

[54] **LIQUID SPRAYING DEVICES PRESSURIZED FROM WATER SUPPLY**

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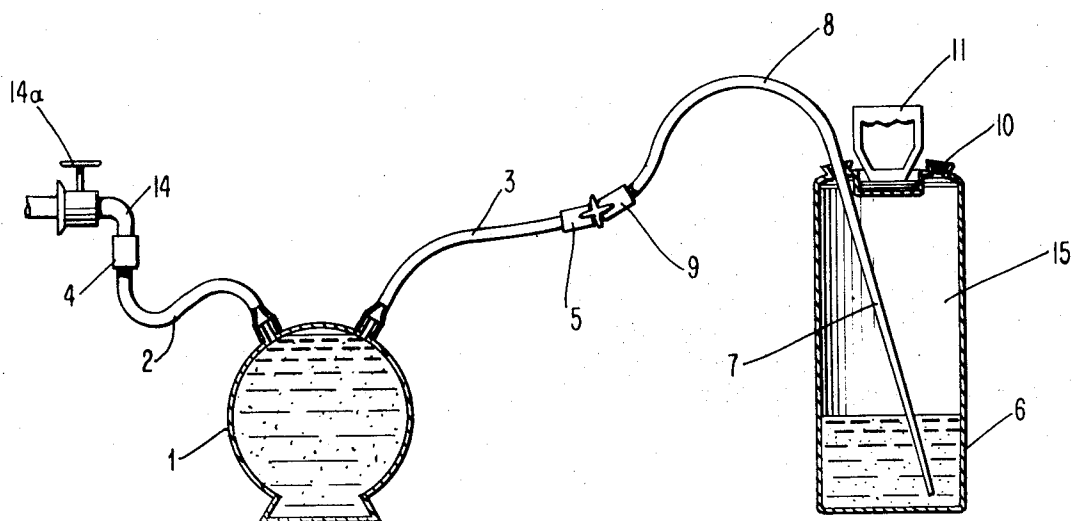
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[57] **ABSTRACT**

Apparatus for spraying plants and the like comprises a spray tank provided with a nozzle and an intermediate tank which can be connected to a supply of water under pressure. The spray tank is pressurized by connecting it to the empty intermediate tank which is connected to the water supply. The water under pressure from the supply first displaces air from the intermediate tank to the spray tank and then partially fills the spray tank in which the material to be sprayed has been introduced, so as to compress the air that was originally in the spray tank and the air displaced from the intermediate tank, thereby providing sufficient pressure throughout the spraying time.

**5 Claims, 5 Drawing Figures**



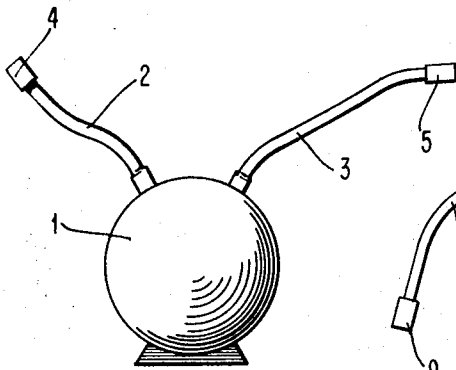


Fig. 1

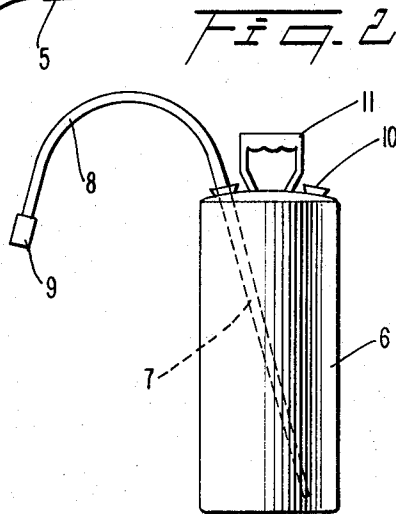


Fig. 2

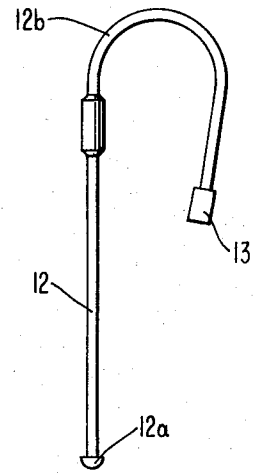


Fig. 3

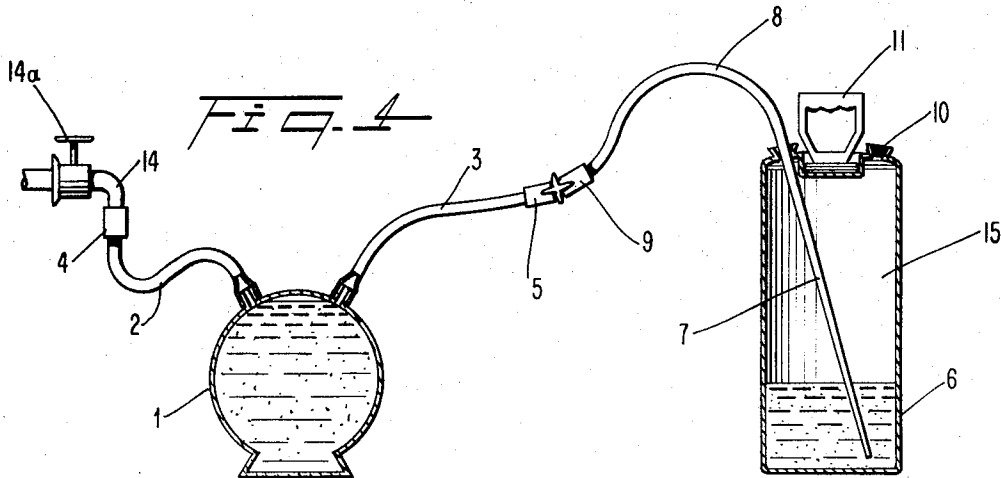


Fig. 4

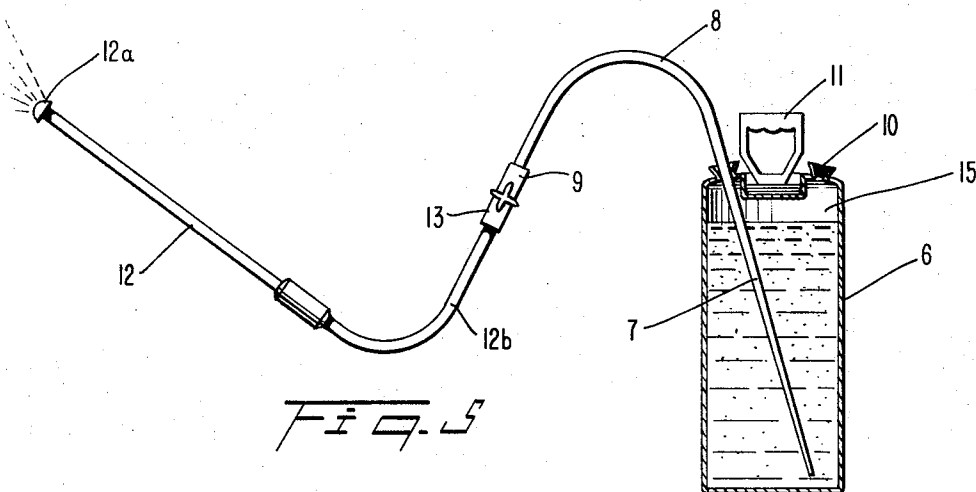


Fig. 5

## LIQUID SPRAYING DEVICES PRESSURIZED FROM WATER SUPPLY

The present invention relates to self-contained liquid spraying devices in which the liquid to be sprayed is pre-pressurized.

Known devices of this type comprise a tank in which the liquid to be sprayed is maintained under pressure by means of a manual pump which must be actuated vigorously to provide sufficient pressure. Such devices have serious drawbacks for the user. On the one hand the effort required to provide sufficient pressure for spraying the liquid is long and laborious. On the other hand the pump comprises a number of mechanical or moving parts such as valves and pistons which quickly deteriorate and hence require regular maintenance. Moreover the pump increases the weight of the device, which is customarily carried by hand, so that the user is more quickly fatigued.

A spraying device has also been proposed which can be filled and pressurized by means of a supply of water under pressure such as a conventional water system. Such a device comprises a tank which is equipped with a spray nozzle and which can be connected during the filling phase with a water delivery pipe under pressure. The water under pressure flows into the tank which is thereby filled and pressurized until the pressure in the tank is equal to the pressure in the delivery pipe. While such a device avoids the need of a pump or other mechanically moving parts, it suffers from the drawback that it does not provide sufficient pressure to be sustained for the duration of the spraying time.

The present invention provides a spraying device having the advantages of avoiding mechanically moving parts while at the same time providing sufficient pressure throughout the whole of the spraying time.

In accordance with the invention a device for pressurizing and spraying liquids, and more particularly liquids used for the treatment of plants, comprises two separate tanks which are connected to one another, preferably in such manner that they can be detached. One of the tanks is connected to the delivery pipe of a water supply under pressure and allows the filling and pressurizing of the second tank which contains the product to be sprayed. For the purpose of the present description the former tank is referred to as the "intermediate" tank or reservoir and the latter is referred to as the "spray" tank.

In the device according to the invention the "intermediate" reservoir is provided on the one hand with a device for connecting it to a pressurized water supply and on the other hand with a coupling system provided with suitable valve means for connecting it with the "spray" tank. As water under pressure from the supply flows into the intermediate reservoir, the air initially in the reservoir is displaced into the spray tank. When the intermediate reservoir is filled, the water under pressure flows through the reservoir into the spray tank where it compresses the air that was originally in the spray tank and also the air that was displaced from the intermediate reservoir. By reason of the air displaced from the intermediate tank sufficient pressure is produced in the spray tank to last throughout the spraying operation. The spray tank is provided with one or more nozzles through which the pressurized liquid in the tank is sprayed. It is also provided with a closable opening for the introduction of the products to be sprayed

which are put into the tank before the filling and pressurizing operation. While the spray tank and intermediate reservoir can if desired be permanently connected, it is preferable to connect them by means of a separable coupling so that only the spray tank need be carried during the spraying operation.

The nature and advantages of the invention will be more fully understood from the following description of a preferred embodiment shown by way of example in the accompanying drawings in which all of the views are schematic and in which

FIGS. 1, 2 and 3 show respectively the intermediate reservoir, the spray tank and the spray nozzle of spraying apparatus in accordance with the invention

FIG. 4 shows the intermediate reservoir connected to a pressurized water supply and to the spray tank for filling and pressurizing the spray tank and

FIG. 5 shows the spray nozzle connected with the spray tank for spraying.

As schematically illustrated in the drawings, spraying apparatus in accordance with the invention comprises an intermediate reservoir 1 (FIG. 1) which is shown in the form of a spherical tank provided at its top with an inlet tube 2 and an outlet tube 3. The inlet tube 2 is provided with a coupling 4 for connecting it to a supply of water under pressure such as a water tap 14 (FIG. 4) provided with a valve 14a. The coupling 4 may be a screw type hose coupling or a quick-disconnect coupling such as that sold under the trade name "Gardena." The outlet tube 3 is provided with a coupling 5 for connecting it to the spray tank as will be described below. The coupling 5 may be likewise a screw type coupling or a quick-disconnect coupling. The inlet tube 2 and outlet tube 3 are preferably flexible hose sections suitably connected to the top of the intermediate reservoir 1.

The apparatus in accordance with the invention also comprises a spray tank 6 which is preferably of cylindrical form. The spray tank 6 is provided with a tube 7 which extends substantially to the bottom of the tank and is connected to a tube 8 provided with a coupling 9 for connecting the tube 8 to the discharge tube 3 of the intermediate reservoir 1. The tube 8 is preferably flexible whereas the extension tube 7 may be either flexible or rigid as desired. The coupling device 9 is adapted to connect with the coupling device 5 and is accordingly either a screw type or a quick-disconnect type coupling. The coupling 9 is equipped with a valve device, for example, an "Aqua-stop" system, to prevent loss of pressure from the spray tank 6 when the coupling 5,9 is disconnected. Alternatively the tube 8 is provided with a manually operable valve.

The spray tank 6 has a filling opening provided with a closure 10 for the introduction into the spray tank of the product to be sprayed. The spray tank further is provided with a carrying handle 11 which can if desired be combined with a closure for a filling opening. A shoulder strap may also be provided for carrying the spray tank 6.

The apparatus further comprises a spray device 12 illustrated as a spray tube provided at one end with a variable spray nozzle 12a and connected at the other end to a flexible tube 12b provided with a coupling device 13 for connection with the coupling device 9 of the spray tank. The spray device may also include valve means, for example, a push button or lever type valve, to control the spraying.

The apparatus works in two phases, namely a filling and pressurizing phase and a spraying phase. In the filling and pressurizing phase the necessary quantity of the product to be sprayed is introduced into the spray tank 6 through the filling aperture which is then tightly closed with the closure 10. The spray tank 6 is connected to the intermediate reservoir 1 by means of the coupling device 5,9 and the intermediate reservoir 1 is connected by the coupling device 4 to the tap 14 of a pressure water supply system as illustrated in FIG. 4. The valve 14a of the tap 14 is then opened and the filling of the intermediate reservoir 1 begins. As the intermediate reservoir 1 is filled with water, the air that it originally contained is displaced through the tubes 3 and 8 to the spray tank 6 where it is compressed. When the intermediate reservoir 1 is full, water flows through the reservoir 1 into the spray tank 6 where it mixes with the product to be sprayed and progressively fills the tank, thereby compressing the air which was initially in the spray tank and also the air which was displaced to the spray tank from the intermediate reservoir 1. When the pressure in the spray tank 6 is equal to that of the water supply, no further water flows into the spray tank. The valve 14a of the water tap 14 is then closed and the coupling device 5,9 is disconnected, whereupon automatic valve means in the coupling 9 prevents the pressurized water from being discharged from the tank 6. Alternatively if the tube 8 is provided with separate valve means, such valve is closed to prevent discharge of pressurized water from the spray tank. The intermediate reservoir 1 is emptied in preparation for the next filling.

For the spraying phase the spraying device 12 is connected to the tube 8 by means of the coupling means 9,13 as illustrated in FIG. 5. If the coupling means 9 includes automatic valve means, the valve is opened when the coupling device 13 is connected with the coupling device 9. If a separate valve is provided in the tube 8, it is opened so as to supply the pressurized spraying mixture to the spraying device 12. Thereupon the spraying is controlled by valve means with which the spray device 12 may be provided. The spraying operation is continued until all of the liquid has been sprayed. By reason of the reserve pressure provided by the apparatus in accordance with the invention, sufficient pressure is maintained for proper spraying of the liquid throughout the spraying operation.

By way of example if each of the two tanks has a capacity of 6 liters and the pressure of the water supply is of the order of four atmospheres, the spray tank will contain approximately 4 liters of water at the end of the filling and pressurizing operation. The complete spraying of the four liters of spray liquid can be then carried out satisfactorily, the pressure at the end of the spraying still being sufficient to spray the liquid a suitable distance.

While a preferred embodiment of the apparatus in accordance with the invention has been illustrated in the drawings, it will be understood that modifications may be made. For example, while it is preferable to provide for disconnecting the spray tank from the intermediate reservoir as shown, the two can if desired be permanently connected, as the intermediate reservoir would be emptied after the filling and pressurizing operation, it would not add greatly to the overall weight of the apparatus. While the spray device 12 is shown as being connected to the same tube 9 that is used for fill-

ing and pressurizing the spray tank, it will be understood that the spray device can be connected separately and if desired permanently to the spray tank. Moreover the spray tank can be provided with more than one spraying device. To facilitate emptying the intermediate reservoir 1 after completion of the filling and pressurizing phase of the operation, it can be provided with a closable drain.

The size and capacity of the apparatus is selected according to the use for which it is intended and the preference of the user. The weight of the spray tank when filled should not exceed certain limits since the apparatus is intended to be held by hand, carried on the shoulders or perhaps equipped with wheels for short displacements. In practical terms the spray tank can advantageously contain from 4 to 20 liters of liquid. While the intermediate reservoir has been shown as having approximately the same volume as the spray tank, it can be made larger or smaller as desired. However it should be large enough to supply sufficient air so that sufficient pressure is supplied throughout the spraying operation. If the intermediate reservoir is made unnecessarily large, the amount of liquid that can be introduced into the spray tank is reduced. The apparatus can be made of metal, although in order to reduce the weight, it is preferably made of lighter plastic material.

The spraying apparatus in accordance with the present invention can be used in all cases where spraying of a liquid is to be carried out by means of a simple self-contained apparatus with regular output and without resorting to a pump for pressurizing the liquid. Applications of particular interest are the spraying of horticultural plants, private gardens and small orchards. However the apparatus can be used wherever the spraying of a pre-pressurized liquid is desired.

What I claim and desire to secure by Letters Patent is:

1. Apparatus for spraying plants and the like comprising a portable closed spray tank having a closable opening for the introduction of material to be sprayed, a tube extending from near the bottom of the interior of said spray tank to the exterior thereof, a spray nozzle, means for connecting said spray nozzle to said tube, an intermediate tank having an outlet at the top of the tank and an inlet, means for connecting the outlet of said intermediate tank to said spray tank and means for connecting the inlet of said intermediate tank to a supply of water under pressure whereupon water from said supply first displaces air initially in said intermediate tank to said spray tank and then flows through said intermediate tank to partially fill said spray tank and to compress air initially in said spray tank and the air displaced from said intermediate tank to said spray tank and thereby provide pressure for spraying water mixed with the material to be sprayed through said nozzle.

2. Apparatus according to claim 1, in which said intermediate tank is approximately spherical.

3. Apparatus according to claim 1, in which said means for connecting said intermediate tank to said spray tank comprises a quick-disconnect coupling.

4. Apparatus according to claim 1, in which said means for connecting said spray nozzle to said tube includes a disconnectable coupling.

5. Apparatus according to claim 4, in which said means for connecting said intermediate tank to said spray tank comprises a hose connected to said outlet of the intermediate tank and coupling means for connecting said hose to said tube.

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