July 22, 1941. H. R. RICH 2,250,034

SPRAYING DEVICE

Filed Nov. 7, 1938

Fig. 1.

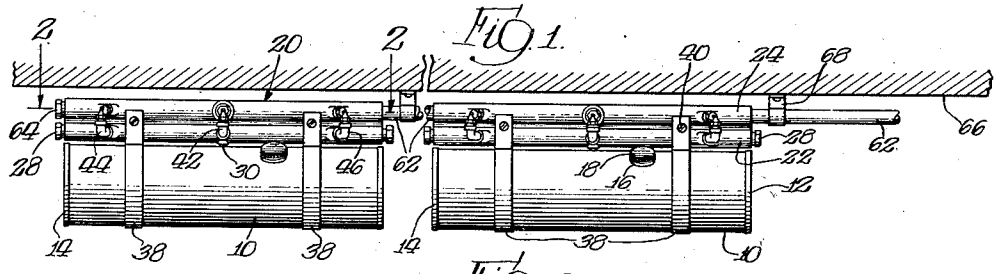


Fig. 2.

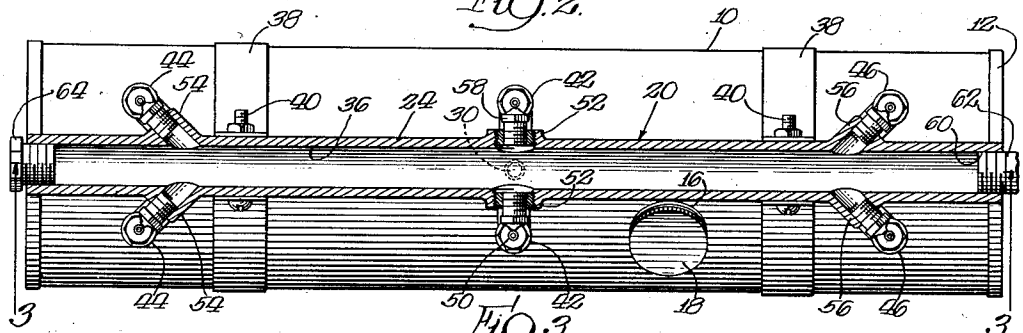


Fig. 3.

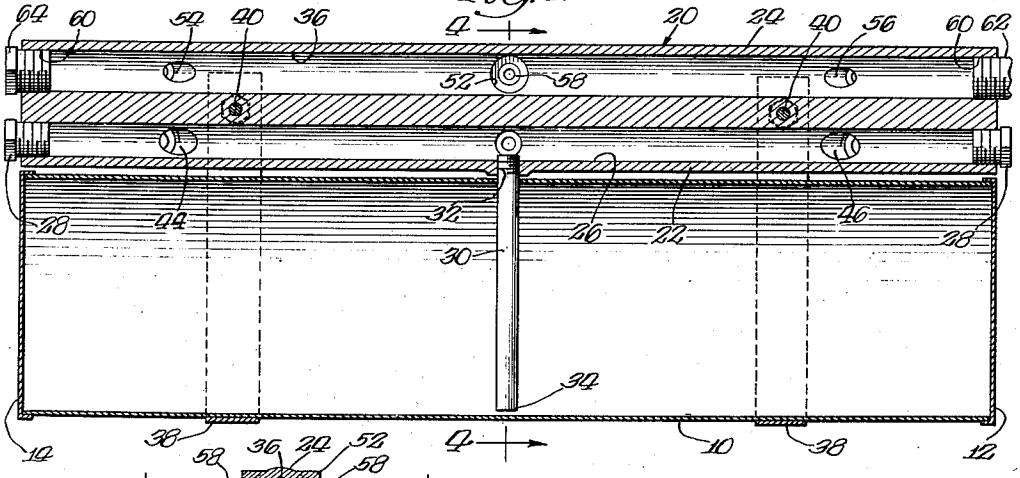
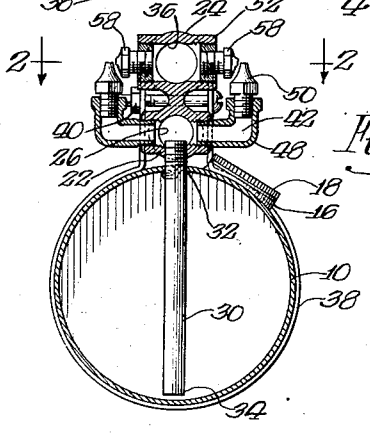


Fig. 4.



INVENTOR.
Hyman Richard Rich,
BY Bair & Freeman
ATTORNEYS.

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SPRAYING DEVICE

Hyman Richard Rich, Milwaukee, Wis., assignor to Enoz Chemical Company, Chicago, Ill., a corporation of Illinois

Application November 7, 1938, Serial No. 239,206

6 Claims. (Cl. 299—86)

My invention relates to spraying devices particularly those of a sort adapted to be continuously operated by some constant source of pressure in order to distribute a cloud of atomized liquid into the atmosphere.

Among the objects of invention is the provision of a new and improved spraying device which has a plurality of spraying jets so directed and distributed as to substantially fill the area to be sprayed with a mist of the atomized liquid.

Another object is to provide a new and improved spray device for use in distributing atomized liquids such as insecticides into a room which is provided with jets or aspirators so positioned upon the device that they operate close to the ceiling in order that the cloud of atomized liquid ejected therefrom may penetrate all of the upper strata of the room as well as the lower strata where the atomized fluid will eventually fall.

Still another object is the provision of a spray device of new and improved construction which is adapted to distribute a relatively large volume of atomized liquid into the atmosphere, which is provided for that purpose with a primary reservoir adapted to hold a relatively large quantity of the liquid, and a secondary reservoir into which the liquid is drawn and which is adapted to feed distributing aspirators with liquid in such a manner that the vertical lift of liquid from the last reservoir to the outlet is only a relatively short distance so that by the provision of jets cooperable with the aspirators, supplied with gas at a moderate pressure, large quantities of the liquid will be rapidly and properly sprayed into the adjacent atmosphere.

Another object still is the provision of a new and improved spray device featuring a two-stage reservoir arrangement, one adapted to the purpose of a storage reservoir and the other adapted to the purpose of a distributing reservoir so that a large number of jets may be used, fed by the distributing reservoir, all capable of distributing substantially equal volumes of the atomized liquid.

A further object is the provision of a new and improved type of spray device which can be used in multiple units connected directly to the horizontal pipe line which conducts gas pressure to operate the devices, these units being so constructed that the pipe line may be conducted into one end and out the other so that the successive units in effect form part of the pipe line without breaks or bends and thus produce a more uniform spraying action.

A further object still is the provision of a new and improved spray device of compact construction which is adapted to be permanently mounted in a pressure line located advantageously in any portion of a room desired and supplied with a filling opening at the top of a reservoir contained therein but below the uppermost portions of the device so that the spraying device may be filled at suitable intervals without the necessity of dismantling any portion of it.

With these and other objects in view, my invention consists in the construction, arrangement and combination of the various parts of my device whereby the objects contemplated are attained, as hereinafter more fully set forth, pointed out in my claims and illustrated in the accompanying drawing, in which:

Figure 1 is a side elevation showing two of my spraying devices attached in a pressure line to the ceiling of a chamber to be sprayed.

Figure 2 is a top view taken on the line 2—2 of Figure 4 showing the gas pressure manifold in section.

Figure 3 is a longitudinal sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a cross sectional view taken on the line 4—4 of Figure 3.

In dispensing liquids and particularly liquid insecticides when used to thoroughly disinfect or fumigate chambers such as warehouses, dairies, storage rooms and such similar structures, it is necessary, in order to have a given quantity of liquid insecticide perform most efficiently, to completely and thoroughly atomize every particle and to distribute the mist thus formed into every nook and cranny of the room.

One of the troubles with commercial atomizers in the past is that the atomizers have been so constructed that they must be suspended a considerable distance down from the ceiling. Under such circumstances, no matter how well the device may atomize the liquid insecticide the cloud or mist thus formed reaches only the lower strata of the room and while it may be reasonably effective on the lower portions of the wall, the floor and such merchandise as may be piled thereon, there always remains a considerable portion of the walls above the effective position of the spray which is not touched by the treatment.

Such spaces naturally afford a refuge for insects of a sort which can move rapidly from one portion of the room to another. Therefore, the spraying becomes relatively ineffective since these insects which have sought protection can imme-

diately reinfest the premises soon after the spraying has ceased.

It is therefore among the objects of this invention to dispense a minutely atomized liquid near the ceiling with considerable force and further to distribute a multiplicity of aspirating jets so that a complete blanket or cloud of the atomized insecticide is spread over the room at the ceiling so that every portion of the room is treated, leaving no refuge for any insects of any sort.

Another difficulty which has frequently arisen in the past has been failure to distribute a sufficient quantity of atomized liquid insectide into a chamber so that the effect thereof will outlast the incubation period of any of the insect forms which are designed to be eliminated. Although spraying devices now in use are designed to be replenished with reasonable frequency by substituting a filled container for those which are rapidly emptied, this alone does not supply the deficiency since in order to replenish the exhausted reservoir the spraying system must be frequently shut off. A greater harm results, however, by reason of the fact that since it is a considerable inconvenience to replenish the exhausted reservoirs the job is frequently left undone or partly undone and incomplete treatment habitually results.

In the spraying device herein presented there is provided a reservoir of ample proportions which in each instance is provided with a suitable number of aspirating outlets to thoroughly and rapidly dispense into a chamber a large quantity of atomized liquid. The device has been so designed that each and every aspirating outlet is supplied with liquid to be dispensed at approximately the same quantity and pressure so that although all of them draw through different distances from the same storage reservoir there are no internal restrictions such as would prevent full and complete operation of all of the jets simultaneously.

My device comprises generally a primary or storage reservoir **10** which in the embodiment shown has a cylindrical shape and is designed to be used in a horizontal position. The cylinder is customarily made of a relatively light weight material closed at both ends by means of caps **12** and **14** and provided near the top in the position shown in Figure 1 with a filler opening **16** closed by a screw cap **18**.

Located above the reservoir there is shown in this embodiment a single casting designated generally by the reference character **20** consisting of a pair of elongated tubular members **22** and **24** respectively.

The member **22** has an elongated chamber **26** extending from one end to the other parallel to the reservoir so that the bottom of the chamber is substantially horizontal to permit liquid after being drawn into it to distribute itself by gravity to a uniform level throughout. Plugs **28** close each end of the chamber. Near the center, at the lower side of the chamber in this particular embodiment there is provided a threaded opening in which is secured by means of a gas tight joint a stand pipe **30** which extends downward from the chamber through an aperture **32** in the upper side of the primary reservoir to a level **34** adjacent the bottom thereof. Chamber **26** accordingly forms what might be termed a secondary reservoir for the device which is virtually a second stage in the passage of liquid from the primary reservoir out into the room.

Immediately above the secondary reservoir is located the second tubular member **24** which has likewise a central passage or chamber **36** extending from end to end. The chamber **36** is made for convenience parallel to the chamber **26** and is similarly disposed horizontally. The single casting **20** embodying the tubular members is secured to the cylinder **10** by means of straps **38** which surround the cylinder and are secured at either side of the casting by means of nuts and bolts **40**. The cylinder, it will be noted, is prevented from slipping endwise by the positioning of the stand pipe **30** in the hole **32**.

The secondary reservoir or chamber **26** is herein shown provided with a series of six aspirating outlets. At the center the outlets **42** are directed perpendicular to the axis of the tubular member while the pairs of outlets, **44** at the left and **46** at the right are directed angularly away from the center at an angle of approximately 30° from the axis of the tubular member. In each of the outlets is positioned an elbow fitting **48** which is capped on the upward extending arm with a tip **50**. It will be noted that the outlets each enter the chamber **26** in a substantially horizontal direction and are sufficiently large so that the opening for the outlet is almost coincident with the bottom of the chamber.

From the upper chamber **36** a series of jets are provided identified by the characters **52** in the central positions and **54** and **56** in the left hand and right hand angular positions respectively. There is one jet for each outlet, each provided with a nozzle **58** directed in aspirating relation against and over the tip **50**.

The upper chamber **36** is provided with threaded openings **60** at each end to which may be attached a pipe **62**, for example, such as is shown at the right hand of the chamber in Figures 1, 2 and 3 and a plug **64** such as is shown at the left hand end of the same figures. Where desired, a pipe **62** may be inserted at each end as shown in the right hand spray device of Figure 1 so that a second spray device may be connected to it in the same line or in fact any number of a succession of such spraying devices. Pipe **62** carries compressed air or steam to the device.

The pipe lines and coincidentally the spraying device may conveniently be secured to a ceiling **66**, for example, or to any other suitable structure in the room by means of brackets **68**, or to beams or side walls as occasion requires.

Operation

The embodiment here shown is designed to be secured adjacent the ceiling of a chamber to be treated and to be located in a pipe line through which is conducted some variety of gas at a suitable pressure which is preferably kept constant. The primary reservoir is filled with liquid which is inserted through the filler opening **16** and can be filled almost to the top. By reason of the space remaining between the top of the cylinder **10** and the uppermost edge of the casting, the device is permitted to be filled conveniently even though located close to the ceiling of a room.

After the device has been filled, gas under pressure is started through the pipe line **62** and is immediately ejected outward in the several directions indicated through the nozzles **58**. This produces an aspirating effect upon all of the tips **50**, which produces a cumulative suction within the secondary reservoir **26** which is effective in drawing liquid from the primary reservoir up through the stand pipe **30** into the

secondary reservoir where it flows by gravity to both ends of the chamber. By this operation, regardless of whether or not one set or another of the nozzles may be near or far from the source of pressure, the summation of the suction effect produced by all of them is made effective in the secondary reservoir so that a strong uniform suction effect is produced which will draw the secondary reservoir full of the liquid to be dispensed.

Thereafter, liquid is drawn out of the secondary reservoir through the elbows **48** and tips **50** from which it is blown in a cloud or mist outward into the atmosphere within the chamber to be treated.

By reason of the fact that the lift for each aspirator is no more than the distance from the bottom of the secondary reservoir **26** to the top of each tip **50**, a plentiful supply of atomized liquid is distributed uniformly from each and every outlet even though some slight differences in pressure or diameter may be present, such as an occasional inadvertent clogging or some other reason which might under any other circumstances render one jet or another considerably less efficient.

The same uniformity of distribution is made possible for similar reasons in spraying devices such as the device illustrated at the left of Figure 1 wherein the outlets lie at a greater distance from the source of gas pressure than those at the right of said figure. Because of the fact that the lift is very short in each instance and also by reason of the fact that the accumulative lift of all of the six jets in each container is sufficient to maintain the secondary reservoir **26** practically full in each instance all of the jets may be properly fed during operation regardless of their distance from the central source of gas pressure.

There has therefore been provided an atomizing liquid dispenser capable of completely saturating a chamber with a cloud of atomized fluid uniformly distributed into every part thereof and which is so designed that it can be used singly or in multiple units at any reasonable distance from a source of gas pressure used to operate it.

Some changes may be made in the construction and arrangement of the parts of my device without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim as my invention:

1. A liquid spray device for spreading a cloud of atomized liquid comprising a tank forming a primary liquid reservoir for storing liquid at a level below the top thereof, a member having a chamber therein forming a normally empty secondary liquid reservoir spaced above and independent of the primary reservoir, a single stand pipe extending centrally from the secondary reservoir to the bottom of the primary reservoir, and a second member having a passage therein lying adjacent the first member adapted to be connected in a fluid pressure line, a plurality of aspirators on the first member spaced at different distances from the stand pipe and directed at various angles with respect to the central axis thereof communicating with the secondary reservoir and a series of correspondingly directed jets communicating with the passage in the second member directed against said aspirators for drawing jointly through the secondary reservoir upon the stand pipe to fill said secondary reservoir to a temporary gravity level common to all the aspirator inlets and for drawing separably on said secondary reservoir to lift the liquid substantially a minimum distance and spread said vaporized liquid uniformly in a plurality of directions into the atmosphere.

2. A liquid spray device for spreading a cloud of atomized liquid comprising an elongated tank forming a primary liquid reservoir, an elongated tubular member having a chamber therein forming a secondary liquid reservoir, a single stand pipe extending from the central portion of the secondary reservoir to the bottom of the primary reservoir, and a second elongated tubular member having a passage therein lying parallel to and adjacent the first tubular member adapted to be connected in a fluid pressure line, a plurality of aspirators spaced along the first tubular member communicating with the secondary reservoir at different distances from the center thereof and at equal distances above the bottom of said secondary reservoir and a series of correspondingly directed jets communicating with the passage in the second tubular member directed against said aspirators for drawing jointly on the stand pipe to lift the liquid a substantial distance to a uniform gravity level in said secondary reservoir and for drawing separably from that level in the second reservoir to lift the liquid substantially a minimum distance and spread said vaporized liquid uniformly in a plurality of directions into the atmosphere.

3. A liquid spray device for generating a sheet of atomized liquid comprising a tank forming a primary liquid reservoir, a member having a single elongated cavity therein forming a secondary liquid reservoir having a horizontal bottom extending from end to end of said primary reservoir adapted to contain a relatively large volume of liquid at a substantially uniform depth and a single stand pipe extending from the secondary reservoir midway between the ends thereof to the bottom of the primary reservoir forming a passage for liquid from one to the other, a plurality of aspirator passages arranged in pairs along the axis of the cavity and directed horizontally outward in all directions so that the angular spaces between them are substantially equal, said passages having horizontal portions communicating with the secondary reservoir at the bottom thereof and vertical portions terminating in outlet tips, thereby being supplied with liquid at a uniform head of pressure, and a series of jets connected to a source of fluid pressure directed at said tips for creating a suction at each to draw liquid into said secondary reservoir and to aspirate said liquid from the secondary reservoir into the surrounding atmosphere in all directions.

4. A spray device for liquids adapted to be permanently mounted in a pressure pipe line so as to spread a cloud of atomized fluid into the space adjacent the ceiling of a room comprising a topmost elongated chambered portion having a horizontal connection with said pipe line and a plurality of jets spaced therealong and directed outward therefrom, a lower chambered horizontal portion having a plurality of aspirating outlets therefrom, one for each of said jets, and a primary reservoir portion permanently attached directly to and below the lower chambered portion having an aperture in the top, a stand pipe in the lower chambered portion loosely filling said aperture and extending into the primary

reservoir adapted to supply said chambered portion with liquid, said primary reservoir being provided with a normally closed filler opening near the top thereof independent of the adjacent portions of the device adapted to be used for filling said reservoir without disturbing its position on said pipe line.

5. A liquid spray device for generating a cloud of atomized fluid comprising an elongated unit including an upper portion having an elongated cylindrical cavity for receiving a gas under pressure, a threaded connection at one end of the cavity for connecting to a gas line, a threaded connection plug means for closing the other end of the cavity adapted to be removed therefrom to provide an uninterrupted scavenging passage for blowing gas therethrough under pressure during a cleaning operation, a lower portion integral with the upper portion connected thereto by a web having an elongated lower cylindrical cavity forming a secondary reservoir for liquid and removable plugs at opposite ends of the secondary reservoir for closing openings therein adapted to be removed to permit connection of the secondary reservoir with corresponding parts of adjacent devices, an elongated primary reservoir for liquid having connections secured to said web for supporting said reservoir adjacent the underside of said unit, a pipe sealed in the secondary reservoir extending through an open hole into said primary reservoir, said lower portion of the unit having a plurality of threaded bosses extending in various directions and a plurality of identical aspirating outlet members threaded therein and feeding from a uniform level of liquid in said secondary reservoir, said outlet members being spaced at various balanced distances from the pipe, said upper portion of the unit having a plurality of threaded bosses positioned one each in the same general direction as the bosses in the lower portion and a plurality of identical straight nozzles fitted into said upper bosses communicating with the upper cylindrical cavity in aspirating relation to the outlets and spaced at progressively increasing distances from said source of gas adapted when subjected to pressure to draw jointly on the pipe for filling said secondary reservoir throughout its length to a uniform gravity level and then being adapted to draw individually from the secondary reservoir at said level to expel a vaporized liquid in uniform quantities from each nozzle.

6. A unitary fluid spray device for spreading a sheet of vapor over the upper portion of a room comprising an elongated cylindrical tank forming a primary reservoir for fluid wherein the length of a body of fluid contained in the reservoir is relatively greater than the depth and width, an elongated hollow cylindrical member equivalent in length to the tank located adjacent and parallel to the upper side of the tank forming a secondary reservoir, said reservoir having a central stand pipe extending downwardly therefrom through an aperture of greater diameter in the upper side of said tank to a point adjacent the bottom, and a second elongated hollow cylindrical member equivalent in length to the first, joined to the first in parallel relation at the upper side thereof forming a chamber for fluid under pressure, aspirating outlet fittings spaced at various distances along the axis of the secondary reservoir at both sides having the orifices thereof in a horizontal plane substantially coincident with the axis of said chamber, a jet for each outlet spaced along the axis of said second cylindrical member, openings at the ends of said cylindrical members forming normally closed connections thereto and straps extending around the walls of the tank securing said tank to the cylindrical member.

HYMAN RICHARD RICH.