

June 1, 1971

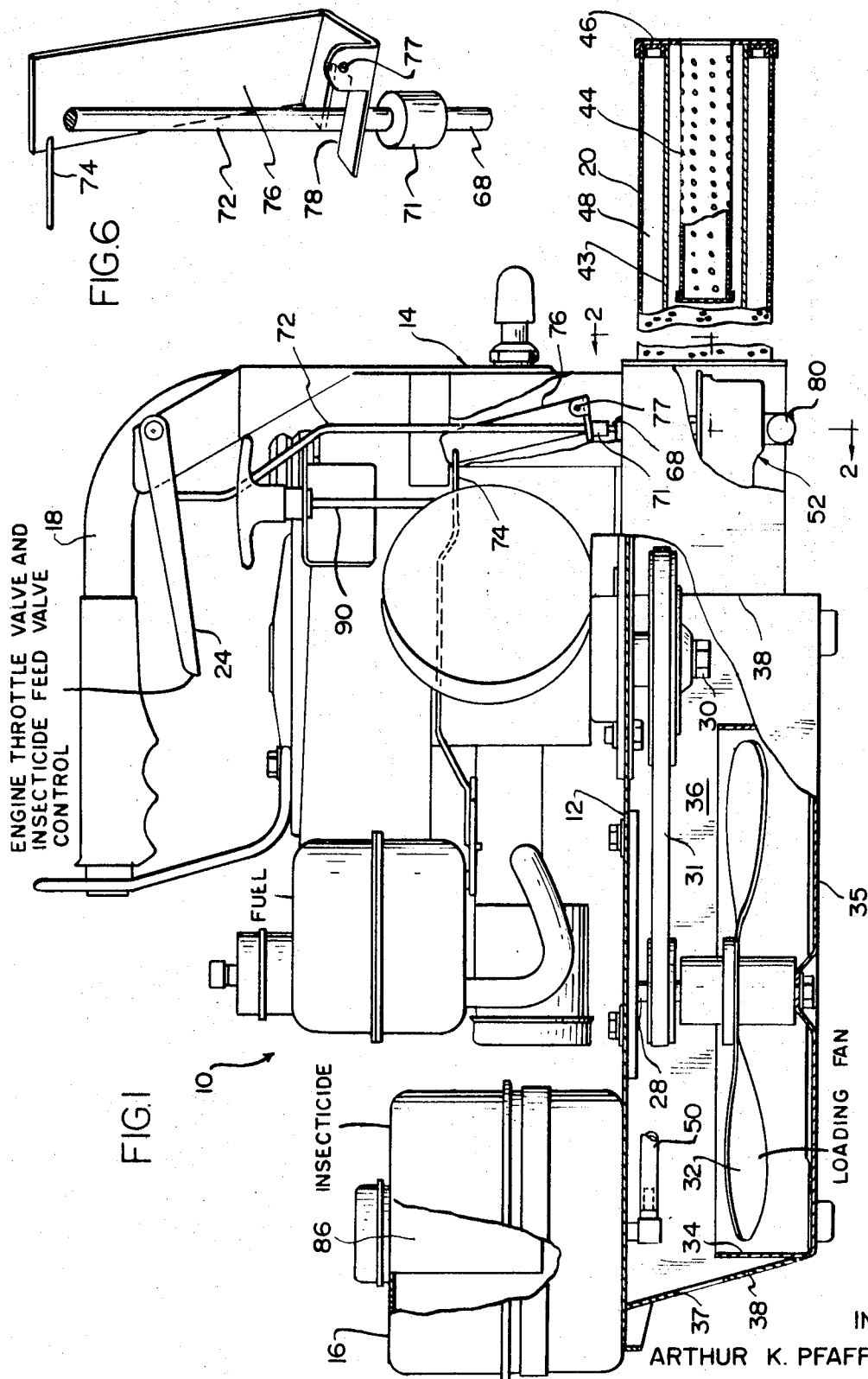
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3,582,496

THERMAL FOGGER

Filed March 28, 1969

2 Sheets-Sheet 1



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FIG. 2

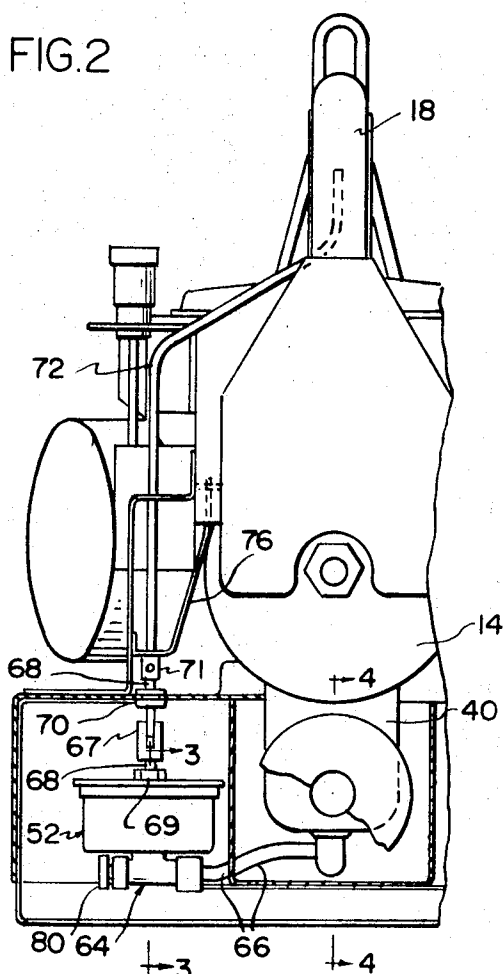


FIG. 3

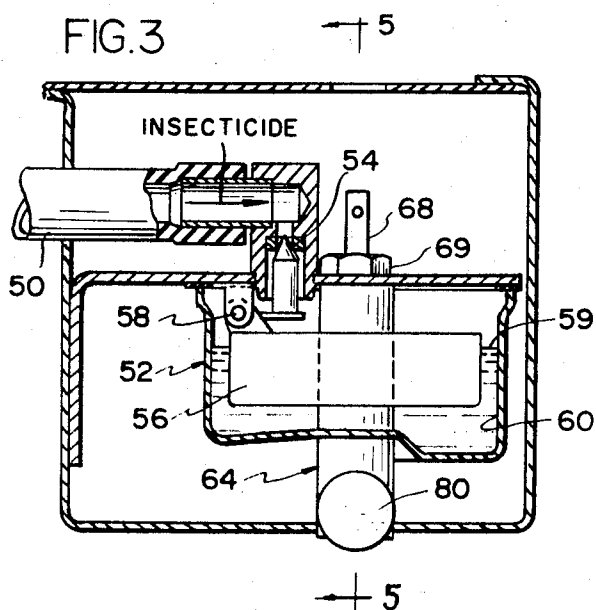


FIG. 4

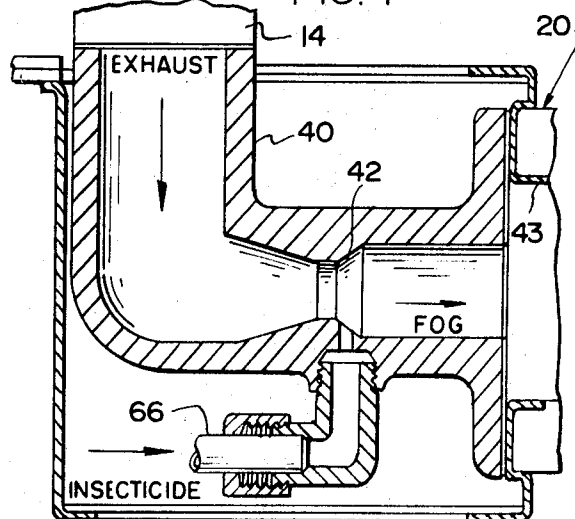
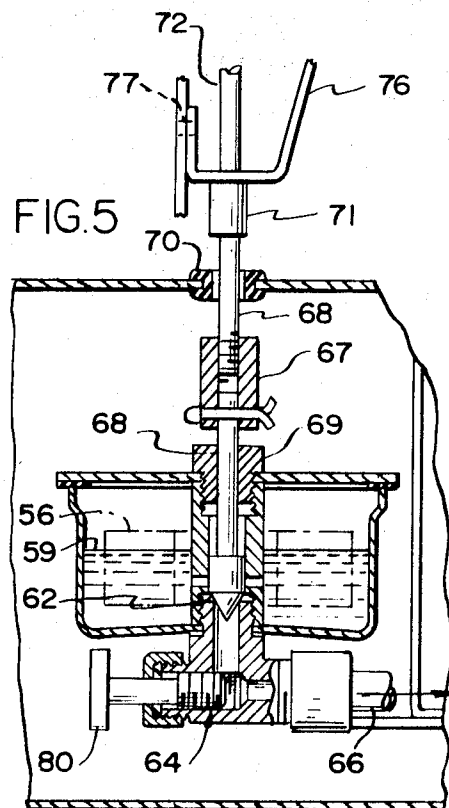


FIG. 5



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3,582,496

THERMAL FOGGER

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7 Claims

ABSTRACT OF THE DISCLOSURE

A portable thermal fogger powered by an internal combustion engine, including passage means having a venturi restriction for directing the engine exhaust gases to a forwardly disposed mixing tube for discharge therefrom, and a fogging liquid formulation tank and means including a pressure regulating carburetor having a float controlled inlet valve for directing the liquid formulation to the passage means for admixture with said exhaust gases, and said carburetor and venturi restriction being located laterally adjacent one another and approximately at the same vertical elevation.

In fogging, a liquid formulation insecticide is vaporized by heat and discharged from a device called a fogger as small particles of only approximately .5 to 50 microns diameter. Generally a fan is used to drive these vaporized particles into the ambient atmosphere. One problem experienced in prior art foggers is the bulky size and heavy weight of the unit which renders it relatively immobile. Secondly, normal use of foggers involves varying the fog discharge direction from horizontal to both upward and downward inclinations, and the fog consistency under such changing inclinations, particularly in portable foggers, commonly likewise changes from that which is desired. Consequently, the fog actually discharged might be dryer or wetter than desired, might have particle sizes not within the range expected, or might even be totally starved of fog discharge or be so flooded to spit slugs of liquid formulation.

This invention utilizes the hot exhaust gases from a portable internal combustion engine for vaporizing liquid fogging formulation, first accumulating the formulation in a carburetor and then metering it under a constant head for admixture with the engine exhaust gases according to some adjusted ratio to give a desired fog consistency.

A primary object of this invention is to provide a lightweight portable thermal fogger, powered by the exhaust gases of an internal combustion engine, which can be used in various angular inclinations for upward, downward or horizontal fog discharge without appreciable variation in fogging output or consistency.

Another object of this invention is to provide a thermal fogger which has means for dispensing liquid fogging formulation automatically in proportion to the output of the powering internal combustion engine and further having means for adjusting the dispensing output at any specific engine output.

Another object of this invention is to provide a thermal fogger having a pressure regulating device disposed between the fogging liquid formation tank and engine exhaust gases passageway, which device is located laterally adjacent said inlet so that a substantially constant input head is maintained independently of the angular inclination of the fogger.

These and other objects will be more fully understood after reviewing the following specification, the accompanying drawing forming a part thereof, wherein:

FIG. 1 is a side elevational view of a preferred embodiment of the subject fogger;

FIG. 2 is a front elevational view, partly broken away

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and in section as seen generally from line 2—2, of the fogger of FIG. 1;

FIGS. 3 and 4 are sectional views taken generally from lines 3—3 and 4—4 in FIG. 2;

FIG. 5 is a sectional view as taken generally from line 5—5 in FIG. 3; and

FIG. 6 is an enlarged perspective view of a control shown in FIG. 1.

In the drawing, a fogger unit 10 is shown which includes broadly a frame 12 supporting an internal combustion engine 14 and a liquid insecticide formulation tank 16. A handle 18 permits the portable carriage of the fogger, and mixing tube 20 provides for fog discharge from the forward end of the unit. By manipulation of throttle 24, the output of the engine is controlled as is the inlet flow of the liquid formation that determines the fogging output of the unit.

A shaft 28 mounted to extend along an axis parallel to output shaft 30 of the engine 14 rotatably supports a pulley, and a drive belt 31 trained over this pulley and a pulley keyed to shaft 30 connects them together rotatably. A fan or paddle 32 is secured to the pulley to rotate on the shaft 28 as the engine operates, and circumferential wall 34 and bottom wall 35 of the frame baffle the high pressure side of the fan. The space or cavity 36 defined above the fan and the baffle structure within the surrounding frame walls 38 communicates through openings 37 in these walls 38 with the ambient air. Consequently, paddle rotation churns the air in the cavity to create a load or drag on the engine, and air merely migrates into or out of the cavity through the openings 37.

The exhaust of the engine is communicated by manifold 40 having a venturi restriction 42 to the mixing tube 20 for discharge from the open end of the tube. The tube 20 is baffled internally which requires that the exhaust gases and formulation carried thereby must change directions and thus thoroughly mix. The baffle includes a large outer pipe 43 and a perforated smaller inner pipe 44 therein, the inner pipe having its inner end closed and outer end open and being supported within annular end cap 46 which closes the outer end of pipe 43. Thus, the engine exhaust gases enter the inner pipe from annular spaces between the pipes for discharge from the outer open end of this inner pipe. Insulation 48 surrounds the pipe 43 to provide increased safety against accidental burning of the user.

The formulation tank 16 communicates through appropriate hosing 50 to a carburetor 52 (FIGS. 3 and 5), this carburetor having an inlet control valve 54 which is opened and closed by a float 56 pivoted as at 58 within the carburetor. Thus, a constant level 59 of liquid formulation is maintained in the carburetor cavity 60 as determined by the float 56. The carburetor cavity communicates via a flow control valve 62 (FIG. 5), an adjustable fog regulator valve 64 and appropriate hosing 66 to exhaust manifold 40 (FIG. 4) at the downstream side of the venturi restriction 42.

The flow control valve 62 is connected to a stem 68 which is connected at its upper end through coupling 67 with a rod 72 moved by the throttle 24. The stem 68 and rod 72 are guided in bushings 69 and 70, respectively, for movement relative to the frame. In addition, connection is made from the trigger 24 to the output control rod 74 of the engine, the output control itself typically including a carburetor having adjustable fuel and air inlet control mechanisms that provide the proper fuel/air mixtures for starting and sustained engine operation. The particular details of construction of the engine output control are not shown since it forms no part of the subject invention, but the important aspect is that the engine control and the liquid formulation control are keyed together for simultaneous operations. This linkage con-

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nection includes a lever 76 (FIG. 6) pivoted at 77 and having a slotted opening 78 that overlies the rod 72 and is restrained against a sleeve 71 secured on the rod. A pinned connection is also made at the upper end of the lever 76 with rod 74.

The adjustment of the linkage is such that at the idle condition of the engine, there is no liquid formulation discharge from the carburetor cavity 60 since valve 62 is closed; and conversely, when the engine is at normal full power operating condition as determined by its control rod 74 being shifted laterally to the right (FIG. 1) through the action of trigger 24 the stem 68 is also elevated to open the control valve 62 for maximum regulated discharge. A generally proportioned output relationship is maintained from the no formulation discharge-engine idle condition and the maximum formulation discharge-full power operating condition of the engine. Because of the free linkage between the rod 72 and lever 71, the engine can be started and warmed, and its output varied by shifting the lever 76 and rod 74 manually and independently of the trigger 24.

In addition to the control mentioned, the output valve 64 permits restriction adjustment of the formulation passage between the carburetor and the engine exhaust manifold at any specific engine output to give the desired output for consistency and output. This also can be adjusted to compensate for different viscosities of the different liquid formulations. Once the member 80 for the valve 64 is adjusted for the particular formulation and output characteristic desired, it probably need not be adjusted anymore and the fogger output is then provided by actuation of the throttle 24.

Referring now to a preferred orientation of the components previously mentioned, note that carburetor 52 and the venturi restriction 42 of the manifold 40 are located laterally adjacent one another relative to the direction of the outlet tube 20. This means that even at varying angular inclinations of the outlet tube; downwardly, upwardly or horizontally, the vertical distance between the venturi restriction 42 and the liquid formulation level 59 in the carburetor is maintained generally constant. This meters the liquid formulation to the exhaust manifold at a uniform pressure and provides uniform fog consistency independently of the angular inclination of the outlet tube 20.

It is possible to propel the liquid formulation from the tank 16 to the carburetor 52 solely by gravity, in which case the tank is located at an elevation higher than the carburetor. It is also possible by means of a small air pump (not shown) on the formulation tank to pressurize the tank to propel the liquid to the carburetor independently of the relative elevations thereof. In either case, because the carburetor 52 is laterally adjacent the venturi restriction 42 and the pressure of liquid formulation between them is constant, the fog consistency is uniform generally independent of the angular inclination of the unit.

The fogger unit can be light in weight since the engine 14 used preferably is a lightweight two cycle engine. Moreover, because the engine is loaded at all times by means of the air paddle 32, continuous volumes of heated exhaust gases are possible for vaporizing the liquid formulation. With a three horsepower engine, it is possible to vaporize approximately two to four gallons of formulation per hour for fog discharge having particle sizes between .5 to 50 microns, depending on the adjustment of the flow control valve 64. The fog propulsion from the unit is obtained by the vaporizing admixture of the formulation with the exhaust gases, and no fan or the like is used. Adjustment of valve 64 achieves the desired dry or wet fog consistency which thereafter remains basically uniform independently of the actual fog output. This is so since the flow control valve 62 and engine throttle control are operated simultaneously by actuation of the trigger 24, where increased engine speeds consequently

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provide greater volumes of exhaust gases to vaporize to the same degree the greater volumes of liquid insecticide admitted to the engine exhaust manifold. The venturi restriction creates a negative pressure at the formulation inlet, which both draws formulation into the mixing tube for quick admixing with the exhaust gases and also rapidly expands the formulation for completely vaporizing the formation without required extreme high temperatures which might degrade heat sensitive insecticides.

Both the liquid insecticide and the fuel for the engine can be easily added by means of top openings in the respective storage tanks. The formulation tank further has a filter 86 that is removably positioned over the opening and helps to keep solid impurities from the internal workings of the fogger for more dependable operation. To assist in the portability of the unit, a shoulder sling or strap can be connected to the frame 12 to be draped over the shoulder of the user. The engine 14 is started by means of a starting rope 90, and the engine is likewise stopped by means of a shorting switch.

What is claimed is:

1. A thermal fogger comprising in combination an internal combustion engine having an exhaust outlet discharging products of combustion; a discharge mixing tube; passage means having a restriction connecting the exhaust outlet with the inlet of the discharge mixing tube; a fogging liquid formulation tank; conveying means connected both to the tank and to the passage means at a location of the latter immediately downstream of the restriction for delivering liquid formulation for admixture with the products of combustion for discharge therewith from the tube as a fog, said last mentioned means including a pressure regulator chamber maintaining a predetermined liquid head and a formulation control valve between the chamber and passage means effective to meter flow of liquid formulation to the passage means; said restriction and the chamber being located laterally adjacent one another and at the approximate same elevation to provide that the inclination of the discharge mixing tube can be varied without appreciably varying the relative elevations of the chamber and venturi restriction; linkage means to open and close the formulation control valve as desired; and a fan keyed in driving relation to the output shaft of the internal combustion engine and having its high pressure side disposed within a baffle structure operable to load the engine without achieving other beneficial work.

2. A thermal fogger according to claim 1, wherein an adjustable throttle control is provided for varying the output of the internal combustion engine, and wherein means connect the throttle control with the linkage means for the formulation control valve to provide that for increased engine outputs beyond the idle the formulation discharge is increased progressively.

3. A thermal fogger according to claim 1, wherein an adjustable needle valve is provided in the means between the tank and the passage means operable upon adjustment to vary the rate of formulation admission to the passage means for varying the fog consistency as decided.

4. A thermal fogger, comprising in combination an internal combustion engine having output controlling throttle means and an exhaust outlet discharging products of combustion from said engine; a discharge mixing tube; passage means connecting the exhaust outlet with the inlet of the discharge mixing tube; a fogging liquid formulation tank; means including control valve means between the tank and passage means for delivering liquid formulation for admixture with the products of combustion for discharge therewith from the tube as a fog; linkage means keyed between the engine throttle means and control valve means operable to open the formulation control valve means from a closed condition progressively as the engine output increases from idle to full power, said passage means having a venturi restriction therein and the liquid formulation delivery means being connected to

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the passage means immediately downstream of the venturi restriction; a fan; means keying the output shaft of the internal combustion engine in driving relation to the fan; and structure generally baffling the fan operable to load the engine without otherwise achieving beneficial work.

5. A thermal fogger, comprising in combination an internal combustion engine having an exhaust outlet discharging products of combustion from said engine; a discharge mixing tube; passage means connecting the exhaust outlet with the inlet of the discharge mixing tube; a fogging liquid formulation tank; means including a formulation control valve between the tank and the passage means for delivering liquid formulation for admixture with the products of combustion for discharge therewith from the tube as a fog, said means further including means for maintaining a substantially constant pressure of the formulation at the control valve; linkage means to open and close the formulation control valve as desired; a fan; means keying the output shaft of the internal combustion engine in driving relation to the fan; and structure defining baffles about the fan operable to load the engine without achieving other beneficial work.

6. A thermal fogger, comprising in combination an internal combustion engine having output controlling throttle means and an exhaust outlet discharging products of combustion from said engine; a discharge mixing tube; passage means connecting the exhaust outlet with the inlet of the discharge mixing tube; a fogging liquid formulation tank; means including a formulation control valve between the tank and the passage means for delivering liquid formulation for admixture with the products of combustion for discharge therewith from the tube as a fog, said means further including means for maintaining a substantially constant pressure of the formulation at the control valve; and linkage means connected between

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the engine throttle means and the control valve operative to open the formulation control valve from a closed condition progressively as the engine output increases beyond the idle to full power.

7. A thermal fogger, comprising in combination an internal combustion engine having an exhaust outlet discharging products of combustion from said engine; a discharge mixing tube; passage means connecting the exhaust outlet with the inlet of the discharge mixing tube; a fogging liquid formulation tank; means including a formulation control valve between the tank and the passage means for delivering liquid formulation for admixture with the products of combustion for discharge therewith from the tube as a fog, said means further including means for maintaining a substantially constant pressure of the formulation at the control valve; linkage means to open and close the formulation control valve as desired; an adjustable needle valve in the means between the tank and the passage means operable upon adjustment to vary the rate of formulation admission to the passage means for varying the fog consistency as desired.

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