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(54) Cleaning apparatus

(57) A suction cleaner comprises a cleaning fluid dispensing system mounted in the hand-grip of its suction hose for dispensing shampoo cleaning fluid during the washing function of the cleaner. The dispensing system comprises a container divided into two compartments 36, 34 by a rolling-wall type diaphragm 64, the first compartment 36 forming a reservoir for the cleaning fluid and having an outlet 60, and the second compartment 34 having an inlet 58 for water under pressure.

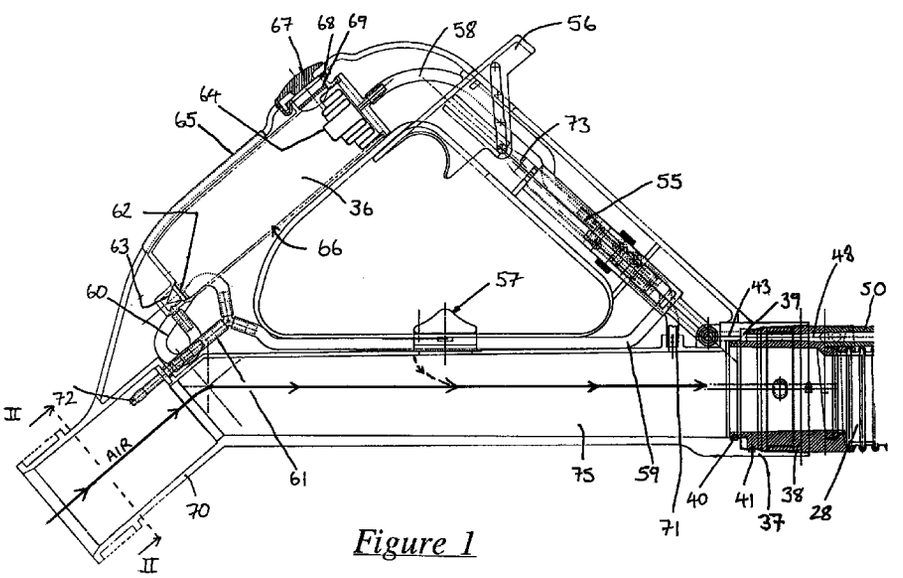

Figure 1

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Description

This invention relates to cleaning apparatus, such as a multi-function suction cleaners, having a cleaning fluid dispensing system.

In multi-function suction cleaners having a washing mode of operation, the cleaning fluid or shampoo must normally be pre-mixed with water in a reservoir within the cleaner. A disadvantage of this is that the correct quantity of shampoo must be pre-mixed with the water every time the water reservoir is filled. Another disadvantage of known multi-function cleaners is that they do not offer a rinsing mode of operation. It has been proposed to provide a reservoir of cleaning fluid, arranged for cleaning fluid to mix with a stream of clean water being pumped to the washing head from the cleaner: these proposed arrangements have been generally complex with several flow valves through which the cleaning fluid passes; the valves are liable to become blocked when the equipment is not in use and the residual cleaning fluid in the valves dries out.

In accordance with this invention there is provided a cleaning apparatus comprising a cleaning fluid dispensing system which comprises a reservoir divided into two compartments by a flexible wall, a first compartment for containing cleaning fluid and having a dispensing outlet, and the second compartment having an inlet for water under pressure.

Thus when water under pressure is applied to the second compartment, cleaning fluid is dispensed from the reservoir. Preferably the water under pressure is branched from a main flow of water passing to the cleaning or washing head of the apparatus, and the dispensed cleaning fluid mixes with this flow downstream of the branching point in a WASH mode of the apparatus.

Preferably the cleaning fluid reservoir is mounted in a hand-grip, which comprises a tubular portion connectable at a first end to a flexible suction hose extending from a suction cleaner body of the apparatus and at its second end to a wand or directly to the cleaning or washing head of the apparatus (at the user's choice). Preferably the hand-grip includes an L-shaped handle joined at its opposite ends to the tubular portion: preferably the second end of the latter is angled to extend generally parallel to the adjacent, first arm of the L-shaped handle. The user grips the hand-grip around the second arm of the L-shaped handle.

Preferably the dispensing system includes a control valve for controlling the flow of the water under pressure. In one setting, the water is applied to the dispenser over a branch to dispense cleaning fluid into the main flow. In another setting, the branch to the dispenser is shut-off and clean water only flows to the cleaning head, for rinsing purposes. In a further setting, the branch to the dispenser is connected to the air suction stream to drain the water compartment of the dispenser and so allow the cleaning fluid compartment to expand for refilling the latter with cleaning fluid. In a yet further setting, the feed of water to the dispenser and to the cleaning head and the suction to the water compartment of the dispenser are all shut-off, to provide a DRYING mode in which the apparatus applies normal suction only to the cleaning head.

In a preferred embodiment, the dispensing system is controlled by a single valve permitting one-handed operation, with the cleaning fluid mixing with the water downstream of the valve and therefore without the risk of the valve becoming blocked.

Preferably the control valve is mounted in the hand-grip and is manually operated by an actuator (preferably a slidable trigger) also mounted on the hand-grip. Preferably the actuator detents in its respective positions. Preferably the actuator includes indicia or other markings visible, in each of its positions, to indicate the operating mode.

Preferably only one fill of the shampoo or cleaning fluid reservoir is necessary for several (e.g. two) refills of the water reservoir in the cleaner.

Preferably the reservoir is tubular in shape and the flexible wall comprises an elastomeric diaphragm sealed across one end of the compartment. Preferably the diaphragm is a rolling-wall type of diaphragm, comprising a series of annular sections, one encircling another and joined together to form a convoluted configuration. Under pressure from one side of the diaphragm, the diaphragm expands along the length of the reservoir by means of the annular sections inverting: for example, they may invert one-by-one, starting with the centre section.

Preferably the dispensing outlet of the reservoir forms a constriction which determines the rate of flow of cleaning fluid, for a constant applied water pressure, so that the water finally passing to the cleaning head will include a constant concentration of the cleaning fluid. Preferably the dispensing outlet is provided with a non-return valve.

An embodiment of this invention will now be described by way of examples only and with reference to the accompanying drawings, in which:

FIGURE 1 is a longitudinal section through a hand-grip of a suction cleaner in accordance with this invention;

FIGURE 2 is a sectional view along the line II-II of the hand-grip Figure 1;

FIGURE 3 is a block diagram to explain the operation of a dispensing valve of the hand-grip of Figure 1, in a WASH mode of the cleaner;

FIGURE 4 is a block diagram to explain the operation of the dispensing valve in a RINSE mode of the cleaner;

FIGURE 5 is a block diagram to explain the operation of the dispensing valve in a DRYING mode of the cleaner; and

FIGURE 6 is a block diagram to explain operation of the dispensing valve in a REFILL mode of the cleaner;

Referring to Figure 1 of the drawings, there is shown a hand-grip of a suction cleaner in accordance with this invention, the hand-grip comprising an injection moulded plastics body which is formed in two halves, so as to allow components to be mounted inside the hand-grip before its two halves are joined. The hand-grip includes a straight tubular portion 75 formed at one end with the tubular collar 37 which connects to a suction hose 28, and formed at its opposite end with an angled portion which terminates in an end connector 70 to which an extension tube or a cleaning accessory may be connected. The hand-grip further comprises an L-shaped handle, having a first arm joined to the tube 75 adjacent the end connector 70 and a second arm joined to the tube 75 adjacent the end connector 37. The first arm of the L-shaped handle lies parallel to the axis of the end connector 70 and the second arm of the handle lies substantially perpendicular to the axis of the end connector 70. A slidably-mounted suction control knob 57 is mounted on the tube 75 under the L-shaped handle, to control a window allowing air to enter and reduce the suction at the inlet connector 70 if desired.

A passage 43, which receives water from the body of the cleaner via the fluid feed tube 50, is connected to a port 100 of a dispenser valve 55 housed within the second arm of the L-shaped handle and shown in detail in Figure 8. The dispenser valve 55 comprises a piston 101 which is slidably mounted in a barrel 102. An actuating rod 73 connects the piston 101 to a trigger 56 on the handle. The valve further comprises a manifold 74 having three ports 103, 104, 105 which extend through the side wall of the barrel 102 and are connected to outlets 80, 81, 82 respectively. O-ring seals e.g. 83 are mounted around the piston 101 at intervals along its length. An annular cut-out 84 is formed in the piston 101 to connect ports 103 and 104 together when the piston is slid fully into the barrel, i.e. when the end of the piston is positioned at A (Figure 11). As the piston 101 is retracted from this position, water from passage 43 can enter the barrel 102 and the position to which the piston is retracted determines to which of outlets 80, 81, 82 the water flows. With the end of the piston at position C (Figure 9), water flows out through port 105 only. If the piston is withdrawn to position D (Figure 8), then water can flow out of both ports 104 and 105. To shut off the flow of water altogether, the piston is pushed back into the barrel to position B (Figure 10).

An elongate cylindrical shampoo reservoir 66 is disposed within the first arm of the handle of the hand-grip. A removable plug 67 covers an aperture 68 for filling the shampoo reservoir 66, preferably from a sachet of shampoo. A fine gauze filter 69 covers the aperture to prevent any dirt entering the reservoir. A portion of the handle wall overlying the reservoir 66 is formed with a window 65 which enables the user to see how much shampoo is left within the reservoir 66. An elastomeric diaphragm 64 is sealed across an end of the reservoir 66: the diaphragm 64 is a rolling wall type, moulded in a convoluted shape such that it is able to open out when unequal pressures are applied to the compartments 34, 36 on its opposite sides. A pipe 58 is connected to the adjacent end wall of the reservoir 66 from the outlet 81 of the dispenser valve 55.

The opposite end of the reservoir 66 is formed with an outlet aperture in which an orifice plate 62 is disposed. Orifice plate 62 comprises a metal disc having a small hole in its centre, the size of the hole determining the rate of flow of shampoo from the compartment 36 of the reservoir. A non-return valve 63, of the duck-bill type, is mounted over the orifice plate 62.

The operation of the dispenser valve 55 and shampoo reservoir 66 will now be described with reference to Figures 3 to 6 of the drawings. Figure 1 shows the dispenser valve set in the wash mode, by setting the piston with its end at position D. In this mode both water and shampoo are fed to the shampoo head via an outlet pipe 61. Water under pressure enters the valve barrel and passes out through ports 104 and 105 and along pipes 58 and 59. Pipe 58 is connected to the compartment 34 of the shampoo reservoir 66. The water pressure on the inlet side of the diaphragm 64 is approximately 22 psi, whilst the other side of the diaphragm (in contact with the shampoo) is at atmospheric pressure. Thus shampoo is forced out of the compartment 36 of the reservoir 66 through the orifice plate 62 and non-return valve 63 to mix with the flow of fresh water passing along the pipe 59. The size of the hole formed in the orifice plate 62 determines the concentration of shampoo in the mixture. It should be noted that the pump 25 of the cleaner maintains a constant pressure of water behind the diaphragm 64, so that the flow-rate of the shampoo remains constant. The diaphragm 64 progressively expands and eventually will completely fill the compartment 36 of the shampoo reservoir 66, whereupon the reservoir will need refilling. For this purpose, all of the water contained behind the diaphragm 64 must be drained, to return the diaphragm 64 to its original convoluted configuration. Figure 6 shows the piston 101 fully inserted into the barrel 102 to position A, to provide the drain mode. The annular cut-out 84 formed in the piston 101 now connects the water space behind the diaphragm to the tube 75 of the hand-grip, by way of a pipe 71 connected to the manifold 74. Thus the water in the compartment 34 is sucked out into the air stream which is passing to the cleaner through the suction hose 28. The nozzle of a shampoo sachet is introduced into the filling aperture 68 and squeezed by hand to refill the reservoir: this refilling is assisted in that as the diaphragm 64 collapses, fresh shampoo is drawn into the compartment 36 by suction.

If it is desired to rinse a surface with fresh water only, the piston 101 is set to position C within its barrel as shown in Figure 4. In this rinse mode, water passes out of the valve 55 only through the fresh water pipe 59. No shampoo is dispensed in this mode because no water pressure is applied to the diaphragm 66 in the shampoo reservoir.

In order to dry a surface being cleaned, the flow of both water and shampoo is stopped by setting the piston 101 with its end at position B as shown in Figure 5.

The trigger 56 which controls the piston 101 is slidably mounted and projects through the second arm of the L-shaped handle. The piston actuating rod 73 is journalled to the trigger 56 such that sliding the trigger inwardly or outwardly moves the piston 101 into or out of the valve barrel. The user places his or her index finger on the profiled inner end of the trigger 56 to move it outwards and his or her thumb on the outer end of the trigger to move in inwards: the trigger detents in each of its different positions.

The angled end connector 70 of the hand-grip comprises an oval-section female socket as shown in Figure 2. An outlet pipe 72 is mounted to project into this socket parallel to its axis, the inner end of the pipe 72 being connected to the pipe 61. The female connector 70 is arranged for receiving the male end of an extension tube or cleaning accessory. Typically two rigid extension tubes are provided with the cleaner, each having a male connector at one end and a female at the other.

The extension tubes connect the hand-grip to the tool being used e.g. a shampoo cleaning head. The outlet pipe 72 of the hand-grip connects to a fluid feed tube running along the extension tubes.

Claims

1. A cleaning apparatuses comprises a cleaning fluid dispensing system which comprises a reservoir (66) divided into two compartments (34, 36) by a flexible wall (64), a first compartment of the reservoir (36) for containing cleaning fluid and having a dispensing outlet (60) and the second compartment (34) of the reservoir having an inlet (58) for water under pressure.

2. A cleaning apparatus as claimed in claim 1, characterised in that the water under pressure is branched from a main flow of water passing to a cleaning or washing head of the apparatus and the dispensed cleaning fluid mixes with this flow downstream of the branching point in a WASH mode of the cleaner.

3. A cleaning apparatus as claimed in claim 2, characterised in that the dispensing system comprises control valve means (55) operable to relieve the second compartment (34) of the reservoir from the water under pressure, in a RINSE mode of the apparatus.

4. A cleaning apparatus as claimed in claim 3, characterised in that the control valve means (55) is operable to interrupt said main flow of water and to relieve the second compartment (34) of the reservoir from the water under pressure, in a DRYING mode of the apparatus.

5. A cleaning apparatus as claimed in claim 3 or 4, characterised in that the control valve means (55) is operable to interrupt said main flow of water and vent the second compartment (34) of the reservoir, in order to permit refilling of the first compartment (36) with cleaning fluid.

6. A cleaning apparatus as claimed in any one of claims 3 to 5, characterised in that the control valve means (55) comprises a single actuator (56) which is manually operable.

7. A cleaning apparatus as claimed in any preceding claim characterised in that the cleaning fluid reservoir (66) is mounted in a hand-grip which comprises a tubular portion (75) connectable at a first end (37) to a flexible suction hose (28) extending from a suction cleaner body (1) of the apparatus, and its second end (70) connectable to a wand or directly to the cleaning or washing head of the cleaner.

8. A cleaning apparatus as claimed in any preceding claim characterised in that the reservoir (66) is tubular in shape and the flexible wall (64) comprises an elastomeric diaphragm sealed across one end of the reservoir.

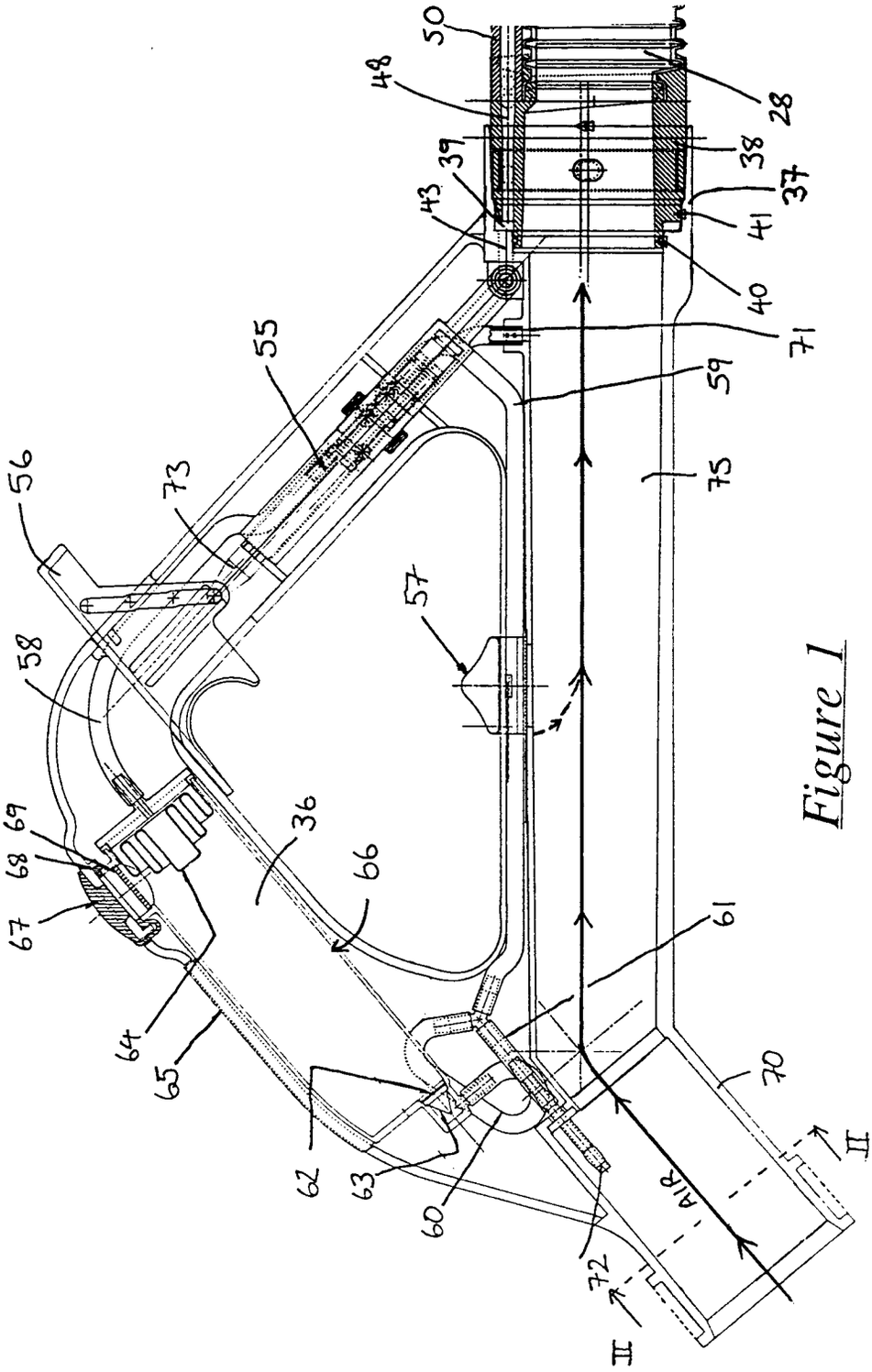

Figure 1

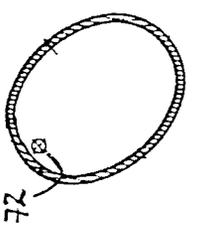

Figure 2

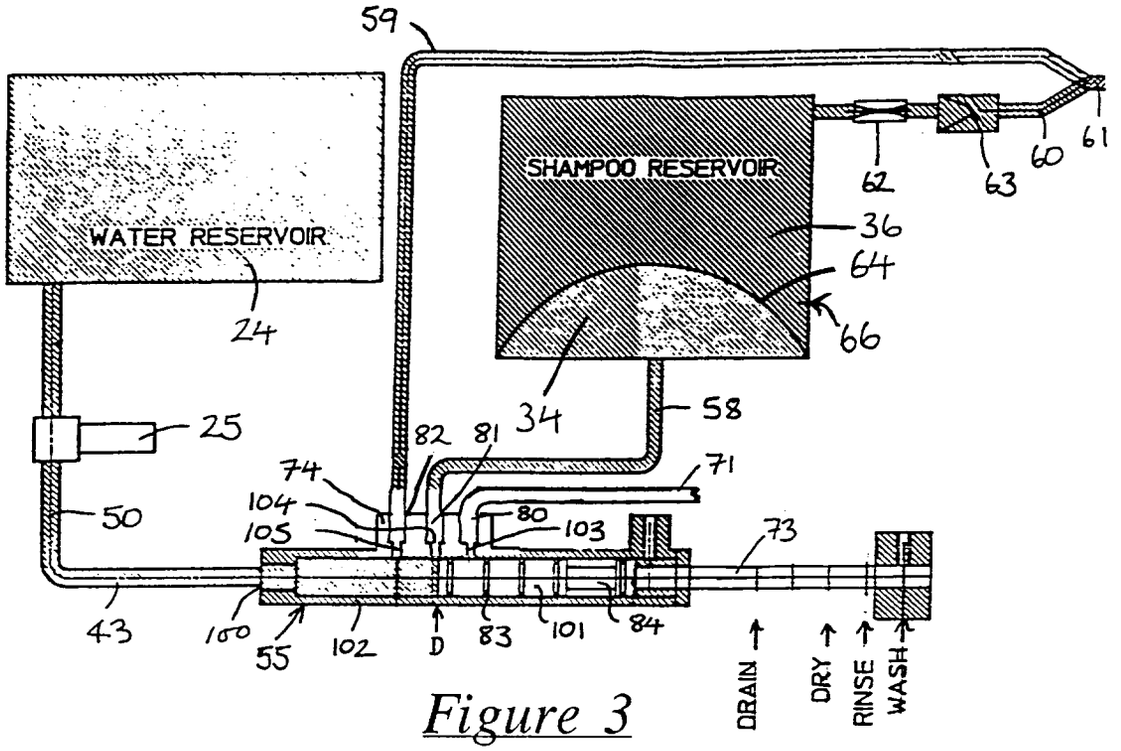

Figure 3

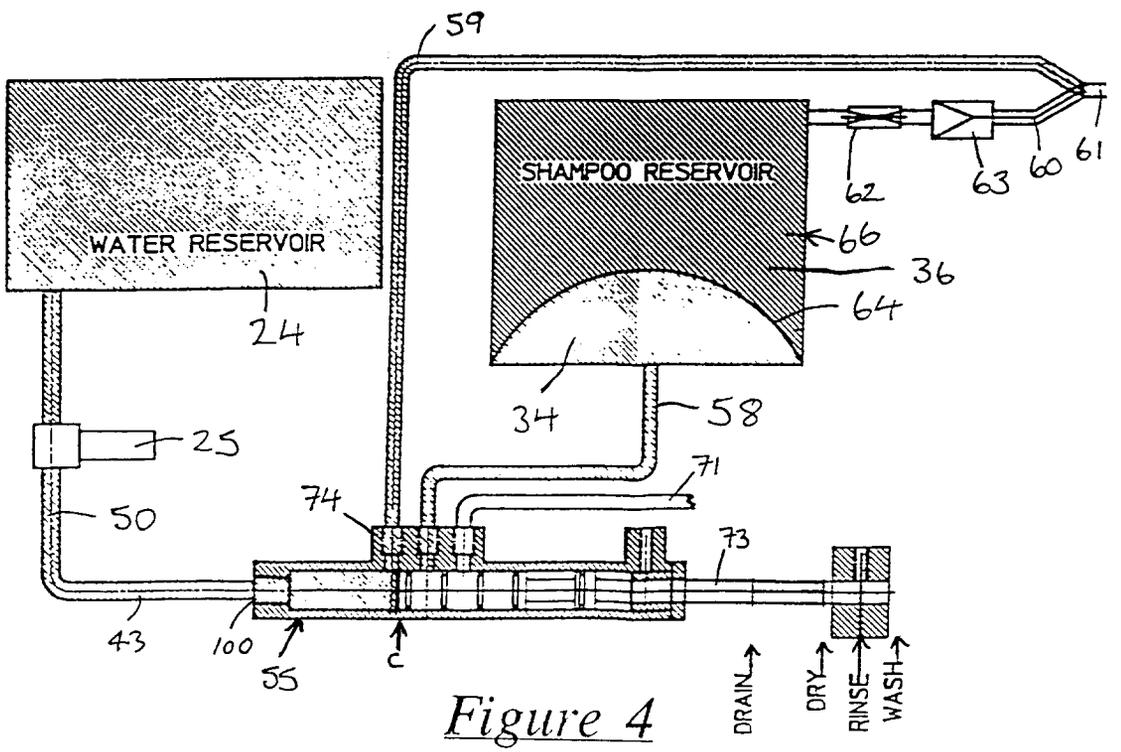

Figure 4

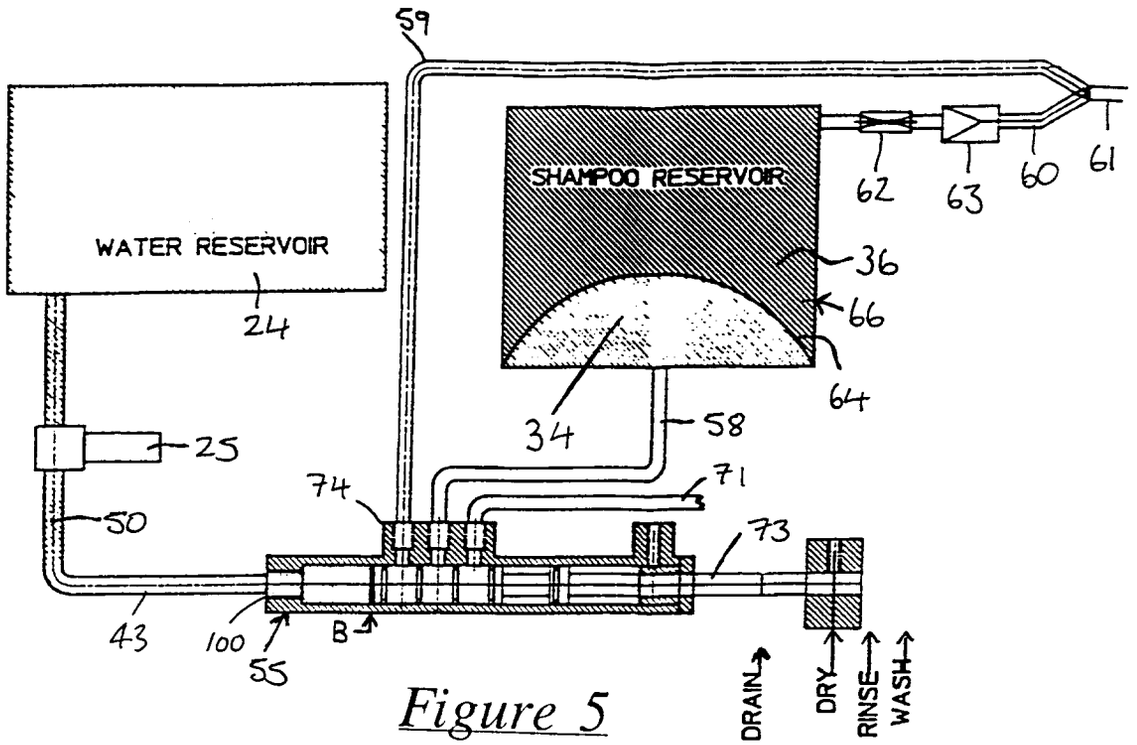

Figure 5

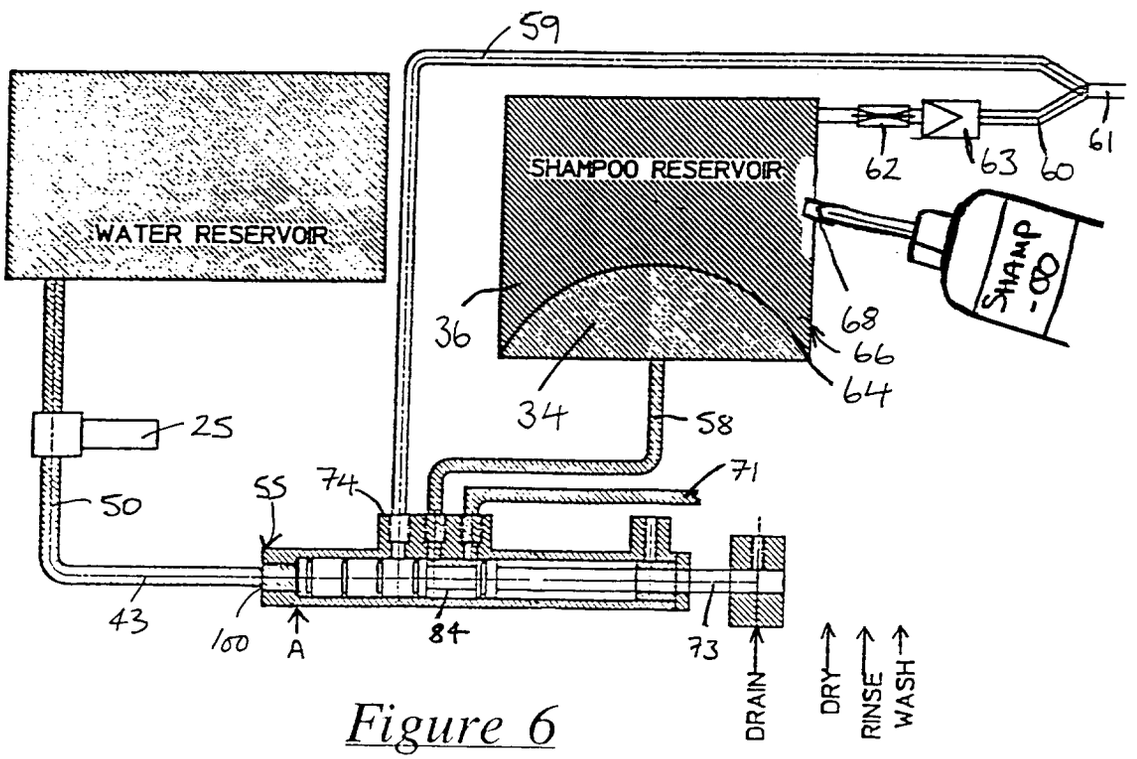

Figure 6