Aug. 4, 1970 D. E. COLLINS 3,522,911

PRESSURIZED FOGGER

Filed Oct. 10, 1967 2 Sheets-Sheet 1

Fig. 1

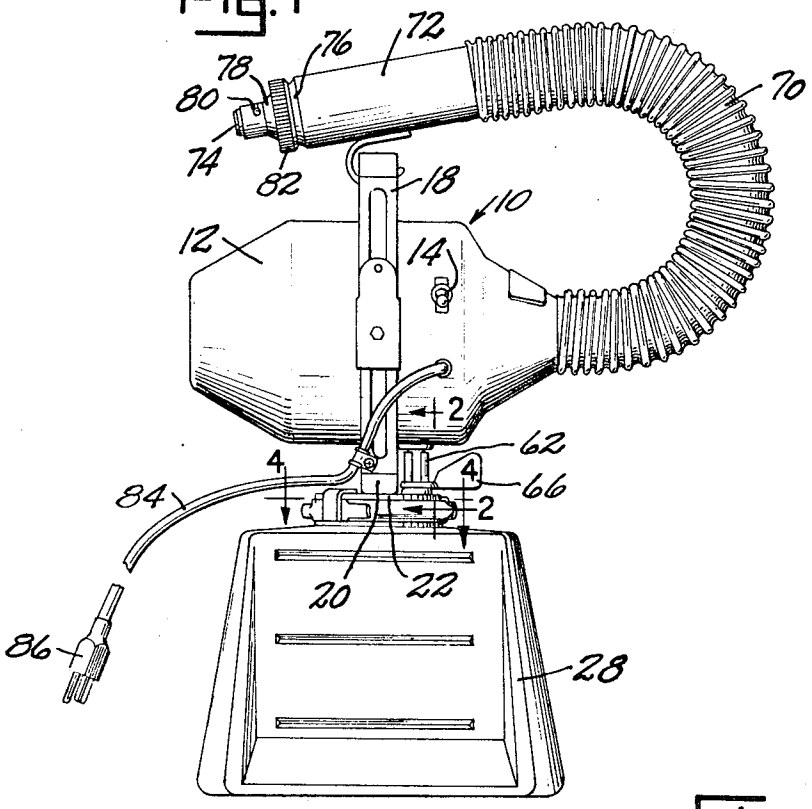

Fig. 3

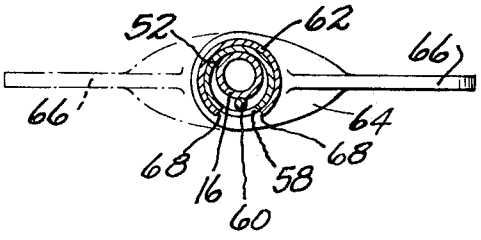

Fig. 2

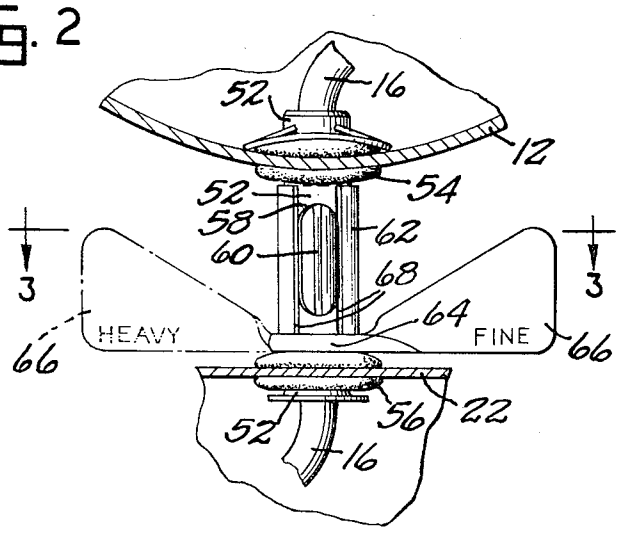

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Fig. 4

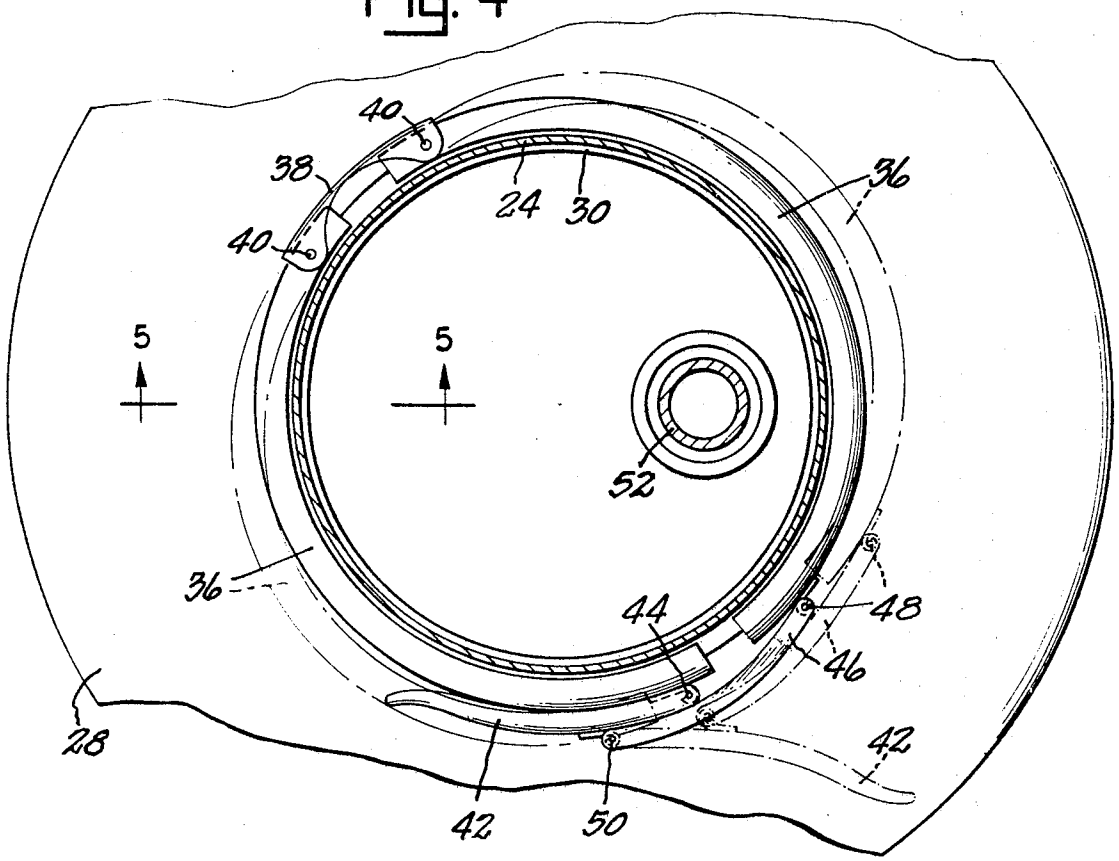
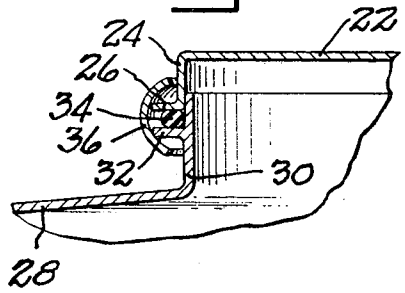


Fig. 5



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PRESSURIZED FOGGER

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Int. Cl. B05b 7/30
U.S. Cl. 239—348 4 Claims

ABSTRACT OF THE DISCLOSURE

A pressurized fogger having an air pressure chamber with a fog forming discharge means and a sealed liquid container communicating with the chamber and supplying liquid through a conduit to said discharge means, wherein a valved bleed port is adjustable to control the air pressure acting upon liquid in the container. A flexible discharge tube connected to the air pressure chamber mounts the discharge means and a part of the flexible conduit extends therethrough.

This invention relates to improvements in pressurized foggers by means of which insecticides and pesticides, deodorants and scenting materials may be entrained in an air stream to be dispersed or distributed in the form of a fog or mist.

This invention is an improvement upon the type of fogging device disclosed in the copending application of Roger Roberts, Ser. No. 515,594, filed Dec. 22, 1965, now Pat. No. 3,379,373.

Heretofore, fog and mist producing devices have been of the type in which entrainment of liquid particles of small size in an air stream is produced by aspiration, or of the type in which such entrainment of liquid particles in air stream is produced in part by pressure exerted upon the liquid in a container to discharge it into an air stream at a nozzle. The two types of devices produce fog or mist of different types with respect to the particle size of entrained liquid, with respect to the range or the space through which fog is discharged or dispersed, and with respect to the retention of the sprayed liquid or mist upon a surface being sprayed. Consequently in prior devices of either type, the usage of the device has been limited and it has been necessary to change devices as different conditions of use have been encountered.

It is the primary object of this invention to provide a device of this character which is readily adjustable to accommodate the formation and dispersion of fog by entrainment of liquid particles by aspiration only, or by entrainment of liquid particles into an air stream from a pressurized liqud supply.

A further object is to provide a device of this character having a control valve which is readily operable to convert the device from generation of fog or mist by aspiration only to generation of fog or mist under pressure, and vice versa.

A further object is to provide a device of this character having a pressure generating chamber with a fog discharging outlet and a sealed liquid container from which liquid is supplied to the discharge outlet, wherein conduit means connect the chamber and the container and adjustable means are provided for bleeding the container to atmosphere.

A further object is to provide a device of this character having valve means adjustable to regulate the air pressure in a liquid container and thereby control the rate of liquid entrainment and the size of the liquid particles entrained in an air stream.

A further object is to provide a device of this character having novel means for controlling the direction of discharge of fog without sacrifice of volume of fog being

generated and without interference with the entrainment of liquid from a liquid container into an air stream.

A further object is to provide a device of this character with a novel means for mounting a liquid container so as to effectively seal the container and accommodate rapid change and replacement of liquid containers.

A further object is to provide a device of this character having a novel construction of bleed valve in a conduit connecting an air chamber and a liquid container.

Other objects will be apparent from the following specification.

In the drawings:

FIG. 1 is a view of the fogger in side elevation.

FIG. 2 is an enlarged fragmentary detail sectional view taken on line 2—2 of FIG. 1 and illustrating the connection between the air pressure chamber and the liquid containing chamber of the device.

FIG. 3 is a transverse sectional detail view taken on line 3—3 of FIG. 2 and illustrating the bleed valve construction.

FIG. 4 is an enlarged transverse sectional view taken on line 4—4 of FIG. 1 and illustrating the means for sealing the closure for the liquid container.

FIG. 5 is a fragmentary detail sectional view taken on line 5—5 of FIG. 4.

Referring to the drawings which illustrate the preferred embodiment of the invention, the numeral **10** designates an air pressure chamber which is preferably of the character illustrated in the co-pending panent application of Roger Roberts, Ser. No. 515,594, filed Dec. 22, 1965. The air pressure chamber constitutes a housing **12** having an air inlet opening (not shown) at one end thereof, as at the left hand as viewed in FIG. 1, and an outlet at its opposite end. The housing **12** contains a fan or blower (not shown) operated by a motor (not shown) under the control of a suitable electric switch whose actuator is shown at **14**. At the fog discharging outlet of the chamber **10**, preferably at a tapered or frustoconical portion, is mounted a discharge nozzle **74**. The nozzle has the smallest diameter of its bore located intermediate its ends so as to provide a venturi passage having an outwardly flaring discharge portion.

A liquid conduit **16** has a discharge portion which preferably projects into the nozzle and which is of a length to extend to, through and outwardly of an opening in the air pressure chamber housing **12**, as best seen in FIG. 2. The air pressure chamber housing **12** has secured thereto a handgrip **18** having end portions **20** projecting below the chamber at opposite sides thereof and mounting and suspending below the chamber housing **12** a cover or seal **22**. The seal **22** is preferably substantially circular and, as best seen in FIG. 5, may have a cylindrical or marginal wall **24** terminating in an outturned flange **26**.

A liquid container **28** is adapted to be carried by the air pressure chamber housing **12** and handle **18** and, in the construction shown, has an upwardly projecting neck **30** outlining a top opening therein and adapted for telescopic fit with the marginal wall **24** of the cover **22**. A flange **32** encircles the neck **30** spaced below the upper margin thereof and provides a seat for a compressible sealing gasket ring **34** which is pressed upon by the cover flange **26**.

Any suitable means may be used for detachably anchoring the liquid container **28** to the air pressure chamber housing **12** to effect a seal between the cover **22** and the container **28**. As here shown in FIGS. 4 and 5, such means may constitute a readily releasable constricting locking ring so constructed as to draw the flanges **26** and **32** together into sealing compressing engagement with the gasket ring **34**. This constricting locking ring construction preferably constitutes a pair of arcuate ring

sections 36, each of slightly less than 180° in longitudinal extent. Each ring section 36 is of a cross sectional configuration providing centrally converging side portions adapted to bear against the edges of the flanges 26 and 32 to draw them together while maintaining clearance at the side edges thereof relative to the cover wall 24 and the container neck 30, as seen in FIG. 5. A connector link 38 extends between and joins the ring sections 36 to which it is pivotally connected at 40 in a manner to permit at least limited swinging of the ring sections 36, as between the full line and dotted line positions shown in FIG. 4. The other ends of the ring sections 36 are interconnected by a suitable releasable latch mechanism. In the form shown such latch mechanism includes a lever 42 pivoted at one end thereof to the end portion of one of the ring section 36 at 44. A link member 46 is pivoted at one end at 48 to the other ring section 36 and is pivoted at its opposite end at 50 to the lever 42 intermediate the ends of said lever and spaced from the lever pivot 44. Link 46 is preferably curved longitudinally thereof and the parts are so proportioned that in the normal locked position of the link 46 and lever 42 as shown in full lines in FIG. 4, the lever pivot 44 will be positioned radially outwardly of a line extending between the link pivots 48 and 50. Consequently the locking mechanism passes over the center in its movement between sealing and release positions whereby the locking mechanism is held closed effectively in its operative or full line position. The compression of the sealing ring or gasket 34 effected incident to the constricting or closing of the ring lock also assists in maintaining the ring lock in its over center sealing position.

In spaced relation to the handgrip end portions 20 and eccentrically of and preferably adjacent to the margin of the cover 22 is mounted a tube 52. The upper end of tube 52 extends into the housing 12 of the air pressure chamber and is effectively sealed at an opening in said housing by a sealing grommet 54. The lower end portion of the tube 52 extends through an opening in the cover 22 with which it is sealed by means of a sealing grommet 56. The tube 52 has a bleed opening 58 therein at the portion thereof between the grommets 54 and 56. The liquid conduit 16 extends through the tube 52 as seen in FIGS. 2 and 3 and is preferably positioned therein by a spacing bar 60 which is preferably carried by the interior of the tube 52 spanning the bleed opening 58. Bar 60 also serves as a protective means preventing injury to the tube 16, which preferably is formed of rubber, plastic or other suitable flexible material.

A part-cylindrical sleeve 62 encircles the portion of the tube 52 between the grommets 54 and 56 and is carried by an end plate or member 64 from which projects the handgrip or actuator 66. The opening provided between the edges 68 of the sleeve 62 is preferably of substantially the same circumferential extent as the bleed opening 58 so as to avoid restriction of opening 58 when the parts are adjusted as illustrated in FIGS. 2 and 3. Sleeve 62 has a snug rotative fit upon the tube 52 so that rotation of the sleeve 62 from the full line position to the dotted line position illustrated in FIGS. 2 and 3 will result in closing of the bleed opening 58 of the tube 52 to reduce leakage of air under pressure from tube 52 to atmosphere through bleed opening 58 to a negligible value.

If desired, an elongated flexible discharge tube 70 may be connected to chamber housing 12 to define the outlet or discharge of the air pressure chamber in conjunction with a suitable discharge end structure. In the preferred form, the nozzle 74 having a venturi passage therein is mounted at the end of the discharge part 72 of the tube to project therefrom. The liquid conduit 16 extends from an inlet end located in the lower portion of the liquid container 28 through tube 52, chamber 10, tube 70 and tube discharge part 72 to an outlet end located adjacent to or within the nozzle 74 at the reduced part of the bore or passage thereof and centered relative thereto. The arrangement causes air from the chamber 10 flowing through the tube 70 to flow around the outlet end portion of the liquid conduit 16 as it passes through the bore of the nozzle 74.

The end member 72 on the hose 70 in this construction preferably has a frusto conical part 76 mounting the nozzle 74, which frusto conical part 76 is provided with apertures (not shown) arranged in a ring surrounding the inner end of the nozzle. A frusto conical valving part 78 is rotatable upon the part 76 and the nozzle 74 within limits defined by a pin and slot connection 80. Frusto conical valve 78 has apertures therein adapted in one position to register with the apertures in the frusto conical part 76 and in another position thereof to span and close the apertures in the frusto conical part 76. A pattern defining cylinder or ring 82 extends around the apertured part of the valve 78 to guide the discharge of air through the apertured valve parts 76, 78 for impingement with the liquid entraining air stream discharged through the nozzle 74. This frusto conical valve arrangement surrounding the discharge nozzle 74 may be of the same character and type illustrated and described in the Roberts' patent application, Ser. No. 515,594, filed Dec. 22, 1965.

The apparatus is preferably provided with an extension cord 84 carrying an electrical connector 86 for connection with a source of current. It will be understood, however, that the device may be battery operated, in which case an electrical connection to remotely positioned batteries may be provided, or suitable battery mounting means may be secured to the housing 12.

In the use of the device, assuming that the parts are properly assembled, that the liquid container 28 contains a liquid to be sprayed, that the fan or blower within the air pressure chamber 10 is operating and that a sealed connection has been effected between the liquid container 28 and the cover 22 therefor, the device is ready to function. In the event it is desired to produce a fine fog or mist in which the liquid particles are of minimum size, the valve sleeve 62 is set in the position illustrated in full lines in FIGS. 2 and 3 which opens the bleed passage 58 fully so that only atmospheric pressure acts upon the liquid within the liquid container 28. The flow of air generated by the fan or blower within the air pressure chamber 10 flows through that chamber to and through the nozzle 74 at the outlet thereof and past the discharge end of the liquid conduit 16. This results in aspiration of liquid into the air stream and the generation of fog or mist which is discharged through the nozzle. The character of the fog or mist is controlled in part by the adjustment of the valve 78 in cases where such a valve is utilized. In the open position of the valve, forward flow of air streams through passages surrounding the nozzle impinge upon the fog discharged from the nozzle in a conical pattern determined by the flared or tapered nozzle outlet defining the recovery angle of the nozzle venturi. The rate of eduction or aspiration of liquid in the operation of the device in this setting can be varied by adjustment of the valve 78, assuming that the rate of operation of the fan or blower within the air pressure chamber 10 is constant. Thus, maximum eduction of liquid into the air stream will occur if the outlet valve 78 is fully closed. An intermediate rate of concentration of liquid in the fog or mist will result when the valve 78 is set at an intermediate position between open and closed positions.

In the event it is desired to provide a mist with liquid particles of larger size and with a heavier coverage of discharge area than can be obtained by aspiration, the sleeve valve 62 may be shifted from the open position illustrated in full lines in FIGS. 2 and 3 to a closed position, i.e. in which the sleeve valve opening 68 is out of register with and spans and substantially closes the bleed tube opening 58. This action increases the percentage of the air pressure generated by the blower in the air chamber 10 which is effectively utilized, that is, it stops the major

part of the leakage or bleeding action which occurs when the bleed passage **58** is open. Consequently, air pressure is transmitted through the tube **52** into the upper part of the liquid container **28** where it is effective to act upon the upper surface of the contained liquid at a rate substantially equal to the pressure existing within the air pressure chamber **10**. Operation of the device in this setting causes combined pressurizing and aspirating action, with the result that a substantial increase in the rate of entrainment of liquid in the air stream, fog or mist produced by the device results. The increased liquid entrainment also results in an increase of the particle size of the liquid particles entrained within the stream of discharged fog or mist. The nature of the fog or mist and the fineness of the particles of liquid therein can also be regulated in part by adjustment of the discharge valve **78** as previously discussed.

It has been found in one embodiment of this invention that the range of particle size may vary from 20 microns average for aspirating operation when the sleeve valve **62** is open to 48 microns average during pressure discharge when the sleeve valve **62** is closed. The term "average" is used to indicate the median size of particles when sprayed liquids of different types with different viscosities and specific gravities are employed.

The particle size of liquid entrained in the fog or mist produced by the device can also be regulated by changing the setting of the sleeve valve **62** to regulate the size of the part of the bleed opening **58** which is exposed or open in partially open settings. Thus, restriction of the bleed port will permit the application of limited pressure upon the liquid within the container **28** to provide low pressure positive feed or discharge of liquid into the air stream in conjunction with the aspirating action produced at the nozzle.

An important advantage of a device of this character which selectively functions for aspirating discharge and for pressure discharge at relatively high velocity and large particle size is that of effective residual type spraying can be done, in which liquid material being sprayed is deposited and retained upon a surface such as upon a plant being sprayed with an insecticide. Of particular interest is the fact that such residual type spraying is effective even with liquid particles in the range of 48 microns average, in view of the fact that it has heretofore been considered necessary for effective residual type spraying to provide a mist or fog containing particles of liquid of much larger size, such as particles in the order of 100 microns or more.

Another important consideration of the mist or fog discharge under pressure and velocity attainable with this device is that residual spraying at a distance is possible. Thus, residual spraying of surfaces at a height of 20 feet above the sprayer is possible when the sleeve valve **62** of this device is closed. This is important for usage both indoors and outdoors and for both insect control and plant disease control. Indoor residual spraying in such buildings as greenhouses, barns and storage buildings is thus effective with the present device.

Another factor of importance in the use of a device having a flexible discharge hose **70** with a discharge nozzle **74** in its end and with an adjustable discharge valve **78**, as herein described, is that the device functions effectively without sacrifice of volume of discharge and without interfering with completeness of emptying of the liquid container, while providing effective control of the direction of discharge. Thus it will be apparent that the liquid container can be held horizontal for effective and complete liquid entrainment during the time that mist is being discharged upwardly or downwardly.

Another important feature of the claimed device is

that an effective seal of the liquid container is provided by releasable means. Thus, the toggle action locking ring clamp **36** provides effective compression of the sealing ring or gasket **34** of the device, and at the same time is readily releasable. The ready release of the seal of the liquid container permits rapid replacement of liquid containers when the device is to be used for successive spraying operations under conditions requiring different spray liquids.

While the preferred embodiment of the invention has been illustrated and described, it will be understood that changes in the construction may be made without departing from the spirit of the invention.

I claim:

1. A pressurized fogger comprising:
an air pressure chamber having an air inlet and an air outlet including a discharge nozzle having a venturi passage, and containing motor operated air pressure generating means,
a sealed liquid container spaced from said chamber,
a tube interconnecting said container and chamber for communication,
a liquid conduit having an inlet in said container and an outlet in said chamber adjacent said nozzle and passing through said tube, and
selectively operable means for opening said tube to atmosphere,
said nozzle and conduit outlet being arranged for aspiration of said liquid when said tube is open to atmosphere while said air pressure generating means operates.

2. A pressurized fogger as defined in claim **1**, wherein:
said last named means includes a bleed opening in said tube and a sleeve rotatably encircling said tube and having an opening and selectively positionable to register with said bleed opening and controlling the air pressure in said liquid container.

3. A pressurized fogger as defined in claim **1**, wherein:
said last named means includes a bleed opening in said tube and adjustable means having a part selectively positioned at and between a setting spanning said bleed opening and a setting clear of said bleed opening.

4. A pressurized fogger as defined in claim **1**, wherein:
said chamber carries a handle and a cover is carried by said handle below said chamber,
said container cooperates with said cover and with releasable sealing means to define a closed liquid compartment, and
said tube connects said chamber and said cover.

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LLOYD L. KING, Primary Examiner

U.S. Cl. X.R.

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