

HOSE-END SPRAYER ASSEMBLY
BACKGROUND OF THE INVENTION

[0001] This invention relates generally to a sprayer assembly adapted to be connected to a source of pressurized carrier liquid, and is adapted to be mounted to a container of chemical liquid to be siphoned into the stream of carrier liquid in a valve open position.

[0002] There are a variety of sprayer assemblies arranged to be mounted on a container of liquid chemical and coupled to the end of a hose for drawing an amount of the liquid chemical into the water path through a venturi effect or by the provision of an air gap. A rotatable valve, manually operable, is designed to turn the sprayer on as the carrier liquid inlet and the product inlet are connected, to turn the sprayer off by disconnecting the product inlet and carrier liquid inlet, and to provide for rinsing in which the carrier liquid passage is connected to discharge.

[0003] It is important to vent the container to atmosphere in the ON position of the sprayer while chemical liquid product is being drawn into the liquid carrier stream.

[0004] The vent control is on the rotary valve within valve chamber of the sprayer housing in accordance with U.S. Patents 6,578,776 and 6,672,520 which, as pointed out in application Serial No. the aforementioned related, 60/515,416, allows for unwanted seepage of carrier liquid into the chemical container during the vent open position which is, of course, most undesirable. If such seepage is allowed to persist the liquid

chemical will become so diluted that it could lose its effectiveness when spraying garden shrubs and the lawn with a selected chemical. The invention set forth in the aforementioned related application solves this problem by isolating the carrier liquid/chemical liquid connection from the vent and vent control, thereby avoiding the aforementioned dilution problem.

[0005] It would be desirable to provide another solution to venting of simple construction which is easy to use and assemble yet highly effective in providing for reliable vent control, and avoids any possibility of seepage of carrier liquid into the container in a vent open condition.

SUMMARY OF THE INVENTION

[0006] It is therefore an object of the present invention to provide a hose-end sprayer assembly having a rotary valve which connects a carrier liquid inlet passage with a liquid product inlet opening in an ON position of the sprayer and which simultaneously opens a vent located on the sprayer housing. An external vent control member is mounted on the housing and is engageable by the valve to open and close the vent respectively during the ON and OFF positions of the valve. The external vent control may comprise a rocker arm having a vent seal for movement into and out of a vent path, and a cam surface or the like for engagement by a projection on the valve during its rotary movement to effect rocking between vent ON and OFF positions.

[0007] Other objects and variations are made possible in accordance with the invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Fig. 1 is a side elevational view of the sprayer assembly according to the invention, the rotary valve and the vent control not being shown for the sake of clarity;

[0009] Fig. 2 is a perspective view, partly broken away, of the vent control member which is part of the sprayer assembly according to the invention;

[0010] Fig. 3 is a view similar to Fig. 1, with the vent control member mounted in place on the housing of the assembly;

[0011] Fig. 4 is a sectional view, at a reduced scale, taken substantially along the line 4-4 of Fig. 3;

[0012] Fig. 5 is a view similar to Fig. 3 showing the rotary valve installed with the sprayer assembly and rotated to the sprayer OFF position at which the vent is closed;

[0013] Fig. 6 is a view similar to Fig. 5 showing the rotary valve rotated to its ON position with the vent open; and

[0014] Fig. 7 is a view, at an enlarged scale and partly in section, taken substantially along the line 7-7 of Fig. 5.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Turning now to the drawings wherein like reference characters refer to like and corresponding parts throughout the several views, the sprayer assembly according to the invention is generally designated 10 in Figs. 1, 3, 5 and 6, although in Figs. 1 and 3, rotary valve 11 (Figs. 5, 6) is not shown for the sake of clarity, and vent control member 12 (Fig. 2) is not shown for the sake of clarity in Fig. 1.

[0016] The sprayer assembly includes a housing 13 similar to that shown in U.S. patent 6,378,785, commonly owned herewith, the entirety of which is incorporated herein by reference. The housing includes a conduit 14 having an anti-siphon assembly 15 at its free end which includes a closure 16 for mounting assembly 10 to the end of a garden hose (not shown) or the like. The housing further includes an end collar 17 engageable by an annular lip 18 on container closure 19 for supporting the sprayer assembly on neck 21 of a container (not otherwise shown).

[0017] The sprayer housing further includes a transverse bore 22 (Fig. 4) which may or may not have a back wall 23. And, the housing may have an arcuate shaped wall 24 containing indicia such as ON and OFF as shown to assist the user in determining the ON and OFF positions of the valve as will be further explained hereinafter.

[0018] The sprayer housing as aforescribed is essentially the same as that disclosed in the 6,378,785 patent. And, rotary valve 11 is likewise essentially the same as disclosed therein. The rotary valve is shown

assembled in place in Figs. 5, 6, and comprises a cylindrical outer wall 25 that may be closed at one end as at 26. The valve has a carrier liquid duct 27 extending along the diameter of the cylindrical valve, and a radially extending chemical liquid inlet duct 28 in open communication with duct 27. The rotary valve likewise has a turning handle 29 or the like to be grasped by the operator for rotating the valve about its central axis, and an indicator bar 31 or the like extending radially outwardly and which may partially underlie wall 24 when the rotary valve is assembled in place as shown in Figs. 5 and 6.

[0019] The rotary valve is manually rotatable between its ON and OFF positions. In the ON position, shown in Fig. 6, water under pressure from the open garden hose passes through an inlet passage located within conduit 14 and through carrier liquid duct 27 which, as disclosed in the commonly owned application No. 60/515,416, the entire disclosure of which is incorporated specifically herein by reference, includes a Venturi section formed as a gradually reducing inner diameter so as to constrict the flow of the carrier fluid in the ON position of the rotary valve during its movement therealong. The inlet duct likewise has a tube section of essentially constant diameter larger than the smallest diameter of the Venturi section. At a junction between such sections an inlet duct or port (not shown) from the housing is in communication therewith. Such a duct or port, as shown in 6,378,785, communicates with the dip tube extending into the container. Therefore, as the carrier liquid flows along the Venturi

section the carrier fluid pressure drops thereby suctioning chemical product up the dip tube and through the product inlet duct/port into the carrier stream. Chemical product aspirated into the carrier stream thus mixes therewith and is discharged through the open end of the discharge passage (shown in 6,378,785) located in the housing in horizontal alignment with duct 27 in the Fig. 6 position. A rotatable nozzle (not shown) may be provided at the forward end of the sprayer assembly for directing the flow of mixed liquid toward the target. Thus, the rotary valve is selectively rotatable within its bore for interconnecting the carrier liquid inlet passage within conduit 14 and the liquid product inlet port located in the housing with the discharge passage located in the housing in the ON position of Fig. 6. And, the valve is selectively rotatable to its OFF position of Fig. 5 in which the carrier liquid inlet passage is not connected with the liquid product inlet port. Again, the details of such selective ON/OFF positioning of the rotary valve is described in detail in the 6,378,785 patent and in the 60/515,416 application. Further detailed description thereof will therefore not be set forth herein.

[0020] In accordance with the invention, container venting is provided such that a vent port 32 (Figs. 1 and 7) provided in the housing communicates directly with the interior of the container and is open to atmosphere. The vent control according to the invention is external to the rotary valve and its transverse bore by the provision of a control member 33, shown in detail in Fig. 2, which may be in the form of an

arcuate rocker arm 34 having a vent plug seal 35 at one end. And, the rocker arm at its outer edge 36 may have a cam surface 37 formed near its opposite end.

[0021] Between its ends the rocker arm may have a pair of outwardly extending, spaced mounting flanges 38 for mounting the arcuate rocker arm to the outside of the housing parallel to transverse cylindrical wall 39 thereof which forms the transverse bore 22 receiving the rotary valve. And, the housing may have a projection 41 with a barbed outer end which, in the assembled position of the vent control member of Figs. 5 and 6, and as shown in detail in Fig. 7, extends between flanges 38 such that its barbs 42 extend within detents 43 at the inner walls of flanges 38 to facilitate a quick and simple yet secure snap fitting of the arcuate rocker arm in place during assembly. In such a position, plug seal 35 is arranged such as to be coaxial with vent port 32 (Fig. 7).. And, when mounted in place, inner edge 44 of the rocker arm bears against a pivot pin 45 which extends radially outwardly from cylindrical wall 39 of the housing.

[0022] In operation, with the valve rotated to its ON position of Fig. 6, underside 46 of handle 29, which extends radially outwardly of cylindrical wall 39 of the housing, bears against cam surface 37, as illustrated in phantom outline in Fig. 7, causing rocker arm 44 of the vent control member to pivot about pivot pin 45 causing that end to move downwardly and its opposite to move in an upward direction whereupon vent plug seal 35 moves away from vent port 32 to thereby

open the vent. Thus, in the ON position of the valve, the vent which communicates with the interior of the container is open to atmosphere permitting product being drawn from the container by Venturi action of the flowing carrier liquid, to be replaced by air to avoid container collapse and to otherwise avoid any interference with the smooth operation of the sprayer. And, when the operator rotates the valve to its OFF position of Fig. 5, underside 46 of the handle overhang bears against outer edge 36 of the rocker arm pivoting it downwardly as shown in solid outline in Fig. 7 about pivot pin 45 such that vent plug seal 35 is now in sealing engagement with housing 13 overlying the vent port 32 to seal the vent port closed during conditions of storage, shipping, and non-use to avoid any leakage of product through the vent with the valve in its OFF position. Mounting flanges 38 of the rocker arm facilitate the aforescribed pivoting movement of the rocker arm between the valve ON and OFF positions without interference.

[0023] The vent control according to the invention is fully external to the rotary valve and to the transverse bore of the housing in which the valve is received. The rocker arm is simply snapped in place to the outside of the sprayer housing during assembly permitting it to be pivoted about pin 45 as aforescribed while being securely mounted in place without the likelihood of dislodgement during outdoor use of the sprayer assembly. The rotary valve, *i.e.*, the underside of an overhang of the turning handle or the like, is arranged as to bear against outer edge 36 of the rocker arm as well as its cam surface at one end to effect vent

opening and closing respectively during the ON and OFF positions of the valve on the selected rotary movements thereof. It is to be pointed that, within the scope of the invention, the rocker arm can likewise be arranged such that the cam surface is at the opposite end from that shown while achieving the same rocker arm movements. Also, it is within the purview of the invention that other known equivalents could be substituted for the rocker arm, as well as for the arm cam and the cam follower, so long as such a mechanism is operated by the valve on turning to open and close the vent during valve ON and valve OFF positions, and the vent control is fully external to the rotary valve and its transverse bore. For example, the rocker arm could be arranged for pivoting about an axis perpendicular to that of pin 45. Or, other known approaches within the scope of the invention could be practiced.

[0024] Obviously, many other modifications and variations of the present invention are made possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A hose-end sprayer assembly for connection to a container of liquid product, comprising: a housing (13) having a carrier liquid inlet passage (14), a liquid product inlet opening and a discharge passage; a rotary valve (11) mounted within a transverse bore (22) of said housing (13) and comprising a liquid duct (27) and a product duct (28) opening into said liquid duct (27), the valve being selectively rotatable within said bore (22) for interconnecting said carrier liquid inlet passage (14) and said liquid product inlet opening with said discharge passage in a first selective rotative position of the valve (11), the housing (13) having a means external to the transverse opening defining a vent path (32) between the interior of the container and atmosphere in the first rotative position (Fig.6); and characterised in that means external to said housing (13) and to said rotary valve (11) for closing the vent path (32) in a second selective rotative position (Fig.5) of the valve (11) wherein the carrier liquid inlet passage (14) is out of communication with the discharge passage.
2. The sprayer assembly according to claim 1, wherein said means defining said vent path comprises a vent port (32).
3. The sprayer assembly according to claim 1, wherein said closing means comprises a movable external vent plug assembly, said vent plug assembly (33) preferably comprising a vent plug seal (35) movable with the assembly into and out of the vent path (32).
4. The sprayer assembly according to claim 3, wherein said rotary valve (11) engages said vent plug assembly (33) for closing the vent (32) in the second rotative position of the valve (11), the vent plug assembly (33) preferably including a rocker arm (34) having a vent plug seal (35), the rocker arm (34) being pivotally mounted to the housing (13) for movement of the vent plug seal (35) into the vent path (32) in the second rotative position.

5. The sprayer assembly according to claim 1, wherein said closing means (35) comprises a rocker arm (34) pivotally mounted to the housing (13), the valve (11) engaging the rocker arm (34) for moving a vent plug seal (35) on the arm into and out of the vent path respectively in the second and first rotative positions of the valve (11), said means defining said vent path preferably comprising a vent port (32) which is opened and closed upon the pivoted movement of the rocker arm (34).
6. The sprayer assembly according to claim 1, wherein the valve (11) has a handle (29) for rotation thereof, the closing means comprising a vent plug assembly (35) pivotally mounted externally to the housing (13), the valve handle (29) engaging the plug assembly (33) for pivoting same into and out of the vent path (32) respectively in the second and first rotative positions of the valve (11), the vent plug assembly (33) preferably including a rocker arm (34) and a vent plug seal (35), the valve handle (29) engaging the rocker arm (34) for movement of the vent plug seal (35) into and out of the vent path (32).
7. The sprayer assembly according to claim 2, wherein said closing means comprises a rocker arm (34) pivotally mounted externally to the housing (13), an extension on the valve (11) engaging the rocker arm (34) for movement of a vent plug seal (35) on the arm into and out of the vent port (32) respectively in the second and first rotative positions of the valve (11).
8. The sprayer assembly according to claim 5, wherein the housing (13) has a radially extending protrusion (45) underlying the rocker arm (34) to provide for the pivotal movement thereof.
9. The sprayer assembly according to claim 5, wherein the vent plug seal (32) is located near one end of the arm (34), and cam means (37) is located near an opposite end of the arm (34) for engagement by the valve (11) in the first rotative position thereof.

10. The sprayer assembly according to claim 5, wherein the housing (13) has a radially extending pivot pin (45) engaged by the rocker arm (34) to facilitate pivotal movement thereof, the rocker arm (34) preferably being movably mounted to the housing (13) on the pivot pin (45) to facilitate the pivotal movement thereof.
11. The sprayer assembly according to claim 2, wherein said closing means comprises a vent plug assembly having a vent plug (35) for opening and closing the vent (32), said closing means preferably comprising a rocker arm (34) having a vent plug (35) for opening and closing the vent (32), said rocker arm (34) preferably having a cam surface (37) engageable by the valve (11) to effect rocker arm movement.
12. The sprayer assembly according to claim 10, wherein the rotary valve (11) has a turning handle (29) in engagement with the vent control means (33) to effect movement thereof upon valve rotation.
13. The sprayer assembly according to claim 11, wherein the valve (11) has a turning handle (29) in engagement with the cam surface (37) to effect movement of the rocker arm (34).
14. The sprayer assembly according to claim 10, wherein the valve (11) has an external protrusion which engages the vent control means (33) to effect the movement thereof.
15. The sprayer assembly according to claim 11, wherein the valve (11) has an external protrusion which engages the rocker arm (34) to effect the movement thereof.
16. The sprayer assembly according to claim 11, wherein the valve (11) has means defining a cam follower in engagement with said cam surface (37) for moving the rocker arm (34) to the vent open position.