagonally opposite that of the view of FIGURE 1.

FIGURE 3 is an enlarged side perspective view showing the uncovered dispensing means and flow circuit of the present unit.

FIGURE 4 is a top perspective view of the mechanism shown in FIGURE 3.

FIGURE 5 is a schematic view of the apparatus as provided with a pair of series-connected check valves in a carrier-liquid supply line to the unit and arranged for normally and independently preventing a back-flow discharge of a detergent-charged liquid from the unit, and including a means for testing one or both of said check valves for any back-flow leakage therethrough.

FIGURE 6 is an enlarged fragmentary view indicating an arrangement for individually checking the operativeness of one or two check valves of the circuit portion leading to the unit from the external solvent supply.

FIGURE 7 is a view corresponding to that of FIGURE 6 and indicating an arrangement for checking the operativeness of the other check valve of the circuit portion leading from the external liquid supply to the unit.

As particularly illustrated, a present unit **11** is of a wheel-mounted roll-around type for use in providing and forcibly applying a liquid at working points adjacent the unit, and said unit generally comprises a base portion **12** supporting the operative mechanism of the unit and comprising a rectangular tank **13** having a reservoir space **13'** for a liquified material **14** to be provided therefrom for its forcible application at a working point. In the present structure, the top wall **13''** of the tank **13** directly carries the operative mechanism of the unit, and the tank thereby directly comprises the support frame for said mechanism in a base structure which is of minimum weight for its duty. A filler nozzle **15** extends obliquely upwardly from the tank space **13'** at an end thereof and is normally closed by a vented filler cap **15'** for a constant provision of atmospheric pressure within the otherwise closed tank space **13'** in which a charge of the material **14** to be applied by the unit is maintained.

It will now be noted that a rigid suction pipe or conduit **16** leads upwardly from its intake end in a suitable sump or well provided in the bottom of the tank **13** to the suction connection of a mixing injector **17** of the venturi-tube type having an intake connection for an injector-operating liquid and a discharge connection from the injector. A rigid pipe or conduit **18** extends to the injector connection from a flexible supply hose or conduit **19** through an adjustable primary supply valve **20**, and the liquid supplied through the valve **20** is provided at a relatively low pressure, and would usually comprise water from a domestic or industrial supply line. A rigid pipe or conduit **21** leads from the injector discharge connection to the intake of a suitable pump **22** driven by the shaft **23'** of an electric motor **23** and arranged to deliver the liquid received by it at a relatively high pressure to and through a rigid pipe **24** connected by a flexible hose or conduit **25** with a suitable discharge nozzle **26** for the liquid received from the injector and supplied through the pump at a relatively high pressure to the nozzle having its discharge rate adjustable from zero to a maximum.

As particularly shown in FIGURE 5, the suction pipe **16** leading from the reservoir space **13'** is provided, in order, with a trap **27** for collecting any solid particles from the material **14**, a check valve **28** which is operative to prevent a return of the material **14** to the space **13'** and a manually adjustable flow-control valve **29**, said valves and trap being conveniently provided in a portion of the pipe **16** which overlies the supporting tank **13**. An automatic pressure regulator **31** is provided for controlling the flow rate of liquid passing to the injector through the pipe **18** beyond a valve **30** in the pipe **18**, and the portion of the pipe **18** between the valves **20** and **30** is provided with two mutually spaced check valves **32** and **33** connected in series and designed to operate independently and positively to prevent a back-flow of liquid to the supply pipe **19**. A pressure gauge **34** is connected with the pipe **21** from the injector **17** to the pump **22**, and a pressure gauge **35** is connected at the end of a branch **24'** of the discharge pipe **24** for the pump, the arrangement being such that the effective suction pressure of the pump and the effective discharge pressure from the pump may be constantly ascertained.

The automatic actuation of the motor **23** to operate the pump **22** is arranged to be effected in accordance with the pressure in the conduit of the branch pipe **24'** which is intermediately connected with and controls a suitable adjustably settable single-pole pressure-operated electric switch **36** of a suitable structure for the purpose, with said switch being shown as represented by its casing

and arranged for its adjusted setting in accordance with a variable determination of its opening pressure by an adjusting knob (not shown) of the switch. The contacts of a terminal plug **38** of an electrical two-wire extension cord **39** are arranged to supply motor-operating power through a suitable double-pole switch **40** to the series-connected pump motor **22** and pressure-operated switch **36**, and the arrangement is essentially such that the power to the motor is cut off when the pressure at the closed nozzle valve exceeds a predetermined value as determined by the setting of the pressure-controlled switch **36**, the motor circuit being energized to provide a pumped supply of liquid at the adjustable nozzle **26** as long as the nozzle valve is open.

A means is preferably provided for variably proportioning the amounts of carrying and charging liquids delivered to the pipe **21**, and said means essentially comprises a suitably valved by-pass pipe **41** connected by T's **42** and **43** respectively provided in the pipes **18** and **21**; as shown, the T **42** is connected in the pipe **18** between the regulator **31** and the injector connection while the T **43** is interposed in the pipe **21** between the connection for the gauge **34** and the injector connection. A manually settable flow valve **44** is interposed in the by-pass pipe **41**, and is adjustable to provide for any desirable variable proportioning of the charging and carrying liquids in the mixture delivered to the pump **22** up to a limit of about 1 to 45 when the valve **44** is fully closed.

It will be understood that the relation of the valved by-pass pipe **41** to the liquid flow to the pipe **21** beyond the T **43** therein is such that, when the valve **27** is fully open and the valve **44** opened to an adjusted degree, an adjustably proportioned mixture of the carrying and charging liquids is deliverable to the discharging nozzle **26** by the pump **22**. On the other hand, if the by-pass valve **44** is fully closed while the valve **27** in the suction pipe **16** is fully open, the resulting mixture delivered to the pump contains a maximum amount of the charging liquid providable in accordance with the pump action. Alternatively, if the valve **27** is closed, and the valve **44** is either open or closed, only the carrying liquid received from the hose **19** will be delivered at the nozzle **26**, as for rinsing operations in lieu of the delivery of a charged liquid from the applying nozzle **26**.

Referring generally to the functioning of the described assembly, it will now be noted that a closing of the nozzle valve while the unit is operating to deliver a mixture of the liquids will create an appreciable back-pressure tending to force the liquid mixture back into the flow line of the pipe **18** and the supply hose **19**, and that the check valves **32** and **33** are provided for normally preventing such a back-flow which is highly undesirable, if not dangerous, since it might charge the supply line to the hose **19** with the detergent **14**, or other chemically active charging liquid, for its escape to other portions of the supply system providing water or another potable carrier liquid. However, since the combined seal normally providable in the supply pipe **18** by the check valves **32** and **33** while the valves **20** and **30** are open might fail as to said valves to thereby provide back-pressure leakage into the supply line **19**, a means is provided for collectively or independently checking the functioning of the valves **20** and **30** and **32** and **33** if a back-pressure leakage to the supply line represented by the hose **19** connecting the present unit with a domestic or industrial liquid-supply system is suspected or known.

To provide for the desirable leakage testing of the valves **20** and **30** and the check valves **32** and **33**, pipe T fittings **45** are interposed in the pipe **18** ahead of the valve **20**, between the valve **20** and the check valve **32**, between the check valves, and between the check valve **33** and the valve **30**. The respective T's **45** mount suitable normally-closed hose-bib faucets **46** and **47** and **48** and **49** on their stem portions, and the hose-bib nozzles of the different faucets are arranged for their variable selective connection by means of flexible hose elements provided with terminal couplings for threadedly and sealedly connecting the hose elements with and between the hose-bib nozzles of different pairs of the four different said faucets, with FIGURE 5 showing the end faucets **46** and **49** so connected by a hose **52**.

By particular reference to FIGURE 6, a hose element **53** is shown as connecting the bibs of the faucets **48** and **49** whereby, while the shut-off valves **20** and **27** in the pipes **18** and **16** respectively are closed, an opening of the connected faucets for a by-pass flow about the check valve **33** of any charged or uncharged carrier liquid is provided, and a subsequent opening to the atmosphere of the faucet **47** under back-pressure conditions in the supply line **18** beyond the closed valve **20** and the open valve **30** will permit the back-pressure escape from said faucet of any liquid which has leaked through the check valve **32** for indicating by a liquid discharge from the opened faucet **47** a functional failure of the valve **32** as a check valve. FIGURE 7 discloses a hose **54** as connecting the hose-bibs of the faucets **47** and **49** whereby, with the valve **20** closed and the valve **30** open, an opening of the hose-connected faucets **47** and **49** provides for a functioning of the connecting hose element **54** to by-pass the check valves **32** and **33** to provide for testing the functioning of the valve **33** by opening the faucet **48** after the full pressure-holding functioning of the other check valve **32** has been established following its testing in the manner taught respecting the assembly of FIGURE 6.

With further reference to FIGURE 7, it will be noted that the primary supply hose **19** which connects the intake pipe **18** with the pressure supply source of the carrier liquid would extend from a closable connection (not shown) of and with said source, so that this arrangement is further adapted for use in testing the functioning of the closed supply valve **20** of the present unit when said connection is closed, whereby, with the check valves **32** and **33** by-passed by the hose **54** and the faucet **48** closed, a discharge of liquid from the opened faucet **46** would indicate a back-pressure failure of the closed valve **20**. The checking of the operativeness of the valve **33** may also be effected with the arrangement of FIGURE 5 which also provides for a by-passing of the various valves **20** and **32** and **33** for facilitating the removal thereof for any repair or replacement required. Also, if desired, it is a simple matter to test the functioning of the closed flow valve **30** by connecting the faucets **46** or **47** with the faucet **48** by a hose, and then opening the faucet **49** to ascertain any back-pressure leakage of this valve. Although the present test-hose elements **52** and **53** and **54** are shown as of different lengths, it will be understood that the longer hose element **52** may comprise the only hose element needed and provided with the present unit.

Since a present unit for charging an externally supplied carrier liquid with a liquified detergent or other material supplied from the reservoir tank **13** of the unit and for dispensing the mixture from the unit, and is of the roll-around type for its variable use positioning movement on a supporting floor in more-or-less dusty spaces, the mechanism of the unit carried on the top tank wall 13″ is preferably enclosed within a cover element **61** suitably mounted on the tank-providing base portion **12** of the unit. The present cover element **61** is of generally rectangular outline, is open at its bottom, is arranged for its removably supported and suitably fixed and fitted mounting upon the top of the base portion **12** with its sides generally registering with the sides of said portions, and provides a facilitated access to certain parts of the unit mechanisms which are desirably available during its setting-up and use.

As particularly shown in FIGURE 1, the end **62** of the cover **61** disposed adjacent the motor **23** is notched out from its bottom edge for the extension of the tank filler nozzle **15** beyond it and provides a notch **63** extending from its bottom edge and arranged for the free extension

of the pipe **18** from its releasably coupled connection with the supply line **19** into the cover space. A longitudinal cover side **64** is provided with a notch **65** extending from its bottom edge opposite the two-way power-supply switch **40** for the motor to facilitate the connecting and disconnecting of the terminal plug **38** of the power-supplying extension cord **39** to the switch assembly, is provided with a bottom notch **66** at which the handles of the valves **27** and **44** are exposed for their turning, and is further provided with a sight opening **67** opposite the dial faces of the enclosed gauges **34** and **35** to facilitate pressure readings thereof. Also, a notch **68** extending from the bottom of the other cover end **69** freely receives therethrough the pipe **24** from which the nozzle-supplying delivery hose **25** extends in releasably coupled relation to it.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the present detergent dispensing unit will be readily understood by those skilled in the art to which the invention appertains. While we have shown and described structural and operative arrangements which we consider to comprise preferred embodiments of our invention, we desire to have it understood that the showings are primarily illustrative, and that such changes and developments may be made, when desired, as fall within the scope of the following claims.

We claim:

1. In combination with relatively fixed sources of a carrier liquid and of electric power, a liquid-mixing and dispensing unit adapted to be movably supported on a floor or the like adjacent said liquid and power sources, and comprising an electrically operable pump, an elongated flexible supply conduit for connecting the carrier-liquid source with the intake of said pump, a flexible discharge conduit extending from said pump and terminating in an adjustable-flow discharge nozzle, an electric motor of the unit for driving said pump, a flexible extension cord for connecting said motor in a power circuit including said power source, a container of the unit providing a reservoir for a liquid for charging said first liquid, a mixing injector operatively interposed in the pump-supply conduit and having its suction intake connected to the liquid in said reservoir whereby the actuation of said pump is arranged to effect a charging of the first liquid with the second liquid in said injector to provide a mixture for discharge through and from said pump to the adjustably opened said nozzle, and means automatically operative to open the energizing circuit for the motor by reason of the closing of the discharge nozzle.

2. In a movably supported liquid-mixing and dispensing unit, a pump operative to deliver a liquid therefrom at a relatively high pressure, a pipe providing a supply conduit communicating with the intake of said pump and arranged for its connection by a flexible conduit to a relatively fixed and low-pressure source of a carrier liquid, a flexible conduit extending from the discharge outlet of said pump, an adjustably openable discharge nozzle terminally connected with said flexible discharge conduit, a means for actuating said pump, a container on the unit providing a charging liquid for said first liquid, a venturi-type mixing injector interposed in the supply conduit and having its suction intake connected to the liquid in said reservoir whereby the actuation of said pump is arranged to effect a charging of the first liquid with the second liquid in said injector and the mixing of said liquids for discharge through the opened said nozzle.

3. The combination of claim 2 in which pressure-indicating gauges are constantly and independently operative in the supply conduit between the injector and the pump and in the discharge conduit, respectively.

4. The combination of claim 2 providing a conduit by-passing the injector passage receiving the carrier liquid from the supply conduit, and a valve operative in said by-passing conduit and adjustable to adjust the ratio of the amount of charging liquid to the amount of carrier liquid in the mixture delivered from the operating injector.

5. In a movably supported liquid-mixing and dispensing unit, a pump, a closed supply conduit connecting the intake of said pump with a relatively low-pressure source of a carrier liquid apart from the unit, means providing a closed discharge conduit extending from the pump to an adjustable discharge nozzle of the unit, a means for actuating said pump for effecting the delivery of liquid therefrom to the nozzle at a relatively high pressure, a reservoir of the unit arranged to contain a charging liquid of fixed strength at atmospheric pressure, a mixing injector carried by the unit and interposed in the supply conduit and having its suction intake connected to the charging liquid in said reservoir by a closed conduit whereby the actuation of said pump is arranged to effect a charging of the carrier liquid with the charging liquid in said injector and the mixing of said liquids in said injector and in said pump for a discharge of the liquid mixture through the opened said nozzle at a relatively high pressure, and a check valve constantly operative in said last conduit against a pressure back-flow of the liquid mixture through and from the injector into said reservoir.

6. In a liquid-mixing and dispensing unit, a pump, a supply pipe for connecting the intake of said pump with a source of a potable carrier liquid external to the unit, a discharge conduit extending from the pump to an adjustable discharge nozzle, a means for actuating said pump for effecting the delivery of liquid therefrom at a relatively high pressure, a reservoir for a non-potable charging liquid for said carrier liquid associated with the unit, a mixing injector carried by the unit and interposed in the supply pipe and having its suction intake connected to the charging liquid in said reservoir by a suction pipe whereby the actuation of said pump is arranged to effect a charging of the first liquid with the second in said injector and the mixing of said liquids in said injector and in said pump for a discharge of the resulting non-potable liquid mixture through the open said nozzle at a relatively high pressure, a check valve means in said suction pipe constantly operative to prevent a back-flow of the liquid mixture through and from the injector to the reservoir, and a check-valve means operative in said supply conduit ahead of the injector to prevent a back-flow of the liquid mixture into the source of the carrier liquid by and upon a closing of the nozzle.

7. In a liquid-mixing and dispensing unit of the character described, a pump, a supply pipe leading to the pump, means for connecting the intake of said pipe with an external low-pressure pipe-line source of a carrier liquid, a discharge conduit means extending from the pump to an adjustable discharge nozzle, a means of the unit for actuating said pump for effecting the delivery of liquid therefrom and through the opened nozzle at a relatively high pressure, a reservoir for a charging liquid for said carrier liquid provided by the unit and open to atmospheric pressure, a mixing injector carried by the unit and interposed in the supply pipe and having its suction intake connected to the charging liquid in said reservoir by a suction conduit whereby the actuation of said pump is arranged to effect a charging of the carrier liquid with the charging liquid in said injector and the mixing of said liquids in said injector and in said pump for a discharge of the resulting liquid mixture through the opened said nozzle at a relatively high pressure, a check valve means in said suction conduit to the injector constantly operative to prevent a return flow of the liquid mixture through and from the injector to the reservoir, and a check-valve means operative in said supply pipe ahead of the injector to prevent a return flow of the liquid mixture into the supply pipe for the carrier

liquid by and upon the existence in the supply pipe beyond the injector of a back-pressure exceeding the supply pressure of the carrier liquid.

8. The combination of claim 7 in which the check-valve means in the supply pipe comprises a plurality of check valves interposed in series in said pipe for normally and jointly preventing a back-flow of charged liquid from the injector through the supply pipe and into the source of the carrier liquid by and upon the existence of back presure in the supply pipe caused by a closing of the nozzle and exceeding that of the liquid source.

9. The structure of claim 7 whereof the check-valve means in the supply pipe comprises a pair of check valves interposed in series in said pipe and normally jointly operative to independently prevent a pressure back-flow of liquid through and from the injector into the pipe-line source of the carrier liquid, and a means is provided for individually and selectively testing the flow-checking functioning of the different said check valves against back-pressure leakage while they remain operatively installed in said supply line.

10. The combination of claim 7 in which the check-valve means in the supply pipe comprises a pair of check valves interposed in series in said supply pipe of the unit ahead of the injector and both normally operative to independently prevent a presure back-flow of liquid through and from the injector into the pipe-line source of the carrier liquid, normally closed faucets are interposed in the supply pipe between and at opposite sides of the check valves, and a closed connection is provided between the nozzles of pairs of the faucets whereby an opening of an unconnected faucet to the atmosphere will disclose any back-pressure leakage through the check valve which is immediately beyond the opened faucet in the direction of the injector.

11. In a supply pipe arranged for a relatively low-pressure and continuous one-way delivery of a potable carrier liquid therethrough from a low-pressure source of the liquid to a pump means operative to deliver the received liquid therefrom to a discharge nozzle at a relatively high pressure while being charged with a non-potable material, means for introducing a non-potable material into the liquid in the supply pipe, mutually

spaced and normally open shut-off valves interposed in said supply pipe ahead of the means for introducing a non-potable material into the carrier liquid therein, a pair of mutually spaced and constantly operative check valves interposed in series in the pipe portion between said shut-off valves, four normally closed faucets interposed in the pipe in alternate relation in their line and at the intake sides of the different valve and having discharge nozzles, and means comprising a closed conduit member for connecting the nozzles of a pair of the faucets whereby a flow of liquid from either unconnected said faucet which is opened to atmosphere under back-pressure conditions in the pipe faucet will indicate leakage solely through the check valve or the closed shut-off valve immediately beyond it.

12. In a movably-supported liquid-mixing and dispensing unit, a pump, a closed supply conduit connecting the intake of said pump with a relatively low-pressure source of potable water for carrying a detergent, means providing a closed discharge conduit extending from the pump to an adjustable discharge nozzle of the unit, a means for actuating said pump for effecting the delivery of liquid therefrom to the nozzle at a relatively high pressure, a reservoir of the unit arranged to contain a water-charging detergent liquid of fixed strength at atmospheric pressure, a mixing injector carried by the unit and interposed in the supply conduit and having its suction intake connected to the charging liquid in said detergent reservoir by a closed conduit whereby the actuation of said pump is arranged to effect a charging of the water with the detergent liquid in said injector for a discharge of the liquid mixture through the opened said nozzle at a relatively high pressure, and check valves automatically operative in said supply and suction conduits to prevent a pressure back-flow of the liquid through and from the injector into said conduits.

References Cited in the file of this patent

UNITED STATES PATENTS

2,443,146	Pyles	June 8, 1948
2,605,708	Smedes	Aug. 5, 1952
2,846,123	Gray	Aug. 5, 1958
2,898,002	Blanchet et al.	Aug. 4, 1959