March 9, 1954 R. J. JAUCH ET AL. 2,671,650

LIQUID DISPERSING APPARATUS

Filed Oct. 27, 1950

Fig. 1

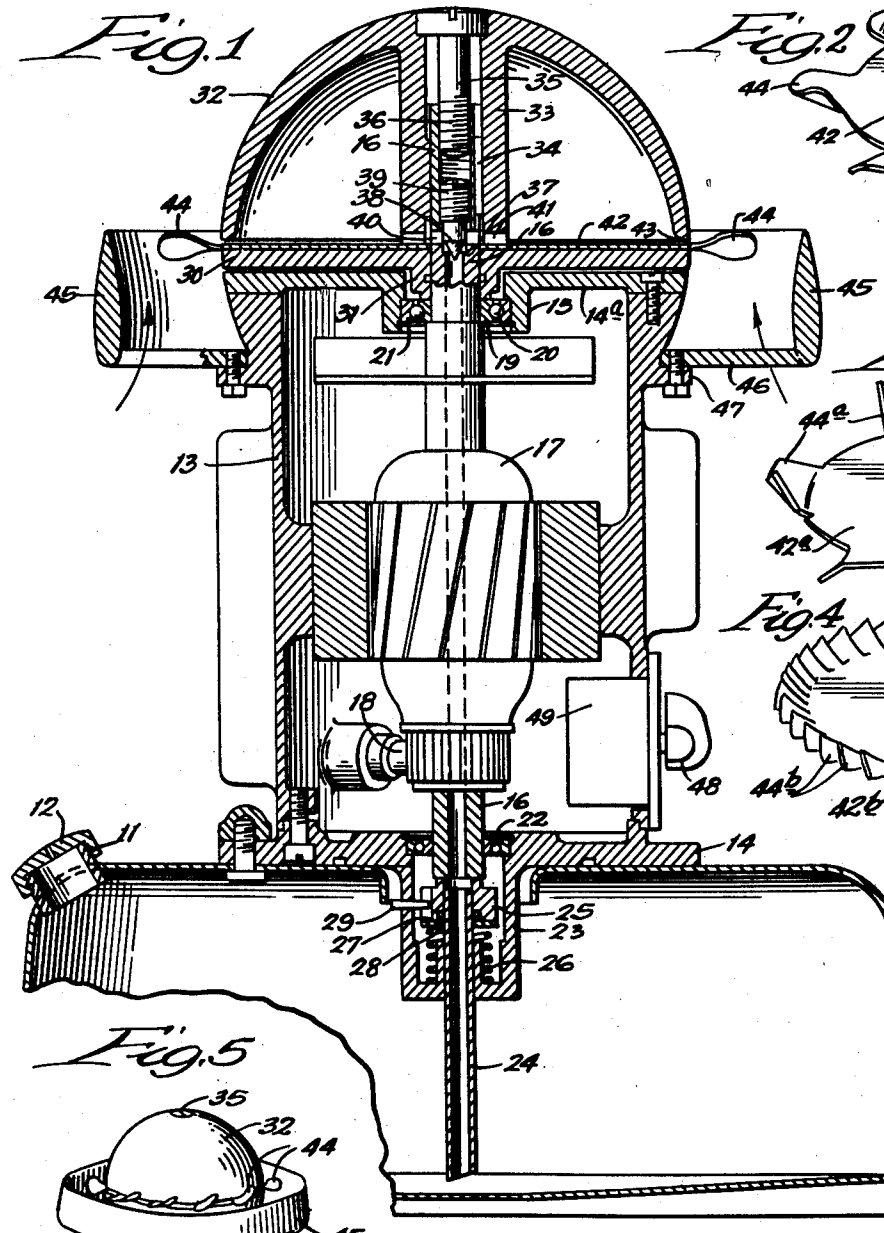


Fig. 2

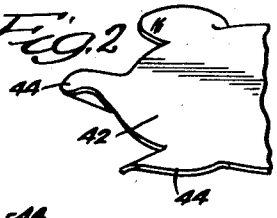


Fig. 3

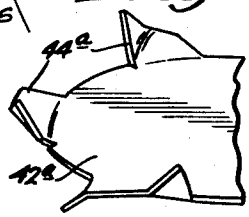


Fig. 4

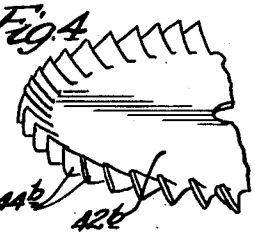
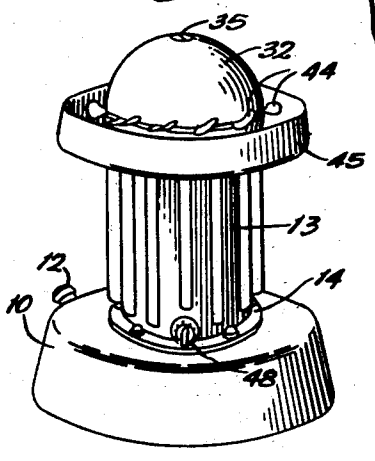


Fig. 5



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UNITED STATES PATENT OFFICE

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LIQUID DISPERSING APPARATUS

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5 Claims. (Cl. 261—88)

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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 solutions.

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, etc. A further object is to provide in such an apparatus adjustable valve mechanism or control means. Another object is to provide apparatus in which liquid particles are attenuated into particles of fine sizes and propelled into the air with a minimum of turbulence and coalescence of the particles. A still further object is to provide dispersing apparatus in which a disc is provided for the attenuation of the particles while at the same time being provided at its periphery with angularly turned portions which direct the particles in a selected direction and in a current of air. A still further object is to provide apparatus for discharging liquid in small particles with a minimum of noise and turbulence and with relatively low power consumption. Other specific objects and advantages will appear as the specification proceeds.

The invention is illustrated, in a single embodiment, by the accompanying drawing, in which—

Figure 1 is a vertical sectional view of apparatus embodying our invention; Fig. 2, a perspective view of a dispersing disc employed; Fig. 3, a view similar to Fig. 2 but showing a modified form of dispersing disc; Fig. 4, a view similar to Fig. 2 but showing another form of dispersing disc embodying our invention; and Fig. 5, a perspective view.

In the specific illustration given, 10 designates a receptacle equipped with an inlet 11 and a closure 12 therefor.

Secured to the top wall of the receptacle 10 is a tubular casing 13 having a flange 14 bolted to the top wall of the receptacle. The tubular casing 13 is equipped at its top with an inwardly extending plate 14a having a downwardly extending central neck portion 15. In the cylindrical casing 13 is a hollow shaft 16 extending through the rotor of the electric motor 17. The motor is of well known construction and need not be described in detail. It is equipped with the usual brush 18 for the supplying of current thereto. The upper end of the hollow shaft 16 is provided with a ball race ring 19 secured to the tube and supported by the balls 20 upon the race ring 21 secured to the neck 15 of plate 14a. The lower end of the hollow shaft 16 is supported

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within the ball bearing 22, as shown more clearly in Fig. 1.

In the specific illustration given, the flange 14 is equipped centrally with a depending cup portion 23 extending through the apertured central portion of the receptacle top and providing a guide for a second tube 24 having its lower open end in the bottom portion of the receptacle 10. In the specific structure shown, a carbon sealing member 25 is provided in contact with the lower end of the hollow shaft 16. Tube 24 is supported by a press-fit with the sleeve in the lower portion of cup 23 so that the tube is in communication with the passage of shaft 16. A spring 26 urges the sealing member 25 upwardly into contact with the lower end of the hollow shaft 16. To seal the carbon seal member 25 to the tube 24, a sealing ring 27 may also be provided in an annular recess 28 in the lower portion of the member 25. A pin 29 extends through an opening in the cup 23 and through a slot in the member 25 to prevent rotation of the member 25. It will be understood that any suitable sealing means may be provided for the lower end of shaft 16 and for coupling the same with an intake tube 24.

A plate 30 is provided with a downwardly extending collar or neck 31 and has a portion resting upon the ball bearing ring 19. The plate 30 is apertured to receive the hollow shaft 16 and the shaft 16 extends for a distance above the plate, as shown best in Fig. 1.

Splined to the top portion of shaft 16 is a closure member 32. The member 32, in the illustration given, is substantially semi-globular and is provided centrally with a depending sleeve portion 33 receiving the shaft 16. A key 34 connects the neck portion 33 with the shaft 16. A bolt 35 is provided with a lower end 36 threadedly engaging a threaded interior portion of the shaft 16 and may be tightened to urge the closure member 32 toward plate 30.

If desired, the shaft 16 may be provided with a valve seat 37 for receiving the valve 38. The valve 38 is carried by a screw plug 39 which engages the enlarged threaded portion in the interior of shaft 16 near its top. By adjusting the plug 39, the aperture in the valve seat 37 can be controlled.

The shaft 16 is provided with ports 40 just above the valve seat 37 to permit liquid to flow laterally. Also, the depending neck 33 of closure 32 is provided with a series of notches 41 in its lower end so as to provide ports through which liquid may flow from the tube 16 through the openings 40 and thence through the ports 41 into the interior of the closure 32.

For the effective dispersion of the liquid, we prefer to equip the plate 30 with a disc 42. The disc 42, in the illustration given, is centrally apertured to receive the shaft 16 while supporting the sleeve portion 33 of closure 32 thereon, as shown best in Fig. 1. In the specific illustration given, the sleeve portion 33 supports the closure member 32 upon the dispersion disc 42 so that the peripheral edge portions 43 of the closure 32 are spaced slightly above the disc 42, thus permitting the discharge of liquid along the upper surface of the disc 42.

The disc 42 has its outer peripheral portions turned to form blades 44, as shown best in Figs. 1 and 2. The blades 44 may be of any suitable number or shape and are preferably turned so as to guide the droplets in the desired direction to permit them to become airborne with as little turbulence as possible. The blades 44 also propel air in the desired direction.

In the illustration given in Figs. 1 and 2, the disc 42 is provided at its periphery with ear-like projections which are turned to form the fan blades 44. The contour of the blades 44 is such as to direct the air in a generaly upward direction but with a slight flaring outwardly. It will be understood that the blades may be given various contours for directing the air and particles in a straight upward direction or in a relatively wide fan-shape direction. Further, the blades may be so fashioned as to throw the air and liquid particles radially and both upwardly and downwardly. The fan 42^a, illustrated in Fig. 3, is provided with long angularly extending blades 44^a which are effective in directing the air in a more vertical direction. The disc 42^b, shown in Fig. 4, is provided with a large number of closely spaced blades 44^b which, when the motor is rotated in one direction, directs the air and liquid particles in a downward direction, as would be desired, when the device is employed for creating a mist or cloud of particles in the space below a house or in the basement, etc. When the fan is rotated by the motor in the other direction, the air and liquid particles are thrown outwardly and upwardly in a relatively wide cone.

The apparatus may be equipped with any desired guard mechanism. In the specific illustration given, we provide an annular guard 45 which is substantially of a teardrop design in cross-section, and which is supported by the inwardly extending arms 46 bolted to the flange 47 of the tubular casing 13. The guard 45 serves not only as a protecting device for the fan 44, but also is useful in producing a more effective air flow, etc. If desired, the blades 44 of the disc 42 may be encircled with a shroud (not shown) for further increasing effective air flow.

The motor 17 may be of any suitable type. It may be a constant or a variable speed motor and it may be a motor which is reversible in direction of movement. The motor may be equipped with any suitable control mechanism. In the specific illustration given, we provide a manual switch 48 and associated therewith is a timer 49 which, after a predetermined period, will close off the motor. The timer 49 may be the usual spring-operated escapement timer which will open the circuit after the manually controlled member 48 has been swung to a selected point on the indicator dial and after the lapse of the indicated period of time. It will be understood that any suitable mechanism may be used for regulating the period of operation of the apparatus and, if desired, a simple manual switch may be employed for turning the motor off and on.

Operation

In the operation of the apparatus, the receptacle 10 is filled with the liquid which is to be dispersed. The liquid may consist of a hydrocarbon such as kerosene containing an insecticide or it may consist of water or other liquids containing dispersed solids effective for destroying insects or for selectively destroying weeds or other vegetation. It will be understood that the liquid which is to be dispersed may be employed for many uses.

The switch 48 is turned for setting the motor into operation and shaft 16 rotates carrying with it plate 30, dispersion disc 42, and the closure member 32. The speed of rotation may be 10,000 R. P. M. or any selected speed. The relatively rapid rotation of the members 30, 32 and 42 create a reduced pressure within the hollow member 32 and liquid is drawn upwardly through the tube 24 and shaft 16 flowing laterally through the ports 40 and 41 on to the top surface of the dispersion disc 42. To maintain the vessel 10 under atmospheric pressure, the cap 12 may be apertured or loosely fitted upon the receptacle. The liquid droplets flowing upon the surface of the disc 42 are attenuated to form tiny liquid particles which may be of the order of 2 or 3 microns in diameter. Larger particles are formed when certain liquids are used and finer particles are formed with other liquids. A control of the particle size may be accomplished through various factors, including the liquid carrier selected, the speeds employed, etc.

In prior devices for dispersing liquids, there has been a tendency for the discharging particles to strike obstructions which are stationary or moving at different speeds so that considerable turbulence is experienced about the periphery of the dispersing members. The turbulence is further increased by discharging a blast of air from a separate structure usually housed below the dispersing plates. As a result of the turbulence, liquid droplets are brought into constant contact with each other thus producing a coalescence and a varying range in particle size. We have found that by employing a single dispersing disc to which the fan blades are physically attached so that there is no relative motion between the blades and the disc, the droplets tend to glide evenly over the peripheral portions of the disc and are directed smoothly into the stream of air flowing from the blades with a minimum of turbulence and with a minimum of coalescence. The operation is relatively quiet and the location of the blades as a peripheral part of the disc results in efficient dispersion while using much less power. Throughout the course of the liquid particles as they move over the disc and are finally guided to a position in a different plane on the periphery of the disc, the particles apparently move with the disc and are drawn into the air stream without disturbance or turbulence. As a result, tiny particles of substantially uniform micron size are discharged. For example, in the dispersion of a kerosene carrier for an insecticide, it was found that the particles discharged were uniformly of diameters of 2 to 4 microns.

By employing discs having blades of different curvatures or contours, the discharged air stream and particles may be caused to take any desired course. When it is desired to change the direc-

tion of the discharged stream or to change the contour thereof, the bolt **35** may be removed and the closure **32** and disc **42** lifted off. A different disc for providing the desired new stream may then be readily substituted and the closure part **32** bolted back in position. By the use of a few discs, effective dispersion can be readily provided for directing the mist of particles downwardly along the ground or upwardly through foliage or cones of spray may be discharged at varying angles.

We have discovered that the particle size of the liquid dispersed fluid bears a definite relationship to speed, quantity of fluid dispersed, and the velocity of the fan, and further that with the above mentioned relationship properly arranged for one type of fluid, an altogether different particle size will be in evidence when the viscosity or weight of the fluid is altered.

As an example, if a ⅓ H. P. motor, operating at a speed of, say, 12,000 revolutions per minute, drives a fan having a fixed capacity of 300 cu. ft. per minute, and the fan handles effectively a dispersal oil at a rate of one gallon per hour, the velocity of the fan may be ample to disperse the particles as rapidly as they leave the disc, and under these conditions there will be little coalescence and the particle size will be extremely fine. However, if it now be desired to employ a water based fluid and there is no valve means for changing the aperture through which the fluid passes, then the speed of the machine will be slowed down, with a consequent slowing down of fan velocity, and an increase in particle size will result, due partially, at least, to coalescence. Since the water is heavier than the oil, this will cause a slowdown of the speed of the motor because of the greater load. The coalescence of the particles caused by the slowing down of the motor speed causes a greater increase of the amount of the liquid deposited on the floor.

By providing a valve for controlling the aperture through which the liquid is discharged, the slowing down of the motor can be avoided and the liquid being dispersed may be dispersed in small micron size (below 5 microns) so that there is a large deposit of the particles on the side walls and a minimum on the floor.

While in the foregoing specification, we have set forth a specific structure in considerable detail for the purpose of illustrating an embodiment of our invention, it will be understood that such details may be varied widely by those skilled in the art without departing from the spirit of our invention.

We claim:

1. In liquid dispersing apparatus, a casing, a motor mounted therein, a hollow shaft mounted for rotation by said motor, a liquid reservoir communicating with one end of said hollow shaft, a disc carried by the other end of said hollow shaft and adapted to receive liquid drawn from said reservoir, a hollow closure member fixed to said shaft and enclosing an inner portion of said disc to provide a relatively quiescent air zone thereabout, a valve member adjustably carried by said closure member for engaging the outlet end of said hollow shaft to control the flow of liquid therethrough, said disc being equipped with blades adjacent the periphery thereof, and a guard member about said blades and spaced therefrom and being operative with said blades to provide an upwardly oriented air stream for dispersing liquid thrown thereinto from said disc.

2. In liquid dispersing apparatus, a casing, a motor mounted therein, a hollow shaft mounted for rotation by said motor, a liquid reservoir in the lower portion of said casing communicating with the lower end of said hollow shaft, a disc carried by the upper end of said hollow shaft and having an opening therethrough receiving said shaft, a hollow closure member mounted for rotation by said shaft and enclosing a portion of said disc to provide a relatively quiescent zone of air about the closed portion of the disc, said hollow closure member having a central aperture therein providing a threaded bore, a threaded valve member engaging the threads of said bore and provided with a conical valve head adapted to enter the upper end of said tube, said disc being equipped with blades adjacent the periphery thereof, and a guard member about said blades and spaced therefrom and being operative with said blades to provide an upwardly oriented air stream for dispersing liquid thrown thereinto from said disc.

3. In a liquid dispersing machine, a casing, a motor therein, a hollow shaft driven by the motor, a liquid receptacle communicating with one end of said hollow shaft, a disc apertured to receive said shaft and carried thereby, said shaft being apertured to permit the flow of liquid on to said disc, a closure about the central portion of said disc and adapted upon rotation to create a suction about said shaft while at the same time providing a relatively quiescent air zone thereabout, fan blades fixed to the peripheral portion of said disc, said fan blades extending outside of said closure, and a generally vertical guard member about said blades and spaced therefrom and being operative with said blades to provide an upwardly oriented air stream for dispersing liquid thrown thereinto from said disc.

4. In liquid dispersing apparatus, a casing, a motor mounted therein, a hollow shaft mounted for rotation by said motor, a liquid reservoir communicating with one end of said hollow shaft, a disc carried by the other end of said hollow shaft and adapted to receive liquid drawn from said reservoir, a hollow closure member fixed to said shaft and enclosing an inner portion of said disc to provide a relatively quiescent air zone thereabout, said disc being equipped with a plurality of fan blades adjacent the periphery thereof and extending outwardly from said closure member, and an annular guard providing a generally vertically-extending wall about said blades and spaced therefrom and being operative with said blades to direct a stream of air upwardly about said disc to disperse liquid thrown from said disc and into the air stream.

5. The structure of claim 4 in which said shaft is equipped with ports adjacent said disc, and with an adjustable valve for controlling the flow of liquid through said ports.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,094,592	Prott	Apr. 28, 1914
1,178,127	Bricken	Apr. 4, 1916
1,892,694	Carter	Jan. 3, 1933

FOREIGN PATENTS

Number	Country	Date
19,792 of 1911	Great Britain	Sept. 5, 1911