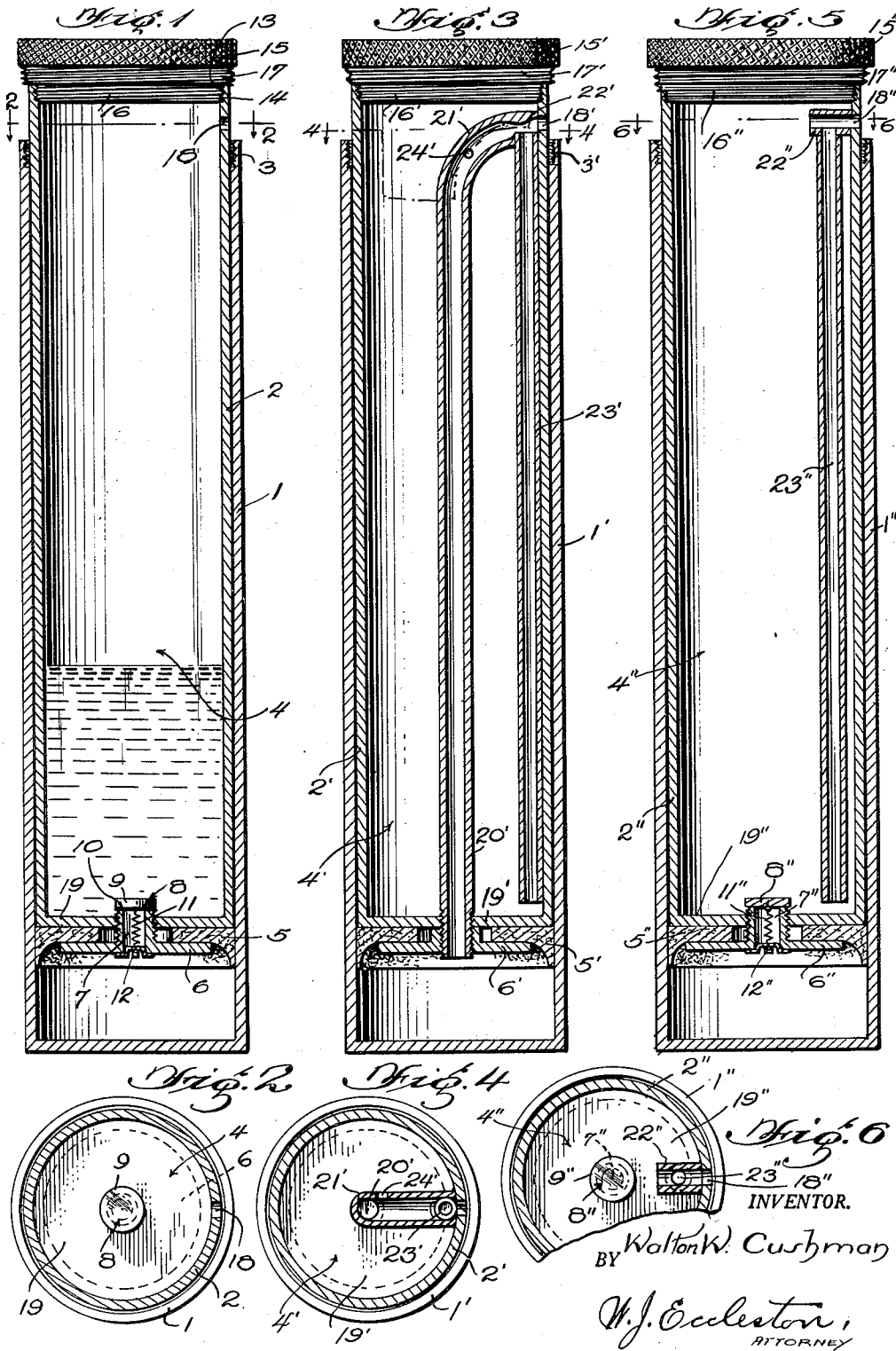


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SPRAYER

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2,540,102

SPRAYER

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2 Claims. (Cl. 299—88)

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The invention described herein, if patented, may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a sprayer, and more particularly, to a sprayer for spraying liquid insecticides, germicides, and the like, in a spray having the liquid particles in micro or minute size.

A major object of this invention is to provide a liquid sprayer of a compact portable nature of pocket size and which can be tightly sealed when not in use, and which will form a spray containing minute particles of liquid.

Another object of this invention is to provide a pocket-type liquid sprayer having a hollow plunger for containing the liquid, a filler opening providing access to the interior of the plunger, a cap for sealing the filler opening, and a locking means associated with the cap to hold the plunger in an inoperative position.

It is a further object of this invention to provide a sprayer for vaporizing liquid into micro or minute particles in which a pump arrangement is utilized for forcing air upwardly through the spray liquid to entrain minute particles of liquid.

It is still another object of this invention to provide a portable sprayer in which liquid is atomized by air forced through a capillary tube by a pump piston reciprocating in a pump cylinder and in which the pump piston includes a liquid open-ended chamber which is sealed off by a cap, and the pump cylinder and cap are provided with cooperative locking means for retaining the piston in depressed inoperative position.

It is still a further object of this invention to provide portable sprayer, forming a spray including both vaporized and atomized liquid particles, having means for forcing air upwardly through liquid to entrain particles in vaporized form, and means for forcing said air through an atomizer for also entraining particles in atomized form.

Other objects and advantages of the present invention will appear in the following detailed description and particularly will be pointed out in the appended claims, reference being had to the accompanying drawing forming a part of the specification and in which:

Fig. 1 is a longitudinal sectional view through one embodiment of the sprayer of this invention, wherein the spray includes liquid particles in vaporized form;

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Fig. 2 is a transverse sectional view of the sprayer of Fig. 1, taken on line 2—2 of Fig. 1;

Fig. 3 is a longitudinal sectional view through another embodiment of the sprayer of this invention, wherein the spray includes liquid particles in atomized form;

Fig. 4 is a transverse sectional view of the embodiment of Fig. 3, taken on line 4—4 of Fig. 3.

Fig. 5 is a longitudinal sectional view of still another embodiment of the sprayer of this invention, wherein the spray includes liquid particles both in vaporized and atomized form; and

Fig. 6 is a transverse sectional view of the embodiment of Fig. 5, taken on line 6—6 of Fig. 5.

Referring to Figs. 1 and 2 of the drawing, there is presented a vaporizing sprayer, one of the embodiments of this invention, in which the reference symbol 1 denotes the pump cylinder for receiving in slidable relationship the hollow cylindrical plunger 2. The cylinder 1 has an open upper end through which the plunger 2 may be reciprocated, said open end being provided with internal threads 3, for a purpose to be described hereinafter. The plunger 2 is provided with a liquid chamber 4 and its lower end or bottom 19 is provided with a packing or gasket 5 for engaging the inner side of the cylinder 1 for pumping action. The packing or gasket 5 is secured to the bottom 19 of the plunger by means of a screw 6 threaded into the bottom of the plunger, and having an opening 7 therethrough forming a passageway between the lower portion of the cylinder and the liquid chamber 4. A suitable one-way valve, denoted generally by numeral 8, is secured in the passageway 7 to permit air, compressed in the cylinder by the downward strokes of the plunger 2 to escape through the passageway 7 and up through the liquid in the chamber 4, and to prevent escape of liquid from the chamber 4 into the cylinder. As shown, to accomplish this purpose, the valve 8 comprises the valve head 9 yieldingly held against the valve seat 10 by means of a spring 11 held by the spider or strap 12 fitting against the screw 6, as shown in Fig. 2.

The upper end of the plunger 2 is provided with a filler opening 13 having internal threads 14 for receiving a screw closure cap 15 having cooperating external threads 16 for sealing the opening 13. The cap 15 is also provided with external threads 17, concentric with the threads 16, for cooperation with the threads 3 on cylinder 1, as described hereinafter. The plunger 2 is provided with an exit spray opening 18 (shown exaggerated for clarity) near the top of the plunger, above the liquid level in chamber 4.

In operation of the embodiment of Fig. 1, it is merely necessary to reciprocate plunger 2 within cylinder 1 in a pumping action to force air on the downstrokes from the bottom of the cylinder through passageway 7 and through the liquid in chamber 4 to entrain the liquid particles. The forced liquid with the entrained particles will be forced on each downstroke through exit opening 18 in the form of a spray, with the liquid particles in vaporized form. When it is desired to replenish the liquid in chamber 4, it is merely necessary to unscrew filler cap 15 from the threads 14 and pour spray liquid through opening 13. When the sprayer is not in use, the plunger 2 may be locked in depressed inoperative position by threading the threads 17 of cap 15 into the threads 3 of the cylinder. This action will, in addition, seal off the spray opening 18 to prevent loss of liquid from chamber 4 when the sprayer is not in use.

It is apparent that a compact portable sprayer has been devised in which the spray liquid is retained in the plunger and in which the liquid is sealed both during the pumping action and when the sprayer is in a state of non-use. In locking the plunger 2 in its depressed inoperative position, the cap 15 may be rotated to screw into the cylinder 1 to engage threads 3 of the cylinder or the cylinder may be rotated to engage threads 17 of the cap while the cap 15 is held stationary.

In the embodiment of Fig. 3, the pump structure is similar to that of the embodiment of Fig. 1 and similar parts bear the same reference symbols except for the addition of a prime symbol. As for example, the cylinder is denoted by the reference numeral 1'. This embodiment differs from the embodiment of Fig. 1 in that it forms a spray solely by atomization and includes the following changes. The valve 8 is omitted, and instead, a central tube 20' has its lower end threaded through the bottom 19' of the hollow plunger and forming a communication with the interior of the cylinder 1'. The upper end of tube 20' is curved as at 21' and is formed into a capillary horizontal portion 22' communicating with the spray opening 18'. Communicating with the passageway 22' is a tube 23' extending downwardly and having its lower end positioned adjacent to the bottom of the liquid chamber 4'. The curved portion 21' of the tube 20' is provided with a minute opening 24' (shown exaggerated for clarity) for a purpose to be described hereinafter.

In the operation of the species shown in Fig. 3, pumping action will force air upwardly through the tube 20' and through the passageway 22'. The suction produced by the air in passageway 22' will draw liquid from liquid chamber 4' up through the pipe 23' and atomization will take place in the passageway 22'. Air will enter the top of the chamber 4' through minute opening 24' to displace the liquid removed and maintain atmospheric pressure on the top of the liquid in chamber 4'. To increase the degree of atomization, the passageway 22' is shaped to form a Venturi tube to increase the suction effect. The combined air and atomized liquid particles will be forced outwardly through opening 18' in the form of a spray. In this embodiment, the filler cap 15' will function in the same manner as cap 15 of the species of Fig. 1 to seal off the liquid in chamber 4'. At the same time, locking the plunger 2' in depressed and inoperative position is accomplished by means of the threads 17' on the cap cooperating with the threads 3' at the top of the cylinder.

The embodiment shown in Fig. 5 combines the vaporization feature of the species of Fig. 1 with the atomization feature of the species of Fig. 3 and similar parts bear the same reference symbols as their counterparts in the embodiment of Figs. 1 and 3 except including the addition of a double prime symbol. For example, the cylinder is denoted by the numeral 1''. In the embodiment of Fig. 5, the valve structure 8'' is exactly the same as the valve structure 8 in the species of Fig. 1. The tube 23'' is similar to the tube 23' of the embodiment of Fig. 3 and has its upper end merging into a horizontally extending stub tube 22'' connecting with spray opening 18'' and communicating with the top of liquid chamber 4''.

In the operation of the embodiment of Fig. 5, on the plunger 2'' downstrokes, air is forced through the passageway 7'' up through the liquid in the chamber 4'' to entrain liquid particles in vaporized form. The combined air and vapor particles will be forced through the stub tube 22'' and outwardly through spray opening 18''. The suction produced in tube 22'' will draw liquid up through tube 23'' and which liquid will be atomized by the rush of air in tube 22''. Thus, the air forced through spray opening 18'', will include liquid particles both in vaporized and atomized form. The cap 15'' serves the same function as the caps in the species of Figs. 1 and 3.

While the invention has been described in more or less detail, it is not to be limited thereby, as changes may be made in the form, arrangement and construction of parts, and equivalents may be substituted, without departing from the spirit and scope of the invention as claimed, the forms hereinbefore described being merely preferred embodiments thereof.

I claim:

1. In a sprayer, the combination of a pump cylinder, a plunger reciprocable in said cylinder and provided with a filler opening, a liquid chamber provided in said plunger, a packing secured to the lower end of said plunger for engaging the cylinder wall for pumping action, said plunger provided with a spray opening adjacent its upper end, a vertically extending tube within the liquid chamber having its upper end disposed at one side of and just below the spray opening, another tube fixed to said plunger and disposed within the same and having its lower end communicating with the interior of said cylinder and its upper end communicating with the spray opening and the upper end of the first-mentioned tube, for atomizing liquid passing upwardly through the first-mentioned tube and causing a spray to be projected through the spray opening, the open ends of the cylinder and plunger being threaded, and a cap provided with threads for cooperation with the threads of the cylinder and plunger.

2. In a sprayer, the combination of a pump cylinder, a plunger reciprocable in said cylinder and provided with a filler opening, a liquid chamber provided in said plunger, a packing secured to the lower end of said plunger for engaging the cylinder wall for pumping action, said plunger provided with a spray opening adjacent its upper end, a vertically extending tube within the liquid chamber having its upper end disposed at one side of and just below the spray opening, another tube fixed to said plunger and disposed within the same and having its lower end communicating with the interior of said cylinder and its upper end communicating with the spray opening and the upper end of the first-mentioned tube, for atomizing

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liquid passing upwardly through the first-mentioned tube and causing a spray to be projected through the spray opening, and a cap threadedly engaging said plunger for sealing off said filler opening, said cap having means for locking the plunger in depressed inoperative position.

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