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CLEANING APPARATUS WITH MULTIPLE AND VARIABLE WATER SUPPLY

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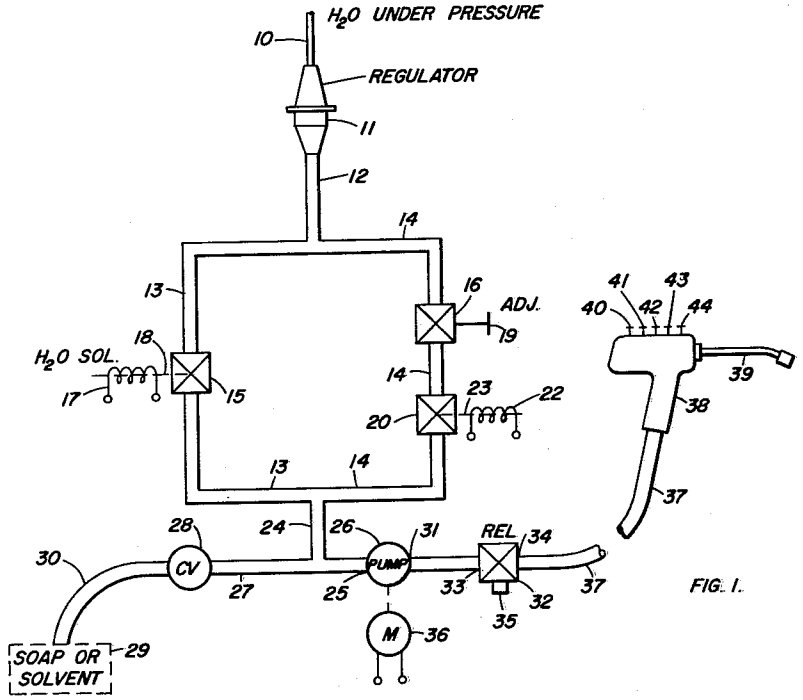


FIG. 1.

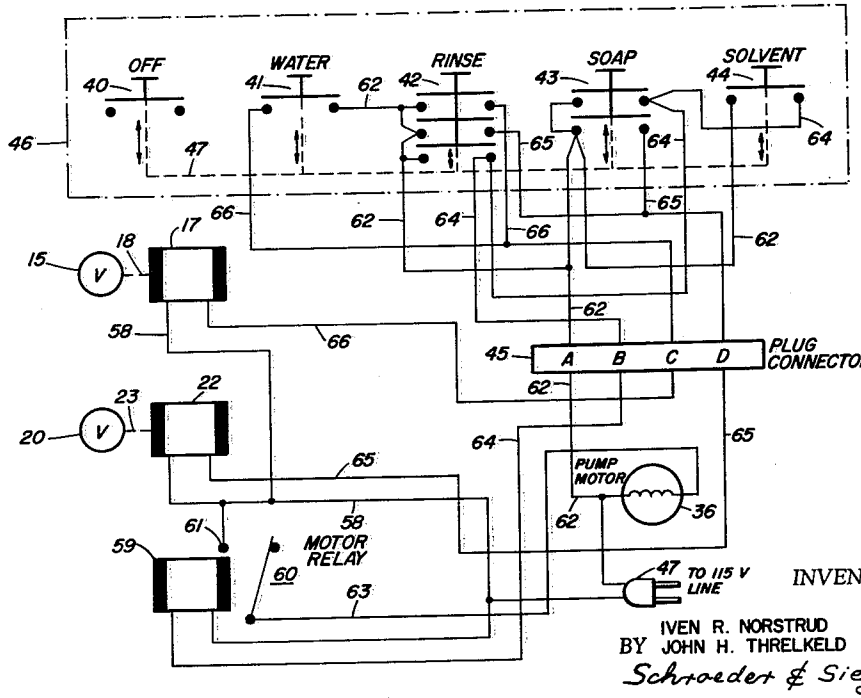


FIG. 2.

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CLEANING APPARATUS WITH MULTIPLE AND VARIABLE WATER SUPPLY

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This invention relates to the field of liquid cleaning apparatus, and more particularly to the field of cleaning apparatus which is portable and uses a plurality of cleaning solutions.

Portable cleaning apparatus is particularly advantageous around service stations and garages where limited space and facilities are available, but nevertheless require means for cleaning the engines and other parts of automobiles, machinery and the like. In the present invention, apparatus is provided whereby water may be directed under different pressures to the surface which is to be cleaned and the operator is also given a choice of cleaning solutions, either using a detergent or soap solution depending upon the type of surface to be cleaned.

It is therefore a general object of the present invention to provide new and improved cleaning apparatus using water, liquid detergents and soaps.

It is yet another object of the present invention to provide simplified control over the operation of the cleaning apparatus dispensing different liquids.

It is still another object of the present invention to provide new and novel cleaning apparatus having a plurality of water pressures available to be dispensed by use of a divided water source.

It is still another object of this invention to provide cleaning apparatus having solenoid operated valves in parallel water lines to simplify the cleaner construction.

It is still another object of this invention to provide new and novel cleaning apparatus capable of delivering soap and detergent solutions and water under two different pressures.

It is yet another object of this invention to provide a new and novel means of connecting the water supply in parallel branches to give greater control over the amount of soap which is being dispensed.

These and other objects and advantages of this invention will more fully appear from the following description, made in connection with the accompanying drawings, wherein like reference characters refer to the same or similar parts throughout the several views, and in which:

FIG. 1 is a hydraulic schematic showing the general placement of the operating components; and

FIG. 2 is an electrical schematic of the cleaning apparatus.

A water line **10** is connected to a source of water under pressure and for some systems it may be desirable to incorporate a water pressure regulator **11** to insure that the pressure is maintained at a pressure lower than the line pressure. Incorporation of the water pressure regulator **11** is not needed where a steady source of water pressure generally having a magnitude of 75 p.s.i. or less is used. A conduit **12** is connected between regulator **11** and a pair of conduits **13** and **14** which communicate with conduit **12**. Conduit **13** is connected to a solenoid operated valve **15** and conduit **14** is connected to an adjustable valve such as a needle valve **16**. Solenoid operated valve **15** has a coil **17** which when energized by electrical current causes an armature **18** to be attracted within the magnetic field of the coil and thereby open valve **15**. When coil **17** is not energized, valve **15** remains in a closed condition and does not allow fluid to pass therethrough. Adjustable valve **16** has a knob **19** or other suitable control for varying the opening within the valve so that the flow of fluid therethrough may be restricted to any one of a plurality of positions which is selected by the operator as will be explained later. Another solenoid operated valve **20** is connected to adjustable valve **16** by another section of conduit **14**. Solenoid operated valve **20** is identical to valve **15** and has a coil **22** which when energized causes an armature **23** to be drawn into coil **22** and thereby open valve **20**. Valve **20** is normally closed and remains so as long as coil **22** is unenergized. Conduits **13** and **14** are connected to the outlets of valves **15** and **20** respectively where they communicate with a common conduit **24** which is connected to an inlet **25** of a fluid pump **26**. Also connected to the inlet **25** of pump **26** is another conduit **27** having its opposite end connected to a check valve **28** at its outlet. Check valve **28** is connected to a source of soap or solvent solution **29** through a conduit **30** which is generally a flexible section of hose which may be placed within a tank or container of the soap or solvent solution. In other words, the check valve is connected so that fluid may be drawn from source **29** but upon a given fluid pressure developing in conduit **27**, check valve **28** closes and does not allow liquid such as water from conduit **24**, to back up into the soap or solvent solution.

Pump **26** has an outlet **31** which is connected to a relief valve **32** at its inlet **33**. Relief valve **32** also has an outlet **34** and a discharge port **35**. Pump **26** is of the type that will permit fluid under pressure at its inlet to emerge from its outlet at the same pressure when not being driven. As will be explained more fully later, whenever relief valve **32** is energized, the fluid therein emerges through discharge port **35** until the pressure within the valve drops to a point where the valve closes. Pump **26** is driven by a motor **36** through a shaft to provide the necessary rotational power required by pump **26**. A conduit **37** is connected to the outlet **34** of relief valve **32** and is shown in broken section, it being understood that conduit **37** may be of any convenient length to provide the operator with a nozzle **38** at a remote position from the rest of the apparatus. Nozzle **38** contains a discharge tube **39** which directs the flow of the liquid onto the work to be cleaned and also contains five electrical push-button switches **40**, **41**, **42**, **43**, and **44**. Switches **40** through **44** will be further explained in the electrical schematic found in FIG. 2. It is generally more convenient to connect the switches **40** through **44** to the rest of the apparatus through a two part plug connector **45**.

Switches **40**, **41**, **42**, **43**, and **44** are generally formed in a bank and may be considered as a switch bank designated as numeral **46**. This switch bank is composed of the several switches just mentioned which are mechanically linked through a linkage **47** so that when one push-button switch is depressed, if any other switch was previously depressed, it is snapped back to its original and deenergized position. Switch **40** is designated as the "OFF" position, switch **41** is the "WATER" position, switch **42** is the "RINSE" position, switch **43** is the "SOAP" position, and switch **44** is the "SOLVENT" position.

A plug **47** is connected to a 115 volt alternating current line and a conductor **58** connected thereto is connected to one terminal of coil **22** and is connected to one terminal of coil **17**. Conductor **58** is also connected to one terminal of a coil **59** of a motor relay **60** and is further connected to a contact terminal **61** of the relay. Another conductor **62**, connected to plug **47**, is connected through plug **45** to a terminal of switch **41**, to three terminals of switch **42**, to a pair of terminals of switch **43**, and to a single terminal of switch **44**. Switch **41** has one contact blade, switch **42** has three contact blades, switch **43** has a pair of contact blades and switch **44** has a single

contact blade as does switch 40. Switch 40 does not have any electrical contacts made with its terminals and merely serves the function of turning the entire system off as will be set forth in more detail. Conductor 62 is also connected to one terminal of pump motor 36 and the other terminal of pump motor 36 is connected to the armature of motor relay 60 through a conductor 63. In order to apply power to motor 36 it is necessary that the armature of relay 60 engage contact 61. Another common conductor 64 is connected to the other terminal of coil 59 and is further connected to a terminal of switch 42 opposite the terminal connected by conductor 62, conductor 64 also connecting a terminal of switch 43 and 44. Thus, any time push-button switches 42, 43, or 44 are depressed, the circuit is completed to coil 59 applying power to motor 36. Assuming that switch 44 was depressed, it will be seen that the pump is driven by motor 36 and since valves 15 and 20 remain closed, solvent will be drawn from source 29 and pumped to nozzle 38. Of course, all the relays may be energized by low voltage simply by using a step down transformer if it is desirable to operate the control switches by low voltage.

In case it is desirous of delivering soap through nozzle 38, "SOAP" push-button 43 is depressed and a terminal opposite that connected to conductor 62 is connected by the switch blade to solenoid 22 through a conductor 65. Thus, water will be drawn through valve 20 and through valve 16, the amount depending upon the setting of adjustable valve 16 and with conduit 30 in the soap solution, a mixture of water and soap will be drawn into pump 26 and dispensed through nozzle 38. Since the soap solution from source 29 may be of different consistencies and since it may be desirable to change the concentration of soap in the mixture, valve 16 may be adjusted by knob 19 to produce the optimum mixture for the cleaning job at hand.

Where it is desirable that water at line pressure be received at nozzle 38, "WATER" push-button 41 is depressed and a terminal opposite the one connected with conductor 62 is connected to solenoid 17 of valve 15 through a conductor 66. Thus valve 15 is open to allow water to enter and leave pump 26 and upon a pressure build-up in conduit 27, check valve 28 is closed thereby stopping the water from diluting the soap solution and preventing any soap from entering the inlet to pump 26.

Should it be desirable to have water at a pressure several times line pressure, water is introduced into pump 26 by actuating valves 15 and 20 and this is accomplished by depressing the "RINSE" push-button switch 42, where conductor 66 is connected to a terminal opposite a terminal connected to conductor 62 so that current is applied to coil 17 of valve 15 and conductor 65 is connected to another terminal opposite a terminal connected to conductor 62 so that current is also applied to coil 22 of valve 20. Therefore, a full supply of water is received at the inlet 25 of pump 26 and is discharged through its outlet 31 and hence through nozzle 38.

In order to stop the flow of any of the liquids from nozzle 38, it is only necessary that "OFF" push-button 40 be depressed and any of the other switches which were depressed beforehand will be automatically returned to their off position thereby stopping the motor 36 and pump 26.

Whenever the pump is in operation, it will be seen that nozzle 38 is dispensing one of the liquids of the system, that is, either water, soap, or solvent and generally the liquid under pressure from pump 26 will not be affected in line or conduit 37. However, should nozzle 38 or discharge line 39 become clogged or any obstruction appear within conduit 37 or beyond, and the pressure within the line reach a predetermined value, relief valve 32 will be actuated. Upon relief valve 32 being actuated, the discharge port 35 will be opened and the fluid will be expelled from the discharge port until the pressure in conduit 37 subsides and the relief valve is again returned to its unenergized state.

In operation, it will be seen that by depressing push-button switch 44 that a supply of solvent may be used to clean a particular area and depending upon the amount of water desired, push-button switch 41 may be depressed to give water at a pressure below that of the case where push-button switch 42 is energized which opens both solenoids in the parallel line from the source of water. By adjusting valve 16, soap may be dispensed at any given rate or any given consistency depending upon the type of cleaning job to be done.

From the foregoing description and drawings, it will be seen that a cleaning apparatus has been disclosed which makes use of a parallel water system to the pump to provide soap in the proper consistency and water of the proper pressure. By the use of the invention disclosed the amount of soap being dispensed may be controlled by controlling the water to the mixture and different types of soap may be used by controlling the amount of water used with the mixture.

It will, of course, be understood that various changes may be made in the form, details, arrangement and proportions of the parts without departing from the scope of this invention which consists of the matter shown and described herein and set forth in the appended claims.

What is claimed is:

1. In a cleaning apparatus:

(*a*) pump means having a liquid inlet and a liquid outlet, said pump means taking liquid thereinto at its inlet and discharging such liquid through its outlet;

(*b*) flow direction means connected to said pump outlet for directing the flow of such liquid against a surface to be cleaned;

(*c*) a relief valve having a liquid inlet, outlet, and discharge port, said relief valve being energized by the pressure at said inlet exceeding a predetermined magnitude to discharge such liquid through said port, and being deenergized by said pressure dropping below said predetermined magnitude to prevent discharge of such liquid through said port;

(*d*) a first conduit connected between said pump means outlet and said flow directing means, said conduit having said relief valve disposed therein;

(*e*) a pair of conduits, each having a first end connected with said pump means inlet and each having a second end adapted to be connected to a source of liquid under pressure;

(*f*) an adjustable valve disposed in one of said pair of conduits for restricting the flow of such liquid into said pump means by a predetermined amount;

(*g*) a pair of control valves disposed in each of said pair of conduits, said valves allowing such liquid to flow therethrough in one position and shutting off the flow in another position;

(*h*) a check valve allowing fluid to flow in one direction only;

(*i*) a fourth conduit connected to said pump means inlet and adapted to be connected to a source of liquid cleaner, said fourth conduit having said check valve disposed therein allowing such liquid cleaner to be drawn from said source;

(*j*) and a plurality of control elements constructed and arranged to be carried by said flow directing means, said plurality of control elements being operably connected to said pair of control valves whereby said pair of control valves may be simultaneously opened and closed and controlled individually.

2. The invention as set forth in claim 1 wherein said pair of control valves are opened and closed electrically and said plurality of control elements include electrical switching apparatus, said switching apparatus having electrical contacts for energizing said pair of control valves when it is desired that such liquid and liquid cleaner

are to be dispensed, otherwise deenergizing said control valves.

3. In a cleaning apparatus:

(*a*) pump means having a liquid inlet and a liquid outlet, said pump means taking liquid thereinto at its inlet and discharging such liquid through its outlet;

(*b*) flow direction means connected to said pump outlet for directing the flow of such liquid against a surface to be cleaned;

(*c*) a relief valve having a liquid inlet, outlet, and discharge port, said relief valve being energized by the pressure at said inlet exceeding a predetermined magnitude to discharge such liquid through said port, and being deenergized by said pressure dropping below said predetermined magnitude to prevent discharge of such liquid through said port;

(*d*) a first conduit connected between said pump means outlet and said flow directing means, said conduit having said relief valve disposed therein;

(*e*) a pair of conduits having a first common end connected with said pump means inlet and having a second common end adapted to be connected to a source of water under pressure;

(*f*) an adjustable valve disposed in one of said pair of conduits for restricting the flow of such water into said pump means by a predetermined amount;

(*g*) a pair of solenoid operated valves disposed in each of said pair of conduits, said valves allowing such water to flow therethrough in one position and shutting off the flow in another position;

(*h*) a check valve allowing fluid to flow in one direction only;

(*i*) a fourth conduit connected to said pump means inlet and adapted to be connected to a source of liquid detergent cleaner and a source of liquid soap, said fourth conduit having said check valve disposed therein;

(*j*) electrical power means;

(*k*) and a plurality of control elements carried by said flow directing means, said plurality of control elements being operably connected between said electrical power means and said pair of solenoid operated valves and said pump means, a first of said control elements applying power to said pump means only, a second of said control elements applying power to said pump means and said solenoid operated valve disposed in the same conduit as said adjustable valve, a third of said control elements applying power to said pump means and both of said solenoid operated valves, a fourth of said control elements applying power to said pump means and said solenoid operated valve disposed in the conduit not containing said adjustable valve, and a fifth control element disengaging any of said first, second, third, and fourth elements thereby disengaging said power means.

4. In a cleaning apparatus:

(*a*) pump means having a liqud inlet and a liquid outlet, said pump means taking liquid thereinto at its inlet and discharging such liquid through its outlet;

(*b*) flow direction means connected to said pump outlet for directing the flow of such liquid against a surface to be cleaned;

(*c*) relief valve means having a liquid inlet, outlet, and discharge port, said relief valve means being energized by the pressure at said inlet exceeding a predetermined magnitude to discharge such liquid through such port, and being deenergized by said pressure dropping below said predetermined magnitude for passage of such liquid from said inlet through said outlet;

(*d*) first conduit means connected between said pump means outlet and said flow directing means, said conduit means having said relief valve means disposed therein;

(*e*) a pair of conduit means having one of their ends connected with said pump means inlet and having their other ends adapted to be connected to a source of liquid under pressure;

(*f*) control valve means disposed in each of said pair of conduits, said valve means having different size openings allowing such liquid to flow therethrough at different rates of flow in one position, and shutting off the flow in another position;

(*g*) valve means allowing fluid to flow in one direction only;

(*h*) conduit means connected to said pump means inlet and adapted to be connected to a source of liquid cleaner, said conduit means having said last named valve means disposed therein allowing such liquid cleaner to be drawn from said source;

(*i*) and a plurality of control means carried by said flow directing means, said plurality of control means being operably connected to said control valve means whereby at least one of said control valve means may be opened and closed.

5. The invention as set forth in claim 3 wherein said adjustable valve disposed within one of said conduits is adjusted to provide the proper restriction within said conduit to provide reduced pressure within said fourth conduit and allow such liquid soap to be drawn into said pump means with such water.

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