July 27, 1937. E. L. DAVIS 2,088,082

LIQUID SPRAYER

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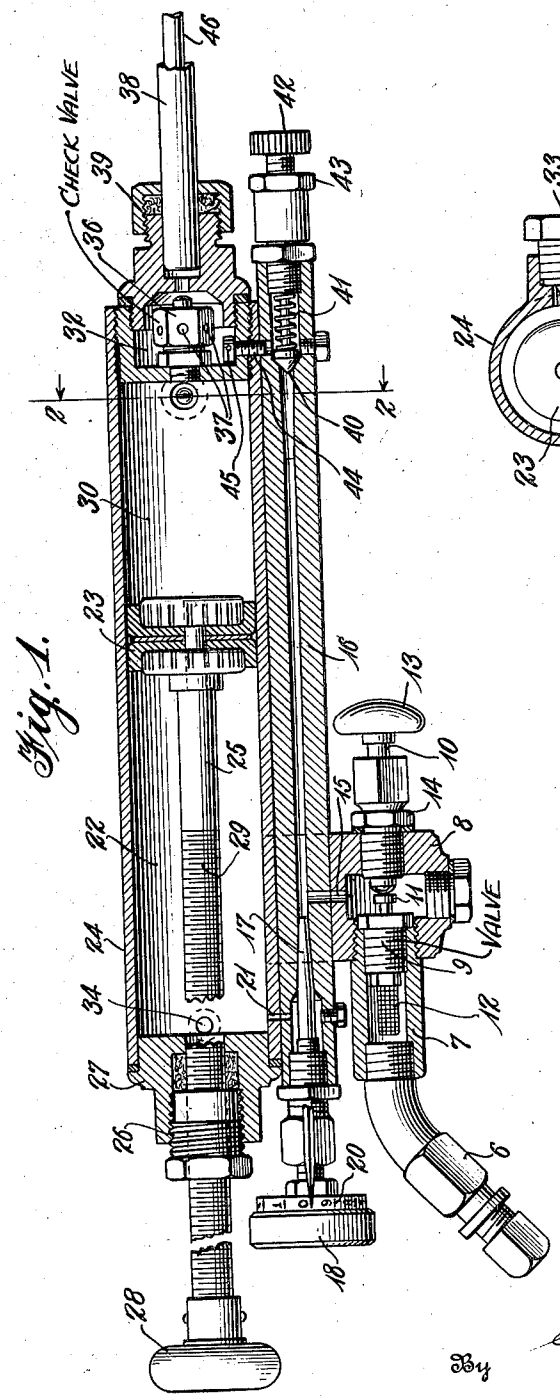


Fig. 1.

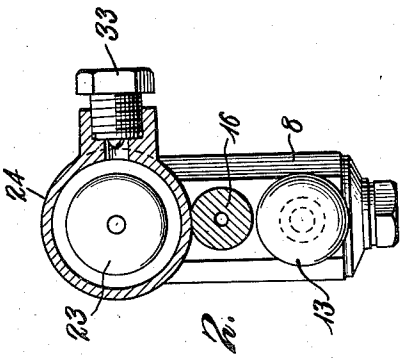


Fig. 2.

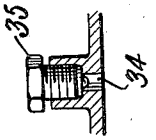


Fig. 4.

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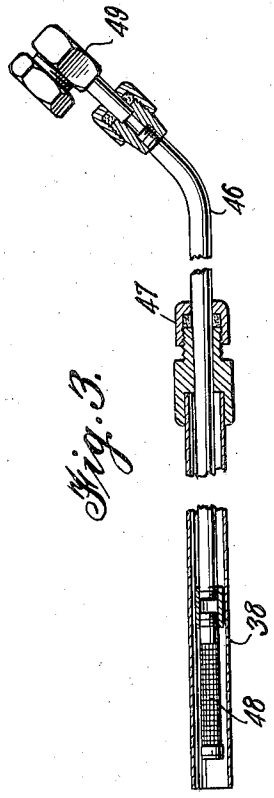


Fig. 3.

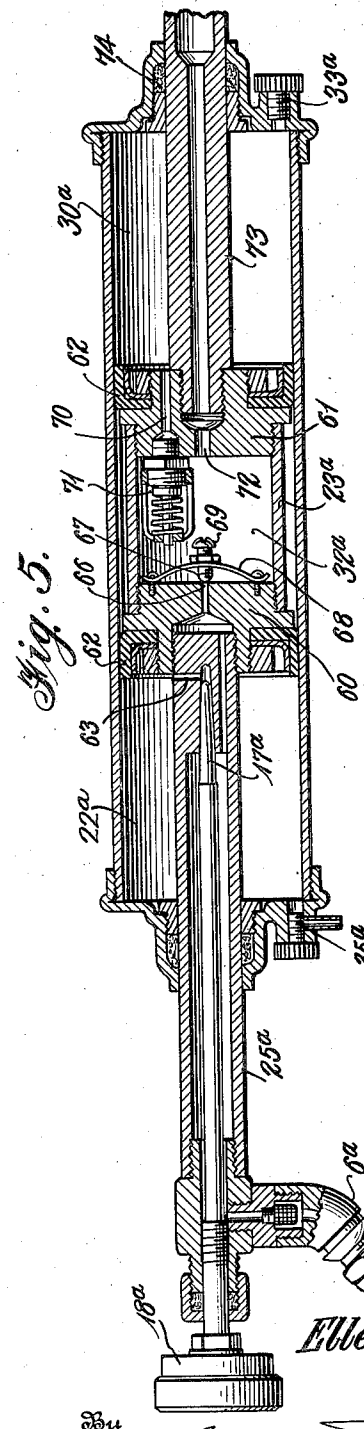


Fig. 5.

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LIQUID SPRAYER

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Application January 17, 1936, Serial No. 59,617

7 Claims. (Cl. 299—85)

This invention relates to that type of liquid sprayers particularly, but not exclusively, used for spraying insecticides or the like, and in which the insecticide is forced by differential pressure derived from a water supply line into a mixing chamber also supplied with water from the same supply line, whence it is discharged through a spray tube and tip to the place desired.

The device embodies means for controlling the pressure applied to the insecticide; also means for controlling the pressure of the water supplied to the mixing chamber and thus to the outlet pipe. In devices of this kind a nice control of the relative pressures and discharges is very desirable, because of the extremely small flow required and also because it is desirable to maintain a constant differential pressure between what may be called the pump chamber and the mixing chamber, so as to insert a constant supply of insecticide and also a constant pressure on the mixing chamber, whereby the feed and proportions of the mixture will not vary.

With these and other objects in view the invention is illustrated in the accompanying drawings in which Fig. 1 is a longitudinal section of the apparatus. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a detail in section of the spray tube and tip. Fig. 4 is a detail in section of a vent port. Fig. 5 is a longitudinal section of a modified form.

Referring particularly to the drawings, 6 indicates a slip joint or other hose connection leading from a water supply under pressure, into a valve casing 7 tapped into a fitting 8 and containing a spring valve 9 which may be opened by pressure applied by a push rod 10 bearing against the head 11 of the valve. A filter screen 12 may be assembled with the valve in the casing 7. The push rod 10 is operated by a knob 13 and works through a suitable gland 14. The chamber of the casing 8 is connected by a port 15 to a tubular pipe 16 the rear end of which has a seat for a needle valve 17 which may be screwed in or out by a knob 18 provided with marks 20 to indicate the adjustment of the valve.

Water passing the valve enters through a port 21 into the space 22 behind the piston 23 in a cylinder or barrel 24. The piston rod 25 works through a gland 26 in the cylinder head 27 and is provided with a knob 28 by which the piston may be retracted (or advanced if desired). The piston rod may be graduated as indicated at 29 to show the extent of its movement.

The other or front end 30 of the barrel 24 forms a reservoir for liquid insecticide or the like. The adjacent cylinder head 31 is hollow to form a mixing chamber 32. The reservoir may be filled by retracting the piston, through a filling port controlled by a removable screw plug 35. The vent port 34, at that time, being opened by removal of the screw plug 35.

Insecticide from the reservoir 30 is fed into the mixing chamber 32 through a check valve 36 the ports 37 of which preferably discharge laterally, and from the mixing chamber the mixture is discharged through the spray tube 38 confined by the slip joint or gland 39 connected to the front cylinder head 31.

Water under pressure received as stated in the tube 16 is supplied to the mixing chamber through a pressure reducing or controlling spring conical valve 40, at the opposite end of the passage to the needle valve 17. The pressure or resistance of the spring 41 of the valve 40 is adjustable by means of the screw rod and knob 42, and when the adjustment is set it may be fixed by a lock nut 43 on the stem. From the needle valve the water passes through a tubular plug connection 44 into the mixing chamber, discharging preferably through a lateral needle port 45 causing a whirling action in the mixing chamber and assisting in commingling the water and insecticide therein.

The discharge tube 38 may have an outer slip connection 46 working in a slip joint 47 permitting it to be turned or set to any desired angle and also advanced or retracted as desired. A filter screen 48 is preferably attached to the inner end of the extension 46, and at its outer end said extension is provided with a spray tip of any suitable or desired kind as indicated at 49.

In the form above described it will be seen that the mixing chamber is located at the front end of the barrel. In Fig. 5 a modification is shown in which the mixing chamber 32*a* is located in the piston 23*a* which itself consists of a short cylinder or barrel provided with heads 60 and 61 and the usual cup leathers 62. In this form the water pressure supply is received into the pressure chamber 22*a* through a port 63 and a passage 64 in the piston rod 25*a* controlled by a needle valve 17*a* the stem of which is connected to a controlling wheel or knob 18*a*, the supply hose 6*a* being tapped into the hollow piston rod as shown. By opening the valve 17*a* water pressure is admitted to the chamber 22*a*.

The passage 64 has a by-pass 66 which leads through the piston head 60 and past a spring pressure differential valve 67 into the mixing chamber 32*a*. This valve is of the type having

a flat spring 68 and the tension may be adjusted by a screw 69.

In this form the reservoir 30*a* for the insecticide communicates with the mixing chamber 32*a* through a passage 70 in the piston head 61, and this passage is controlled by a spring check valve 71.

The outlet from the mixing chamber 32*a* is through a port 72 leading to a discharge tube 73 which works through a gland 74 in the front cylinder head which is provided with the spray tube and tip as in the other form. A vent port 35*a* and filling port 33*a* are also provided for the same purpose as above described.

It will be seen that in each form, by proper manipulation and setting of the valves controlling the inlet of water to the rear side of the piston, and the by-pass of water to the mixing chamber, a differential pressure is established by which the piston will be advanced at any desired rate, and in its advance it will feed the insecticide from the reservoir into the mixing chamber according to a predetermined rate or proportion, and from the mixing chamber the mixture will be discharged through the spray tip to the place of application. Accurate control of the differential pressure between the pump or water supply and the mixing chamber is highly desirable, to maintain the proper mixture. The differential pressure must be sufficient to overcome the pump friction and open the check valve 36 or 71, otherwise the piston will not travel at all. On the other hand it may be desirable to regulate the piston travel to as low as one inch per hour. The spring actuated valve 40 (or 67), once properly set, will maintain a nearly constant differential pressure over a wide range of size in the spray tip outlet, and when properly adjusted it will function even with a very small outlet port in the discharge tip, or with an outlet port almost completely clogged. It will be noted that this valve is located in the by-pass line, that is, the line leading to the mixing chamber, instead of in the pressure line leading to the water chamber.

It is obvious that various other modifications may be made within the scope of the invention and no limitation in this respect is to be understood. When the valves are set and the water is turned on the piston travels at the predetermined rate to feed the insecticide into the mixing chamber at the desired rate, whence the mixture will be discharged through the spray head. When the reservoir is empty it may be refilled by opening the filling and vent ports and retracting the piston for the next operation.

The spring valve 9 and its operative parts may be omitted and a direct hose connection substituted, and a separate valve put at some other point in the hose.

It may also be stated that the sprayer will handle plastic or suspended material in the reservoir as well as an ordinary liquid.

A universal adjustment as to the direction of spray may be obtained by the two bends and the two rotary joints in the spray rod and tip, by the combination of the two rotations and the two bends, the second bend being integral with the tip, as shown in Fig. 3. This is quite a convenience.

I claim:

1. A liquid sprayer having a water pressure chamber with an inlet thereto, a mixing chamber provided with an outlet, means actuated by the pressure in the water pressure chamber to supply insecticide or the like to the mixing chamber, and a water by-pass from the inlet to the mixing chamber, said by-pass being provided with a spring actuated differential pressure valve constructed to reduce the pressure between the inlet and the mixing chamber under all conditions.

2. A liquid sprayer as in claim 1, the pressure reducing valve comprising an adjustable spring pressed valve.

3. A liquid sprayer comprising a barrel, a piston therein, dividing the barrel into a water pressure chamber and a reservoir for insecticide or the like, a valve-controlled inlet to said chamber, a mixing chamber in the piston, having a passage thereinto from the reservoir, a check valve in the passage, a by-pass for water, leading from the water inlet to the mixing chamber, said by-pass being provided with means for reducing the pressure admitted to the mixing chamber, and a spray-tube from the mixing chamber.

4. A liquid sprayer as in claim 3, said means consisting of a valve adjustably spring-pressed against the water-inlet pressure.

5. A liquid sprayer comprising a barrel having a water pressure chamber with a supply inlet thereto at one end and a reservoir for insecticide at the other end, a piston in the barrel between the water chamber and the reservoir, a mixing chamber having a passage thereto from the reservoir, a check valve in said passage, a discharge tube from the mixing chamber having a restricted spray nozzle, a by-pass for water, leading from the supply inlet to the mixing chamber, and a spring actuated differential pressure valve in the by-pass, acting to reduce the pressure between the inlet and the mixing chamber under all conditions.

6. A liquid sprayer comprising a barrel having a water chamber with a supply inlet thereto at one end, a reservoir for insecticide toward the other end, and a mixing chamber in the end of the barrel adjacent the reservoir, a piston in the barrel between the chamber and the reservoir, the mixing chamber having a port thereinto from the reservoir and provided with a discharge tube, a by-pass for water, leading from the supply inlet to the mixing chamber, and a spring-actuated differential pressure valve in the by-pass, to reduce the pressure between the inlet and the mixing chamber under all conditions.

7. A liquid sprayer comprising a barrel having a water chamber with a supply inlet thereto at one end, a piston in the barrel, having a mixing chamber therein, a reservoir for insecticide, in the other end of the barrel, the mixing chamber having a port thereinto from the reservoir, and provided with a discharge outlet, a by-pass for water, from the inlet to the mixing chamber, and a spring-actuated differential pressure valve in the by-pass, to reduce the pressure between the inlet and the mixing chamber under all conditions.

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