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LIQUID SPRAY WASHING APPARATUS

Filed Aug. 8, 1962

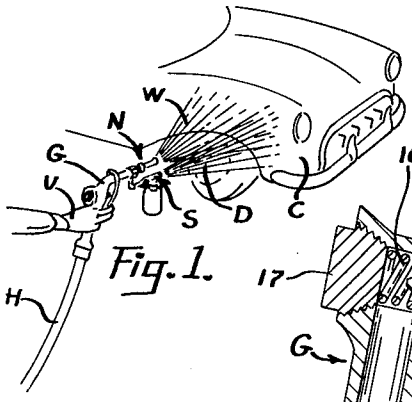


Fig. 1.

Fig. 2.

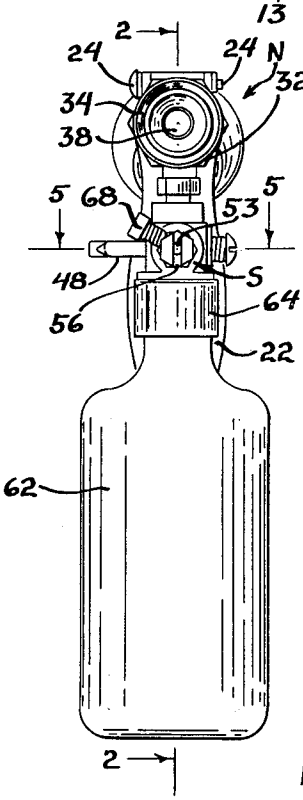


Fig. 3.

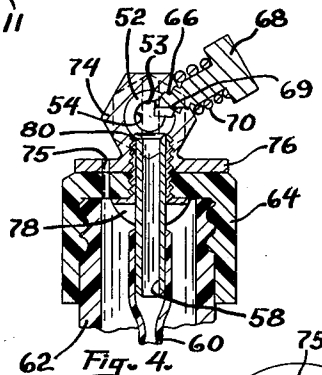


Fig. 4.

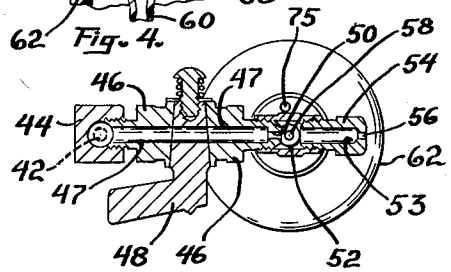


Fig. 5.

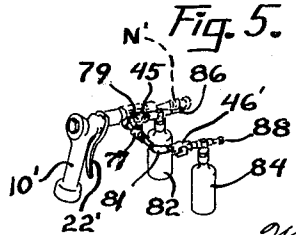


Fig. 6.

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LIQUID SPRAY WASHING APPARATUS

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This invention relates generally to a liquid spraying device, particularly to such a device adapted to spray a liquid cleaning solution and/or a rinsing fluid, and more particularly to such a device which is particularly well suited to operate off of a common garden hose and wash automobiles.

Many devices are known to the prior art for use in washing various objects with soap solutions. However, these have various deficiencies. For example, many such devices utilize solid soaps in water-tight chambers and force fluids through the chambers to form a soap solution. One disadvantage of devices employing solid soaps is that, as they are used during the washing process, they are expended and the strength of the solution becomes more and more diluted. Another disadvantage is that soap remaining in the chamber becomes lumpy, clogs the openings of the apparatus, makes it difficult to clean, and creates many other problems.

It has also been proposed to employ liquid soaps or detergents in such devices. The prior art devices utilizing liquid soaps also have a number of drawbacks. One such drawback is that many devices of this type have a large number of parts and are, therefore, complex and expensive. Other known prior art devices employing liquid cleaning solutions require the expenditure of soap solution and rinsing fluid at the same rate. This uses large quantities of soap or detergent and is highly wasteful. Other known prior art devices utilize compressed air. These latter devices require extra equipment and are therefore, expensive. Furthermore, when using these devices, damage may result to highly polished surfaces, such as painted automobile finishes, because of the high velocity discharge of various impurities and solid particles that may be contained in the water or cleaning solution.

It is, therefore, an object of the present invention to provide an improved spray washing device.

Another object of this invention is to provide such a device which is simple and has few parts, many of which are standard available components.

Another object of this invention is to provide such a device which utilizes liquid cleaning solutions.

Another object of this invention is to provide such a device wherein the flow rate of the liquid cleaning solution may be low while that of the rinse solution may be high.

Another object of this invention is to provide such a device wherein compressed air is not required.

Another object of this invention is to provide such a device, the operation of which may be controlled by a single valve control member.

Another object of the invention is to provide such a device wherein accurate control of the type of soap solution spray produced by the device is afforded.

The manner in which the above objects are attained will be more apparent from the following description, the appended claims and the figures of the attached drawings, wherein:

FIG. 1 is a pictorial illustration of one embodiment of this invention shown connected to a garden hose and being used to wash a car;

FIG. 2 is a cross sectional illustration of the FIG. 1 embodiment of this invention taken along the lines 2—2 of FIG. 3;

FIG. 3 is a front view of the device of FIG. 2;

FIG. 4 is an enlarged cross-sectional detail view of the aspirator mechanism of this invention;

FIG. 5 is a cross-sectional view taken along lines 5—5 of FIGS. 2 and 3, and

FIG. 6 is an illustration of a further embodiment of this invention.

In FIG. 1, one useful application of the invention is pictorially illustrated as involving the connection of the inventive device, designated generally G, to a conventional garden hose H, and its utilization by being held by the hand U of a user to wash an automobile C. Device G comprises a double-barrelled gun-like structure having a trigger, a rinse spray nozzle assembly N and a soap solution spray nozzle assembly S. In FIG. 1, both sprays of rinse water W and soap solution D are shown as being produced and ejected.

Some of the constructional features of the FIGS. 1–5 embodiment of this invention are illustrated in detail in FIG. 2, wherein it will be seen that device G generally comprises an L-shaped body having a water supply conduit **10**, forming a piston-like grip adapted to be held by the hand of a user and provided with a female coupling **12** at the inlet end thereof for connection to a water supply, such as a garden hose. Within coupling **12** there is positioned a rubber or soft plastic sealing washer **13**, for sealing with the usual water supply coupler, which includes, integral therewith, a wire mesh strainer **11** for straining impurities from water that flows through the conduit from the water supply in operation. At the outlet end of conduit **10** there is a main valve including a valve disc **14** which seats against a valve seat **15** formed therein and is urged thereagainst by a suitable compression spring **16**. A threaded plug **17** ordinarily retains but allows removal of spring **16** and valve disc **14** from the body. Integral with valve disc **14** is an actuating pin **18** which extends through a removable and adjustable sealing bushing **20** to the exterior of the body. An actuating trigger **22** is hinged on pin **24** mounted in the body in such a manner as to be selectively manually depressible toward said body against pin **18** to unseat disc **14** from the valve seat **15**, but to normally be biased by said pin away therefrom.

By this main valve, water fed to conduit **10** may pass through the opened main valve into a discharge conduit **26** which forms part of the body and is disposed at an angle to conduit **10**. The down-stream end of the body which forms conduit **26** is provided with external screw threads **28** to which is secured a tubular member **30**. Member **30** is internally threaded at one end to effect such securement, and to its other end is attached the rinse nozzle assembly N, which is of the type commonly employed for garden hose nozzles. Rinse nozzle assembly N includes a nozzle body **32** and an adjustable collar **34** which adjustably screws onto threads **35** over a central pin member **36** which carries a valve disc **38**, both the threads and pin member being formed on the housing **32**. By screwing collar **34** onto threads **35**, valve seat **40** formed internally in collar **34** may be caused to seat against valve disc **38**, thereby shutting off the water supply, if the main valve is opened, from rinse nozzle assembly N or moved away therefrom to allow water to flow therethrough.

Tapped into tubular member **30** intermediate its ends and at one side thereof is a short pipe **42**. An elbow **44** is attached to pipe **42** and allows water to flow into soap solution spray nozzle assembly S including a petcock type valve **46**, when the main valve is opened. Valve **46** includes a housing **47** having a passageway therein and a rotary petcock member **48** which intersects the passage and has a transverse fluid bore therein which may be either aligned with the passageway in housing **47** in the position shown in FIG. 2, or turned transversely out of alignment by rotating the petcock member to prevent any

water passing therethrough to the soap solution spray nozzle assembly. The outlet of the passageway of valve 46 communicates with a jet nozzle 50 formed at one end of housing 47 and of reduced cross section relative to the passageway, which creates and passes a high velocity jet of water into and through a chamber 52 formed in a fitting 74 that is secured to valve housing 47. Chamber 52 comprises a mixing and metering chamber for water, air and cleaning solution and for convenience will be referred to as a vacuum chamber. From vacuum chamber 52 the water passes into passageway 53, that is of larger diameter than jet nozzle 50, formed in spray nozzle 54 which may be provided at its free end with a transverse discharge straight slot orifice 56 adapted to provide a flat fan-shaped spray. It will subsequently be seen that elements 50, 52 and 53, taken with associated elements to be described, form an aspirator.

Communicating with aspirator vacuum chamber 52 is a rigid cleaning solution tube 58, which preferably is metallic. A section of relatively flexible tubing 60 is connected to tube 58 and extends into a suitable receptacle 62, such as a plastic bottle, adapted to hold the cleaning solution. Receptacle 62 is mounted on the soap solution spray nozzle assembly by means of a screw cap 64 to which it is detachably secured.

The aspirator mechanism including the cap 64, solution tube 58 and flexible tubing 60 structural relationship, is shown in detail in the enlarged cross-section of FIG. 4. To the outer lower surface of vacuum chamber fitting 74 a rigid washer 76 is secured. Washer 76 and fitting 74 may be of any suitable material, preferably metallic. In one embodiment of this invention, for example, these members are of brass and brazed together. A bottle cap 64, which may be of plastic, is secured, as by cementing, to washer 76. A screw 78, which, in the illustrated embodiment, is a rather large round headed brass machine screw, is anchored in a threaded bore formed partially in the top of cap 64, washer 76 and fitting 74. Screw 78 is bored completely along and through its longitudinal axis and its end 80 may be reamed so as to have a conical taper. Tube 58, which may also be brass, is rigidly connected to screw 78 as by being inserted into the bore provided in screw 78 and the end of the tube is flared by well-known techniques to prevent withdrawal of the tube from the screw and provide a tight friction fit. Alternatively, the ream at 80 may be omitted and the tube sweated into the screw. A hole of suitable size is drilled and tapped through the top of cap 64, washer 76, and fitting 74 to form the threaded bore into which the screw 78 with its contained tube 58 is inserted and anchored.

It will be further noted from FIG. 4 that a vent passage 75 is formed through washer 76 and the top of cap 64 to place the interior of receptacle 62 into communication with the atmosphere, and a drilled and tapped hole 66 is formed that enters through the side of the aspirator fitting 74 into the vacuum chamber 52. Into this hole is threadedly mounted for selective longitudinal adjustment an adjusting screw 68 which is suitably tensioned by means of a compressed coil spring 70 so as to be locked in any position of adjustment. Adjusting screw 68 includes a threaded shank tip with an axially extending groove 69 formed in its periphery. Groove 69 inclines radially inwardly from a shallow end closest to the head of the screw to a deepest end adjacent the free end of the shank tip. Longitudinal adjustment of screw 68 exposes a greater or lesser cross-sectional amount of groove 69, thereby controlling the amount of atmospheric air that is allowed to bleed into vacuum chamber 52 in operation. The amount of air that is allowed to so bleed varies the pressure in the vacuum chamber and determines the amount of cleaning solution that is aspirated out of receptacle 62, as atmospheric pressure is applied to the cleaning solution within the receptacle through vent passage 75. This bleed arrangement provides a sensitive adjustment for varying the ratio of aspirated cleaning solution to water that flows out of soap solution spray nozzle S. This is extremely important as it is undesirable to aspirate too much cleaning solution. Further, this bleed arrangement also permits air to enter the vacuum chamber during aspiration of soap solution and mix with the water and soap solution to form a uniform and proper spray and avoid forming a sudsy foam, which is both ineffectual as a cleaning agent and wasteful, which will result if proper mixing is not effected in the vacuum chamber. Further, the admission of bleed air into the vacuum chamber contributes materially to the proper aeration of the soap solution. In general, it is desired to restrict the consumption of cleaning solution to an economic minimum consistent with providing a spray of suitable consistency and adequate cleaning ability. The adjustable bleed provided by adjusting screw 68 provides a mechanism to achieve this desire. In practice it has been found that the bleed mechanism may be set so my apparatus, when operated on so-called "city water" averaging a pressure of about 70 p.s.i., consumes only ¾ of an ounce of cleaning solution to one gallon of water per minute, and the soap solution spray emanated from nozzle S is sufficiently strong to clean an automobile and of proper consistency.

The operation of the embodiment illustrated in FIGS. 1 through 5 will now be apparent. The coupling 12 attached to the end of a water supply hose and the receptacle 62 is filled with a suitable cleaning solution, such as a domestic liquid soap or detergent, many of which are on the market under trademarks, such as "Vel," "Swan" and "Lux." When it is desired to wash an object, such as an automobile, nozzle collar 34 is screwed upon threads 35 to shut off the water flow valve in the nozzle assembly N. Petcock valve 48 is then manually opened to the position illustrated. Upon depressing the trigger 22, valve disc 14 is lifted from valve seat 15, the main valve is opened, and water flows from the water supply to conduit 10 into conduit 26 and from thence through the pipe 42, elbow 44, valve 46, and to jet nozzle 50. The water forms a jet at jet nozzle 50 and is ejected through vacuum chamber 52 at high velocity into and through the passage 53 in nozzle 54, thereby creating a partial vacuum in chamber 52. The liquid solution, which is subjected to atmospheric pressure through vent hole 75, then rises through tubes 60 and 58 and enters vacuum chamber 52 where it mixes with the water jet, is aerated by bleed air and passes out of straight slot orifice 52 in the form of a flat, fan-shaped, shampoo-like spray of soapy water.

The object or area thereof being washed is covered with soapy spray, a scanning motion being employed by the user to dislodge dirt without creating any back splash, and valve 46 is closed by rotating petcock element 48 by 90° to shut off the supply of water from the soap solution spray nozzle. Rinse water nozzle N may then be opened by unscrewing nozzle collar 34 and a rinse spray of any desired shape and rate of flow afforded by a garden hose nozzle may be projected from the device against the object which is being washed to work in the soap, further dislodge dirt and rinse it way.

If desired, the spray of rinse water may be simultaneously ejected along with a spray of soap solution by opening both of the spray nozzles, as shown in FIG. 1. In operation, it is normally desirable to open and close the nozzle assemblies by actuating collar 34 and petcock valve 48 several times as various portions of an object being cleaned are treated. Great flexibility is provided in that bleed screw 68 may be set as desired; either, none or both nozzle assemblies N and S may be opened, and the general operation may be controlled by opening and closing the main water supply by squeezing or releasing trigger 22.

It will be apparent that a number of advantages are achieved by the novel construction of this device. For

example, solid soaps are not employed, only a liquid soap solution or a liquid detergent. This prevents the problems pointed out above which often arise due to the use of solid soaps. Another advantage is that the rinse water and the washing solution are provided through two separate nozzles. This means that the flow rates may be individually varied so as to use a minimum amount of soap solution spray relative to rinse water spray to accomplish the desired results while still utilizing sufficient water to rinse properly. This benefit results from dimensioning the separate nozzles differently so as to provide the desired flow rates. The fact that the two separate nozzles receive water from a common source provides still another advantage. This is the advantage of utilizing a single trigger means to control the ejection of both washing solution and rinse water sprays. This results in added convenience to the user. Another advantage results from the mixing and metering chamber-aeration bleed mechanism arrangement which provides for sensitive control of the soap solution spray formed.

Another modification of this invention is illustrated in FIG. 6. In the embodiment of FIG. 6, many of the elements are similar to those described relative to FIGS. 2–5 and the same reference numerals are employed therefor with a prime (') added. For clarity, the rinse water nozzle assembly N' is shown in phantom lines.

In the embodiment of FIG. 6, wherein two soap solution sprays may be formed, the elbow **44** of the FIG. 2 embodiment is replaced by a tee **77** which enables water to flow to either or both elbow **79** and elbow **81**. From these elbows, water may respectively pass through a petclock valve (**45, 46'**) through an aspirator mechanism similar to that previously described with regard to FIGS. 1–5, and to a spray nozzle (**86, 88**). Associated with each of these "twin" soap solution spray assemblies is a cleaning solution receptacle (**82, 84**).

One of the primary advantages obtainable from the embodiment of FIG. 6 is that cleaning solutions of different types and strengths may be provided for specialized applications. For example, receptacle **82** may be filled with a strong cleaning solution for use on white walled tires and receptacle **84** may be filled with a standard solution suitable for cleaning painted automobile bodies. In each instance, the bleed mechanism may be employed to produce the type of spray desired.

It will be noted that, with the embodiment illustrated in FIG. 6, the various advantages set forth above in connection with the FIGS. 1–5 embodiment are retained. However, an additional advantage is achieved by providing the ability to use plural types of cleaning solutions.

Although this invention has been described with particular reference to its preferred use as a washing and rinsing apparatus, it is to be understood that its possible uses are not, in fact, so limited. Other fluids may be used herein besides water and soap or detergents.

The many advantages of this invention over prior art devices will be immediately apparent to one skilled in the art. For example, the devices are compact, are low cost to manufacture as they use many readily available standard components, involve only a single connection to a garden hose or the like to render them operable, and require just a single manual control to operate after being set. It will also be apparent that many modifications of this invention are possible without departing from the spirit and scope thereof. Accordingly, the above description is to be construed as illustrative, rather than limiting. This invention is to be construed as limited only by the scope of the following claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A washing device which comprises a plurality of conduit means; a first normally closed valve connected to supply, upon actuation, pressurized first fluid to each of said plurality of conduit means; first nozzle means at the outlet of a first of said conduit means, said first nozzle means including means for selectively preventing or allowing fluid flow therethrough; cleaning fluid valve means at the outlet of each of the remaining conduit means; aspirating means at the outlet of each of said cleaning fluid valve means, said aspirating means including aspirated fluid supply means; adjustable air bleed means connected to said aspirating means to allow controlled passage of atmospheric air into said aspirating means; and cleaning fluid nozzle means connected to each of said aspirating means to discharge a spray mixture of air, first fluid, and aspirated fluid therefrom.

2. The device of claim 1 wherein said aspirated fluid supply means comprises cleaning solution receptacles mounted on said device.

3. A spraying device which comprises, in combination, a first valve having its inlet side connectable to a pressurized first fluid source; means for actuating said first valve to allow the passage of first fluid therethrough; first nozzle means communicating with the outlet of said first valve to permit the flow of first fluid therefrom; second valve means in cooperative relationship with said first nozzle means to selectively prevent and allow passage of first fluid therethrough; third valve means communicating with the outlet of said first valve means to selectively prevent and allow passage of first fluid therefrom; conduit means defining a fluid passage, a first end of said conduit means connected to the outlet of said third valve means; second nozzle means connected to a second end of said conduit means; aspirator means on the conduit means intermediate said third valve means and said second nozzle means and including a vacuum chamber therein; a liquid receptacle; fluid conduit means connected between said vacuum chamber and said receptacle for feeding liquid from said receptacle into said chamber; and adjustable air bleed means for permitting atmospheric air to enter the vacuum chamber in a controlled manner.

4. An easily portable hand-held washing device which comprises: a pistol grip means including a hollow handle defining a water passage therethrough connectable to a pressurized water source and a trigger-operated valve to selectively allow the passage of water therethrough; first nozzle means communicating with the outlet of said first valve to permit the flow of water therefrom; second valve means in cooperative relationship with said first nozzle means to selectively prevent and allow passage of water therethrough; third valve means communicating with the outlet of said first valve means to selectively prevent and allow passage of water therefrom; conduit means defining a water passage, a first end of said conduit means connected to the outlet of said third valve means; second nozzle means connected to a second end of said conduit means; aspirator means on the conduit means intermediate said third valve means and said second nozzle means and including a vacuum chamber therein; a cleaning liquid receptacle; cleaning liquid conduit means connected between said vacuum chamber and said receptacle for feeding liquid from said receptacle into said chamber; and adjustable air bleed means for permitting atmospheric air to enter the vacuum chamber and mix with said water and cleaning liquid in a controlled manner.

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