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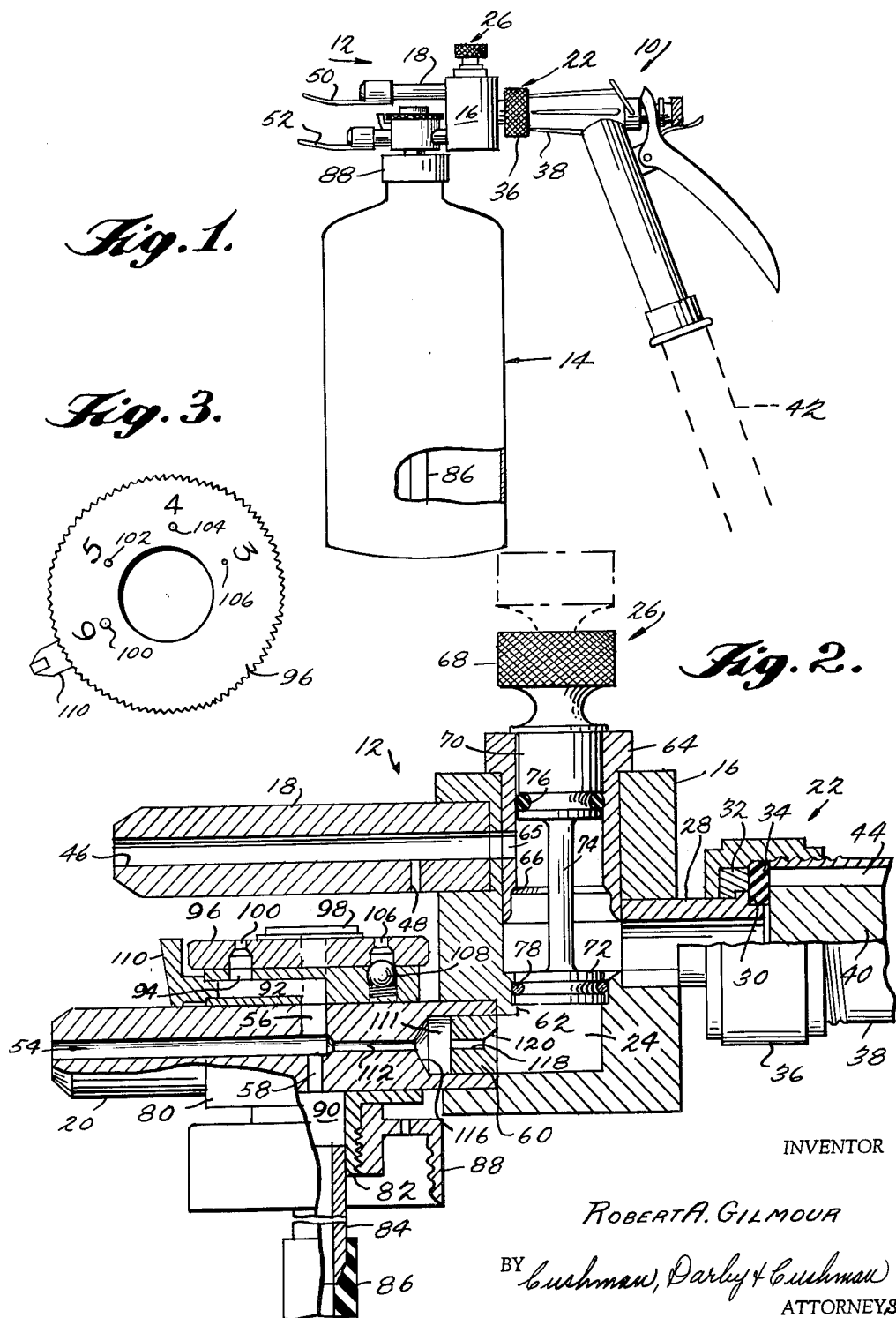
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DUAL SPRAY HEAD HAVING VENT CONTROL MEANS

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Fig. 1.

Fig. 3.



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DUAL SPRAY HEAD HAVING VENT CONTROL MEANS

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This invention relates to spraying devices and in particular to devices of the type in which a pressurized fluid creates a suction which draws a liquid to be sprayed into the conduit and discharges the same in admixture with the pressurized fluid.

Conventional sprayers include a container of liquid to be sprayed, a delivery tube having one end extending into the liquid and communicating at its other end with the suction zone of a spray head. The spray head conventionally includes an open-ended conduit having a fitting at one end for connecting with an air or water hose and a spray discharge opening at its other end. Intermediate its ends the passageway through the conduit has a portion of restricted cross section, the latter being located downstream of the restriction portion. When pressurized fluid is directed through the conduit from the fitting end, a negative pressure is created downstream of the restricted portion. When the delivery tube is connected into this suction zone varying amounts of the liquid to be sprayed may be drawn into the conduit, mixed with the pressurized fluid and discharged through the discharge aperture. Control of the relative amount of secondary liquid drawn into the conduit is conventionally achieved by incorporating an adjustable valve in the delivery tube or by venting the suction zone of the spray head to atmosphere through an adjustable valve.

According to the present invention a sprayer of the type just described is constructed and arranged so that (1) the secondary liquid may be sprayed in controlled admixture with the carrier fluid, (2) the carrier fluid stream may be ejected without the presence of secondary liquid and (3) the carrier fluid stream may be readily switched back to carrying secondary liquid in the same ratio without readjustment of the dilution control mechanism. This arrangement is advantageous when the sprayer is being used in a cleaning operation which requires periodic rinsing of the surface being cleaned. In particular, the device is well adapted for the cleaning of aluminum surfaces with acid. In recent years aluminum trailer bodies have come into wide use and while the aluminum is not subject to excessive corrosion it must be cleaned periodically to maintain its attractive appearance. Since the acid must not remain in contact with the metal for too long a period, it is desirable to acid-spray only a relatively small area of the trailer before rinsing away the acid and corrosion products with fresh water. The use of a single sprayer which can be easily and rapidly adjusted to provide either an acid spray or a fresh water spray effects an obvious saving in the time required for cleaning a large area.

The device is, of course, suitable for other types of operations such as garden spraying where it might be desirable to spray an insecticide and then rinse off fruit which is soon to be harvested.

It is a primary object of the present invention to provide a spraying device of the type described which incorporates in a single spray head means for spraying a liquid concentrate diluted to a controlled degree with carrier fluid, means for spraying the carrier fluid by itself and means for rapidly and easily switching from one spray to the other without the necessity of readjusting the dilution control.

It is another object to provide a unitary spray head having a first flow conduit for spraying a liquid concentrate diluted with carrier fluid, a second flow conduit for spraying only carrier fluid and valve means within the spray head for switching the entering carrier fluid from one conduit to the other.

It is a further object to provide a dual spray head of the type described above in which the degree of dilution of the liquid concentrate is controllable by means of a vent between the suction zone and the atmosphere and a valve associated with the vent for adjusting the cross section of the vent.

It is another object to provide a dual spray head of the type described above in which a restricting insert is associated with the mixture conduit for reducing the effect of carrier fluid pressure fluctuations on the dilution of the liquid concentrate.

The invention will be further understood from the following detailed description taken with the drawing in which:

FIGURE 1 is a side elevational view of a complete spraying device including a water nozzle, spray head and container for liquid to be sprayed;

FIGURE 2 is a side elevational view, partly in section, of the spray head of FIGURE 1; and

FIGURE 3 is a top plan view of the vent control valve of the spray head.

Referring to the drawings, there is shown in FIGURE 1 a spraying device which includes a conventional pistol-grip water hose nozzle 10, a spray head 12 constructed in accordance with the principles of the present invention and a plastic bottle 14 for containing acid concentrate or other liquid concentrate to be sprayed.

The spray head 12 includes a body portion 16 in the form of a hollow upright cylinder which supports two horizontal, vertically spaced spray conduits, or barrels 18, 20, a conventional female hose coupling 22 and a vertically movable valve member 24. The body 16 has a vertically extending axial passageway 24 which is open at the top to permit insertion of the valve member 26 and which communicates with three horizontal passageways for receiving the barrels 18, 20 and the hose coupling 22.

The hose coupling 22 includes a nipple 28 tightly fitted into one of the three horizontal passageways and provided at its outer end with an annular flange 30. Fixed to the outer periphery of the flange 30 by a shrink fit is a metal washer 32 which, together with the flange 30, provides a surface for abuttingly receiving a conventional resilient washer 34 carried in an interiorly threaded coupling member 36. The discharge end 38 of the water nozzle 10 threadedly engages the coupling member 36 and carries a longitudinally movable plunger 40 which is engageable with the washer 34. Water which is supplied to the handle of hose nozzle 12 from a conventional water hose 42 flows along the exterior of the plunger 40 between a plurality of circumferentially spaced ribs 44 which serve to center the latter in the nozzle casing. Movement of the plunger 40 to the right as viewed in FIGURE 2 uncovers the outer end of the nipple 28 and allows water to pass into the body 16.

The barrel 18, having an axial water discharge bore 46 of uniform cross section, is tightly fitted into another of the horizontal passageways in the body 16 so that the bore 46 communicates with the vertical body passageway 24 near the top thereof. A small vent 48 is provided in the barrel 18 for admitting air to the water flowing therethrough. Air entering the water stream, particularly when high water pressure is employed, has the advantage of causing the water stream to be ejected to a greater distance than is the case when the vent 48 is not present. As seen in FIGURE 1, a deflector member 50 is

clamped to the outer end of the barrel 18 for causing the ejector water to form a spray.

Below the water barrel 18 the mixture barrel 20, which also has a deflector member 52, is fitted tightly into another horizontal passageway in the body 16. This barrel has an axial bore 54 which intermediate its ends communicates with upper and lower vertical passageways 56, 58 which extend through the wall of the barrel. At its rear or inlet end the bore 54 expands to a relatively large cross section in which is retained a ring-shaped insert 60.

The vertical, valve-retaining pasageway 24 in the body 16 is provided near its lower end with an inwardly projecting shoulder 62 and at its upper end with a tightly fitting sleeve 64 which has an aperture 65 communicating with the bore 46 of the water barrel 18. Below the aperture 65 is an inwardly extending annular shoulder 66. The valve member 24 is machined from a metal cylinder and includes a knurled top 68 and two smooth surfaced cylindrical portions 70, 72 separated by and integral with a central cylindrical stem portion 74 of greatly reduced diameter. Each of the portions 70, 72 has an annular groove in the surface thereof in which a sealing ring 76, 78 resides.

When the valve member 26 is in a fully down position, as seen in FIGURE 2, the lower edge of the cylindrical portion rests on top of the shoulder 62 in the passageway 24 and the sealing ring 78 seals tightly against the wall of the passageway 24 just above the shoulder 62. At the same time the sealing ring 76 associated with the other cylindrical portion 70 seals tightly against the inner wall of the sleeve 64. In this position of the valve member 26 water entering the passageway 24 of the spray head through the coupling 22 will flow upwardly past the stem 74 and into the water barrel 18. The lower sealing ring 78 prevents water from flowing into the mixture barrel 20, and the upper sealing ring prevents water from escaping between the upper part 70 of the valve and the sleeve 64. When the knurled top 68 of the valve member 26 is grasped and pulled by the fingers of the operator to the dotted line position shown in FIGURE 2 the valve member 26 moves upwardly until the top of the lower valve portion 72 engages the bottom of the shoulder 66 on the sleeve 64. In this position the upper sealing ring 76 is in sealing engagement with the sleeve bore above the shoulder 66 and the lower sealing ring 78 is in sealing engagement with the sleeve bore below the shoulder. In this case water cannot pass upwardly through the sleeve 64 and therefore it flows through the insert 60 into the mixture barrel 20.

Surrounding the mixture barrel 20 intermediate its ends and tightly fitted thereto is a dilution control mechanism which includes a vertical cylindrical body 80 having a downwardly extending, exteriorly threaded nipple portion 82 carrying a tubular extension 84 at its lower end. A flexible plastic tube 86 is force fitted over the lower end of the extension 84 and extends to near the bottom of the container 14. The nipple portion 82 is threaded into and through a screw cap 88 which in turn threadably engages the top of the container.

The nipple portion of the body 80 has an axial bore 90 which communicates with the lower passageway 58 in the wall of the mixture barrel 20. Another bore 92 in the body 80 extends to the top surface thereof near one edge at 94. A circular valve disk 96 is rotatably mounted on top of the body 80 in generally coaxial relationship therewith by means of an axial screw 98. The valve disk has four circumferentially spaced, different sized vent orifices 100, 102, 104 and 106 extending vertically therethrough and alignable with the bore 94 upon rotation of the disk 96. A small spring biased ball 108 resides in a socket located in the top surface of the body 80 for engagement with any of a number of indexing sockets in the lower surface of the disk 96. As seen in

FIGURE 2, the lower portions of the orifices are enlarged and the spacing is such that the orifices may serve as one or more of the indexing sockets. A pointer 110 is secured to the body 80 adjacent the edge of the disk 96 to indicate which orifice is in alignment with the bore 94. Conveniently the pointer 110 also serves to plug the passageway 92 which has been formed by drilling through the side of the body 80.

A vent arrangement of the type just described is more fully described in application Serial No. 150,731 filed November 7, 1961.

The ring-shaped insert 60 in the barrel 20 also more fully described in application Serial No. 150,731, serves by virtue of its shape and position to eliminate or reduce changes in suction which would otherwise occur with changes in water pressure. As shown, the insert 60 fits tightly in an enlarged portion 111 of the bore 54 upstream of the suction zone formed by the junction of a relatively restricted bore portion 112 with a discharge bore portion 114 of relatively great diameter. The enlarged portion 111 communicates with the restricted bore portion 112 through a frustro conical shoulder 116. The insert is located upstream of the shoulder 116 and defines an orifice having a downstream portion 118 of about the same diameter as the bore portion 112 and an outwardly expanding inlet, or upstream portion formed by a frustro-conical surface 120.

To operate the device in a manner to eject a spray of water the valve member is pushed downwardly to the position shown in FIGURE 2 and the water nozzle 10 is operated to deliver water into the sprayer body 16. The water entering the passageway 24 in the body 16 is directed upwardly through the lower portion of the sleeve 64 and then into the water barrel 18 through the aperture 65 in the sleeve 64. Air is drawn into the water stream in the barrel 18 through the vent 48 and the resulting air-water mixture is ejected as a spray against the deflector 50.

When it is desired to spray a mixture of water and the concentrate liquid in the container 14 the operator pulls the vertical valve member 26 to its full up position and rotates the disk valve 96 to align the desired orifice therein with the passage 92, 94 in the dilution control structure. Water from the water nozzle 10 will then flow through the orifice insert 60 into the mixture barrel 20 where it will produce suction downstream of the restricted portion 112. Liquid will thereby be drawn from the container 14 through the tube 86 and will be mixed and ejected with water against the deflector 52. At the same time air will be drawn into the barrel 20 through one of the orifices in the disk valve 96. As the size of the orifice is increased the amount of suction available is decreased. Therefore, by rotating the disk valve 96 to different positions it is possible to select different proportions of concentrate liquid to water.

It will be apparent that the disk valve 96 need not be disturbed when switching from fresh water spray to mixture spray. Thus the disk valve may be set at a desired dilution valve for a particular concentrate liquid or a particular cleaning job and the cleaning and rinsing operations carried out with the assurance that the dilution ratio will not change.

While a specific embodiment has been described, it will be apparent that modifications will occur to those skilled in the art. It is, therefore, not intended that the described details be limiting except as they appear in the appended claims.

What is claimed is:

1. A sprayer adapted to eject either a stream of a mixture of a carrier fluid with a liquid concentrate or a stream of the carrier fluid alone comprising: a hollow sprayer body having a cavity therein; means associated with said body for communicating a source of pressurized carrier fluid with said cavity; an open-ended mixture ejecting con-

duit secured to said body and communicating through the wall thereof with said cavity; an open-ended carrier fluid ejecting conduit secured to said body and communicating through the wall thereof with said cavity at a location spaced from the point of communication of the other conduit; a valve member within said cavity manually displaceable between one position in which it directs carrier fluid from said cavity into said mixture conduit and a second position in which it directs carrier fluid from said cavity into said carrier fluid conduit; flow-restriction means associated with said mixture conduit forming a suction zone in said mixture conduit; a flow-restricting orifice insert upstream of said flow-restricting means which creates said suction zone, said insert having a bore whose downstream end is of uniform cross section of about the size of the bore defined by said flow-restricting means and whose upstream end is of outwardly expanding frusto-conical shape; adjustable vent means communicating through the wall of said mixture conduit with said suction zone and with the atmosphere; said means including a passageway through the wall of said mixture conduit, a disk member having a plurality of different-sized orifices therethrough and means mounting said disk member for rotation about its axis for bringing said different-sized orifices sequentially into alignment with said vent passageway; and means for communicating said suction zone with a source of liquid concentrate.

2. A sprayer as in claim 1 in which said valve member is linearly slidable within said cavity and is constructed with two portions of relatively great cross section engageable with the wall of said cavity; said portions being spaced apart by a portion of relatively small cross section and wherein said mixture conduit and said carrier fluid conduit communicate with said cavity on opposite sides of one of said portions of great cross section.

3. A sprayer as in claim 1 in which said insert is tightly disposed within a bore whose shape downstream of said insert has a portion of uniform cross section and an inwardly tapering frusto-conical portion which communicates directly with the upstream end of the bore defined by said flow-restricting means.

4. A sprayer adapted to eject either a stream of carrier liquid or a stream of carrier liquid in admixture with a liquid concentrate comprising: a hollow sprayer body having a cavity therein; a short straight inlet conduit pass-

ing through the wall of said body and communicating at its inner end with said cavity and carrying an interiorly threaded hose coupling at its outer end for receiving pressurized carrier liquid; a first open-ended ejection conduit extending from said cavity through the wall of said body at a location on the opposite side of said body from said inlet conduit; a second open-ended ejection conduit extending from said cavity through the wall of said body, said second ejection conduit being directly above and parallel to said first ejection conduit; a manually operable valve member linearly slidable within said cavity between one position in which it directs carrier liquid from said cavity into said first ejection conduit and a second position in which it directs carrier fluid from said cavity into said second ejection conduit; flow-restriction means within said first ejection conduit forming a suction zone therein, the wall of said conduit having an upwardly extending vent passage and a downwardly extending concentrate passage communicating with said suction zone; a body member surrounding the portion of the wall of said second ejection conduit in which said passages are located and having passageways communicating with the atmosphere and with said vent passage and said concentrate passage; hollow coupling means communicating through one of said passageways with said downwardly extending passage and carried by said body member below said second conduit for providing releasable attachment with a container of liquid concentrate; a disk member carried on the top of said body above said second conduit, said disk member having a plurality of different sized orifices therethrough; and means mounting said disk member for rotation about its axis for bringing said different sized orifices sequentially into alignment with the passageway which communicates with said vent passage.

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