July 24, 1956 H. E. RITTENHOUSE 2,756,100

LIQUID DISPERSING APPARATUS

Filed April 21, 1953

Fig. 3

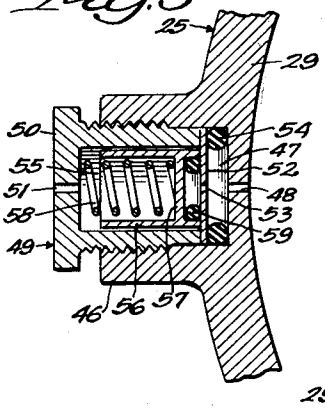


Fig. 1

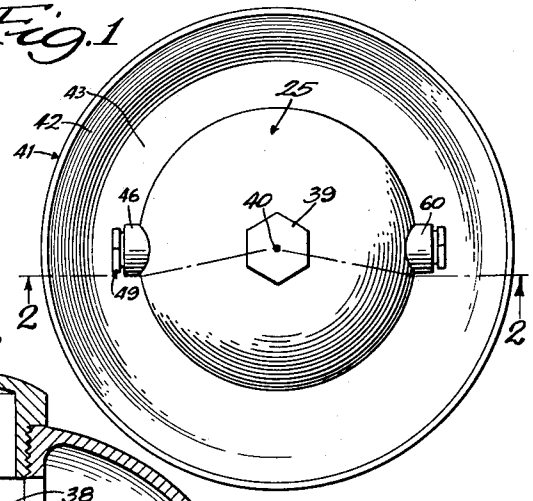
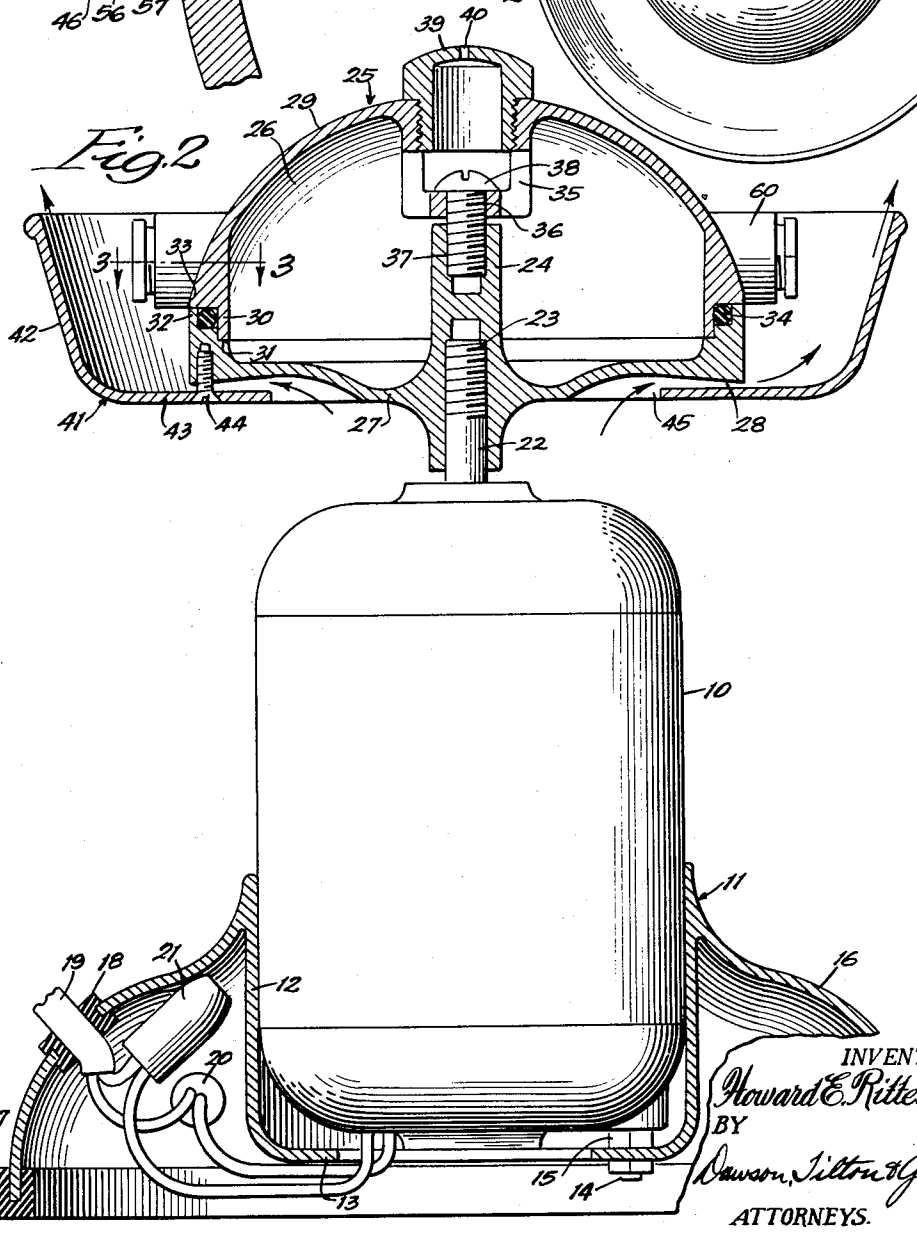


Fig. 2



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LIQUID DISPERSING APPARATUS

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4 Claims. (Cl. 299—63)

This invention relates to liquid dispersing apparatus, and is particularly useful in the dispersing of liquids of various types in small particles to form a mist, spray, etc. The invention is useful in the application of insecticides, herbicides, and similar materials carried in solution.

An object of the invention is to provide improved apparatus for breaking a liquid stream into small particles capable of being moved readily in air streams or currents. Another object of the invention is to provide dispersing apparatus that is small and compact and, therefore, occupies little space and is also inexpensive, wherefore it is particularly suited for home use. Still another object of the invention is that of providing valve means for discharging liquid from a reservoir and that is automatically operable to discharge the liquid into an air stream only when a predetermined volume of air is being supplied by the apparatus.

A further object of the invention is to provide dispersing apparatus in which a reservoir is rotated during the operation of the apparatus and is equipped with a discharge valve, the valve being operated by centrifugal force and opens only upon the reservoir being rotated at a predetermined speed. Still a further object is to provide in dispersing apparatus a directional plate operatively arranged with a plurality of vanes and both being rotatably driven during operation of the apparatus to provide a predetermined volume or mass of air at the designed operating speed of the dispersing apparatus. Yet a further object is to provide a reservoir, direction plate and vanes that are all rotatably driven during operation of the dispersing apparatus to provide a predetermined volume of air passing about the reservoir when the apparatus is operated at the speed for which it is designed. Additional objects and advantages will appear as the specification proceeds.

An embodiment of the invention is illustrated in the drawings, in which—

Figure 1 is a top plan view of the dispersing apparatus; Figure 2 is a vertical sectional view taken on the line 2—2 of Fig. 1 and with the motor being shown in elevation; and Figure 3 is a detailed sectional view of the valve mechanism, the section being taken on line 3—3 of Fig. 2.

The dispersing apparatus includes a motor 10 that may be of any usual construction, and since no particular novelty is imparted to the motor structure, the motor is shown in elevation for purposes of simplicity. The motor 10 is vertically oriented and is equipped at its bottom with a support 11. The support 11 includes an inner cylindrical portion 12 providing at its bottom an inwardly-turned annular flange 13 upon which the motor is supported. Studs 14 or capscrews may be used to secure the motor to the flange 13 and, if desired, resilient washers 15 may be interposed between the flange and the motor to attenuate the motor vibration.

The support 11 is also equipped with generally bell-shaped side walls 16 that taper outwardly and downwardly and are equipped along the lower annular edge thereof with a resilient gasket or support 17 that will be received upon the floor, table, or other support member.

The side wall 16 is equipped with an aperture having mounted therein a rubber grommet 18, and a cable 19 extends through the grommet and carries the electrical leads for supplying the motor 10 with power. It will be noted in Fig. 2 that the wall 16 is also equipped with a second aperture therethrough also having a rubber grommet 20 mounted therein. A switch (not shown) is carried upon the wall 16 on the outer side thereof and is interposed in the conductors to permit the circuit to be selectively opened and closed to actuate the motor 10. An insulator 21 is used to enclose the physical connection between the motor leads and the conductor carried by the cable 19.

The motor 10 is equipped with a shaft 22 having a threaded upper portion 23. Threadably receiving the upper end 23 of the shaft is the central hub 24 of a reservoir 25 that provides a chamber 26 therein adapted to receive the liquid to be dispersed. As previously brought out, the liquid may be any type or kind such as solution forms of insecticides, etc., and hereinafter such solutions will be referred to generally as "liquids."

The reservoir 25 constitutes the head of the dispersing apparatus and includes a lower or bottom portion 27 equipped with a plurality of vanes 28 that extend outwardly from the central hub 24 in a generally horizontal plane. The reservoir 25 also includes a generally globular closure member 29 having a depending annular wall 30 supported upon an annular lip 31 provided by the lower portion 27 of the reservoir. The lower reservoir portion 27 provides an upwardly-extending lip 32 that is annular and has supported thereon an annular shoulder 33 provided by the upper reservoir portion 29. A sealing gasket 34, which may be a rubber O-ring, is interposed between the upper and lower reservoir portions and provides a seal between the meeting edges thereof. The upper or globular closure portion 29 is provided centrally with depending walls 35 that are turned inwardly at the bottom and are equipped with an aperture 36 therethrough. The hub 24 provided by the lower reservoir portion 27 is equipped at its upper end with a threaded bore 37 and the upper reservoir portion 29 is drawn tightly against the lower reservoir 27 by a capscrew 38 extending through the aperture 36 and threadably received within the bore 37 of hub 24. By tightening the capscrew 38, a liquid-tight seal is provided by the rubber O-ring 34, and at the same time the upper and lower reservoir portions are fixedly secured to the motor shaft 22 and are rotatably driven thereby.

The depending walls 35 provided centrally by the upper reservoir portion 29 are threaded and receive a closure plug 39 therein. The closure plug 39 may be equipped with an aperture 40 in the upper wall thereof to provide a vent for the chamber 26 provided by the reservoir. The depending walls 35 are equipped with a plurality of openings therethrough so that the chamber 26 may be filled with suitable liquid by removing the closure plug 39 and pouring the liquid into the central opening provided by the depending annular walls 35.

A directional plate 41, having an upwardly and outwardly-inclined annular wall 42 and an inwardly-turned, substantially horizontal wall 43 formed integrally therewith, is rigidly secured to the lower reservoir portion 27 by capscrews 44. The horizontal wall 43 is equipped centrally with an enlarged annular opening 45, through which air may be drawn and expelled upwardly along the inner surface of the side walls 42.

As is seen best in Fig. 3, the reservoir 25 is equipped on one side with a boss 46 having a longitudinally-extending passage 47 therethrough communicating with the interior of the reservoir through an aperture 48. Threadably-received within the passage 47 is a valve casing 49 equipped with an outer end wall 50 having an outlet port

51 therein and an inner end wall 52 having an inlet port 53 therein. The inner end wall 52 is brought into sealing engagement with the reservoir wall about the aperture 48 by means of a sealing gasket 54 that may be a rubber O-ring. With this structure, any discharge of liquid from the reservoir 25 must be through the aperture 48 and inlet port 53 and into the valve chamber 55 provided by the valve casing 49. Slidably mounted within the chamber 55 is a valve 56 that is generally cylindrical in shape and is equipped intermediate its ends with an imperforate wall 57 that provides a seat for one end of a helical spring 58. The opposite end of the helical spring seats against the outer end wall 50 of the valve casing. The spring 58 normally biases the valve 56 against the inner end wall 52 of the valve casing, and a sealing gasket 59, which may be a rubber O-ring, insures sealing engagement between the valve 56 and inner end wall 52 when the valve is urged against the end wall by the spring 58. It will be noted in Fig. 1 that diametrically opposed to the boss 46 and valve structure carried therein, the reservoir is equipped with an enlargement or boss 60 that provides a valve identical to the valve structure carried upon the opposite side thereof.

Operation

In operation, the motor 10 is connected to a suitable source of power and upon throwing of the switch (not shown) carried by the support casing 16 to the "On" position, the motor is actuated and begins to rotate. It will be understood that a suitable liquid has been placed within the chamber 26 provided by the reservoir 25 prior to actuating the motor 10. As the motor 10 picks up speed, the vanes 28 cooperate with the directional plate 41 to provide an air flow through the enlarged opening 45 and upwardly between the inner surface of the side wall 42 of the directional member and the side walls of the reservoir 25. The spring 58 is operative to force the valve 56 into sealing engagement with the inner end wall 52 of the valve casing, and there is no discharge of liquid from the reservoir 25.

When the motor 10 attains operational speed, which is preferably about 10,000 revolutions per minute, the centrifugal force operative upon the valve 56 tends to move it longitudinally within the valve casing and chamber provided thereby and overcomes the biasing action of the spring 58. When the valve 56 has moved slightly and is spaced from the inner end wall 52, the liquid within the reservoir flows through the aperture 48 and inlet port 53 and into the interior or chamber 55 provided by the valve casing. A loose fit is provided between the valve 56 and the walls of the chamber 55, as is indicated in Fig. 3, and the liquid entering the valve chamber flows between the valve and chamber walls and outwardly and through the discharge or outlet port 51 and into the air stream surrounding the reservoir and that is provided by the vanes 28 and directional plate 41. At this time, the volume or mass of air being supplied by the vanes and directional plate is sufficient to insure that all of the liquid discharged from the outlet port 51 is swept up by the air stream and is dispersed thereby in the form of a mist or very fine particles.

As the reservoir 25 is rotated, the liquid contained therein will be forced outwardly by centrifugal force and against the side walls of the reservoir. The liquid then will readily move from the reservoir and through the valve chamber and outwardly from the outlet port 51 thereof by following the path previously described. Actually, then, the centrifugal force provides a liquid within the reservoir that is under presssure and tends readily to flow through the outlet passages.

The design of the vanes 28 and directional plate 41 is such that the volume of air required to completely disperse all of the liquid being discharged from the reservoir as a fine spray or mist is provided when the dispersing apparatus is rotated at its normal speed. The air flow forms a layer of air over the inner surface of the directional member 41 and none of the liquid discharged from the reservoir impinges upon the inner walls of the directional member. The entire discharge is swept up by the air stream and dispersed thereby and the tendency for coalescence between liquid droplets when they impinge upon a structure is thereby obviated. In actual operation of the apparatus, the inner surface of the directional member 41 remains completely dry and there is no wastage of the liquid by collection thereon and all of the droplets discharged from the reservoir and through the control valve remain in particulate or droplet form and are dispersed in this form. This result is not attained if the walls of the directional member 41 are perforate, and it is desired then to provide the member with imperforate walls.

When the apparatus is shut off, the instant the rotational velocity of the reservoir 25 falls below that required to provide a centrifugal force operable upon the valve 56 to overcome the biasing force of the spring 58, the inlet port 53 is sealed off by the valve 56 and the discharge from the reservoir is terminated. There is no wastage of the expensive insecticide, etc. during the period when the apparatus is actuated or deactuated, and the valve is automatically operable to discharge, or permit the discharge, of liquid from the reservoir only when the reservoir is rotating at a predetermined speed, and this predetermined speed also insures the proper volume of air flowing about the reservoir and outwardly therefrom.

While in the foregoing specification a specific embodiment of the invention has been set out in considerable detail for purposes of illustration, it will be apparent to those skilled in the art that changes in these details may be made without departing from the spirit of the invention.

I claim:

1. In liquid dispersing apparatus of the character described, a support, a motor mounted in said support with the shaft thereof extending upwardly, a hollow casing secured to said shaft and defining a reservoir therein and being provided with a closure-equipped opening for filling the same, a direction member rotatable with said reservoir and having an upwardly and outwardly inclined wall spaced from said reservoir and extending thereabout, a centrifugally operated valve carried by said casing and communicating with said reservoir, said valve being aligned with said upwardly and outwardly inclined wall for discharging liquid theretoward upon rotation of said reservoir at a predetermined velocity, and vanes provided by said casing and disposed between the casing and direction member for providing an air sheath between the reservoir and upwardly and outwardly inclined wall.

2. In liquid dispersing apparatus, a generally semispherical casing defining a reservoir therein, said casing defining a bottom closure wall for said reservoir and being equipped with a plurality of depending vanes, a direction member secured to said casing along said bottom closure wall and having an enlarged central opening therethrough cooperating with said vanes to define an air flow path, said direction member having an upwardly and outwardly extending annular wall spaced from said casing and enclosing a portion thereof, a plurality of centrifugally operated valves carried by said casing and extending outwardly therefrom in alignment with said annular wall for discharging liquid from said reservoir in the direction thereof, and motor means for rotating said reservoir, said centrifugally operated valves being spaced outwardly from the rotational axis of said reservoir and being operative to discharge liquid therefrom when the rotational velocity of the reservoir reaches a predetermined value.

3. Liquid dispersing apparatus, comprising a generally dish-shaped direction member having a substantially horizontal bottom wall and an outwardly inclined side wall extending upwardly therefrom, said bottom wall having an enlarged central opening therethrough, a casing mounted within said dish-shaped direction member, and

defining a reservoir adapted to receive liquid therein, said casing having a cover wall spaced from said upwardly and outwardly inclined wall and having also a bottom closure wall equipped with depending vanes adjacent said central opening, a plurality of centrifugally actuated valves carried by said closure wall in alignment with said upwardly and outwardly inclined wall for discharging liquid theretoward from said reservoir, closure-equipped means provided by said casing for filling said reservoir, and a shaft-equipped motor disposed with the shaft thereof extending upwardly and secured to said casing, said valves being operative to discharge liquid from said reservoir when the rotational velocity thereof reaches a predetermined value and said vanes being effective to provide an air flow upwardly along the interior of said inclined wall to sheath the same from liquid discharged by said valves and to disperse such liquid.

4. The structure of claim 3 in which each of said valves comprises a valve casing secured to said cover wall and defining a flow passage extending radially of the rotational axis of said reservoir and communicating therewith, a valve member mounted within said valve casing for movement between open and closed positions, and a spring normally biasing said valve member into closed position, the biasing force of said spring being selected to be overcome by the centrifugal force of said valve member when the rotational velocity of said reservoir reaches the aforesaid predetermined value.

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