United States Patent

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[15] **3,646,701**

[45] **Mar. 7, 1972**

[54] PORTABLE THERMAL FOGGER

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[22] Filed: **May 4, 1970**

[21] Appl. No.: **34,054**

[52] **U.S. Cl.** .....**43/129,** 252/359 A, 417/380

[51] **Int. Cl.** **A01m 19/00**

[58] **Field of Search** .....43/129; 239/129.8, 138; 417/380, 381; 251/359 A

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[57] **ABSTRACT**

A portable thermal insecticide fogger including an internal combustion engine for generating hot exhaust gases that discharge from an outlet, a supply of liquid insecticide, and a diaphragm pump operated off the changing pressures of the internal combustion engine for pumping the liquid insecticide to a location upstream of the outlet for admixture and common discharge with the exhaust gases.

6 Claims, 2 Drawing Figures

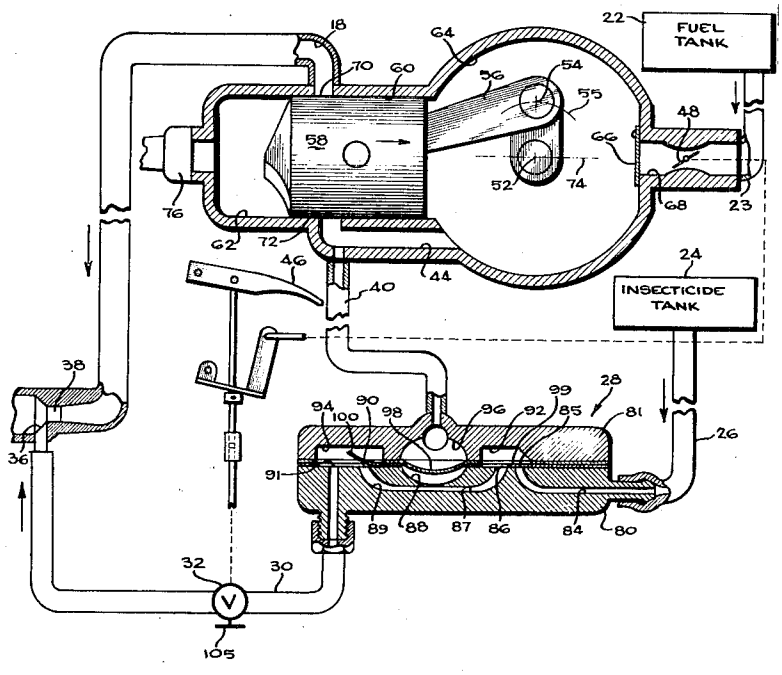
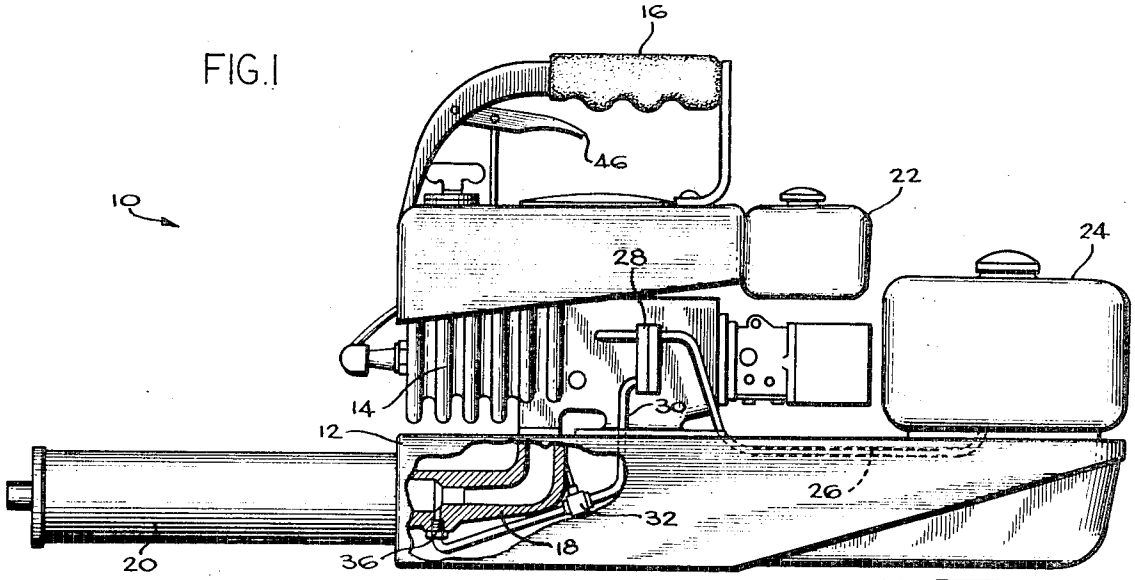


FIG. 1



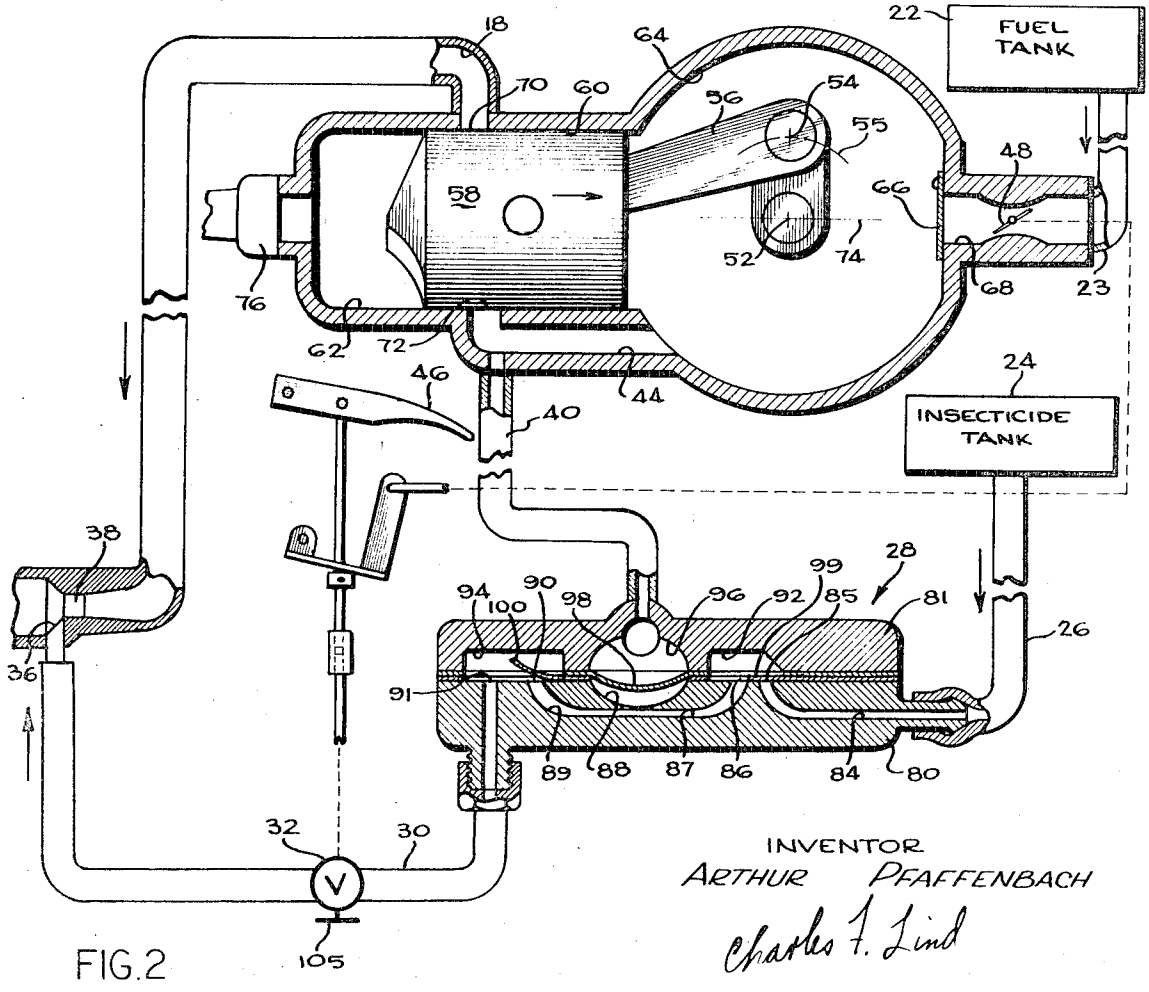


FIG. 2

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PORTABLE THERMAL FOGGER

It is common to utilize the hot exhaust gases discharged from an internal combustion engine as a vaporizing medium for fogging liquid insecticides. The liquid insecticide is metered to and mixed with the exhaust gases, and discharged as a fog therewith. In large wheeled vehicle-type units, either an insecticide pump or gravity feed of the insecticide is possible to move the liquid insecticide from the storage tank to the admixture location. However, smaller hand held units are more compact and lightweight, so that only slight tilting of the unit is permitted before the gravity feed head is changed or even starved, and elaborate pumping and metering means prove impractical. Since the quality of fog depends on variables including the exhaust temperature and volume and the insecticide volume and type, some reliable metering means is needed to establish and hold the desired combination of insecticide and exhaust.

The main object of this invention is to provide in a thermal fogger having an internal combustion engine generating hot exhaust gases an improved insecticide pumping and metering arrangement including a diaphragm pump operated off pressure impulses of the internal combustion engine.

This object and others will be fully appreciated after reviewing the following disclosure including the accompanying drawing, wherein:

FIG. 1 shows in an elevational view an overall arrangement of a portable fogger made in accordance with the subject invention;

FIG. 2 is a schematic type diagram showing the principle components including the internal combustion engine, the diaphragm pump powered thereby, and the working connections of each.

The fogger **10** shown has a frame **12** supporting a small two-cycle internal combustion engine **14**, and a carrying handle **16**. The engine exhaust manifold **18** is connected to an outlet mixing tube **20**. A fuel tank **22** is connected via line **23** to the engine **14**, and an insecticide tank **24** is connected via line **26**, pump **28**, line **30** and outlet control valve **32** to the mixing tube **20** as at **36**. Preferably the exhaust manifold includes a venturi **38** and the insecticide inlet **36** is immediately downstream of the venturi throat. The pump **28** is connected by line **40** to the air-fuel inlet connection **44** of the engine. A trigger control **46** is suitably connected to butterfly inlet control **48** of the engine and to the insecticide control valve **32** for common actuation. In this regard, at the idle condition of the engine where butterfly **48** is substantially closed, the insecticide valve **32** is completely closed; and each is progressively opened upon actuation of the trigger until both are fully opened.

The engine crank rotates about axis **52** to move the rod connection **54** along a circular path **55**, and the engine piston **58** reciprocates in the cylinder **60**. The engine is shown in its power stroke where chamber **62** is filled with hot gases and expanding and where the size of the crankcase chamber **64** is reducing. A check mechanism **66** is located over the fuel-air intake **68** from the fuel line **23** so that the pressure in the crankcase chamber **64** then increases. Upon the piston **58** passing exhaust port **70** the hot exhaust gases escape through manifold **18** for discharge from the outlet tube **20**, and the intake port **72** is also uncovered to admit the compressed fuel and air mixture in the crankcase chamber into the chamber **62**. Upon the crank rod connection **54** passing the full stroke line **74** and the piston direction reversing, the crankcase chamber **64** is expanding to open the check **66** and draw fuel and air mixture into the crankcase chamber. A carburetor (not shown) between the fuel tank **22** and butterfly **48** provides proper air-fuel mixture. When the piston **58** passes the particular ports **70** and **72** the gas and fuel mixture in the chamber **62** is trapped and compressed, and ultimately ignited by spark plug **76**.

The pump **28** is formed by two housing elements **80** and **81** secured together and having appropriate hollow cavities complementing one another with some being separated by or having therein a flexible element acting as a diaphragm or check.

Specifically, housing **80** has inlet bore **84** which leads to an opening **85** at the face of the housing, while adjacent thereto a second opening **86** is provided which leads by means of passage **87** to an enlarged chamber **88** open to the face of the housing and further by passage **89** to an opening **90** at the face of the housing. An outlet opening **91** is provided in face of the housing **80** and is connected to the insecticide line **30** as noted above. The housing **81** has a cavity **92** which overlies and connects the openings **85** and **86** of the housing **80**, a cavity **94** which overlies and connects the openings **90** and **91** in the housing **80**, and a cavity **96** opposite to the cavity **88** in the housing **80**. The line **40** from the engine inlet is connected to this cavity **96**. A thin flexible diaphragm element **98** is extended across and completely separates the chambers **88** and **96** from one another. Moreover, the flexible element is supported between the housings as at **99** and **100** to move as a check valve from a closed position against the adjacent opening to an open position separated from the opening. The flexible check valve **99** normally overlies and closes the inlet opening **85** whereas check valve **100** normally overlies and closes the outlet opening **90**.

The normal operation of the engine provides pressure variation in the crankcase **64** and connected intake line **44**, which pressure is communicated by the line **40** to the chamber **96** to flex the diaphragm element **98**. In this regard and as illustrated, the crankcase chamber is superatmospheric and causes chamber **96** to increase and chamber **88** to decrease in size. Because the check **99** closes the port **85**, any liquid in the chamber **88** is forced through passage **89** to open check **100**, across the connecting chamber **94** and opening **91** to the pump outlet. When the piston **58** reverses direction and during the engine compression stroke, the crankcase chamber **64** goes to a sub atmospheric pressure to collapse the diaphragm element **98** towards the housing **81**. Upon the volume of chamber **88** thus increasing, the check **100** closes and insecticide is drawn from the tank **24** past the check element **99** into the chamber **88**. The diaphragm pump being powered by gas pressures only cannot be destroyed even when the valve **32** is closed, while on the other hand provides insecticide flow proportionately as the engine output increases. Preferably, the valve **32** further has an adjustment means **105** so that it can be adjusted to suit the fog consistency desired.

What is claimed is:

1. A thermal fogger comprising an internal combustion engine having an exhaust manifold and having a pressure line that experiences varying pressures during each cycle of the engine, an outlet tube including a venturi restriction therein, means connecting the exhaust manifold to the outlet tube for exhaust flow through the venturi restriction, a diaphragm pump having an inlet and an outlet and having a pressure connection for powering the pump, an insecticide tank, connecting means between the insecticide tank and the diaphragm pump inlet and between the diaphragm pump outlet and the outlet tube at a location immediately downstream of the venturi restriction, and means connecting the engine pressure line with the diaphragm pump pressure connection, whereby operation of the internal combustion engine pressure powers the diaphragm pump for forcing insecticide to the outlet tube for heating admixture with the exhaust downstream of the venturi restriction and for common discharge from the outlet tube.

2. A thermal fogger according to claim **1**, wherein the internal combustion engine is a two-cycle engine having an intake manifold that experiences varying pressures during each cycle of the engine, and wherein the pressure line is connected to the intake manifold.

3. A thermal fogger according to claim **1**, wherein the internal combustion engine has an output throttle control including a trigger mechanism, wherein a control valve is in the connecting means, and wherein linkage means responsive to the trigger mechanism also opens the control valve as the throttle control is opened such as to increase the output of the engine.

4. A thermal fogger according to claim 3, wherein the internal combustion engine is a two-cycle engine having an intake manifold that experiences varying pressures during each cycle of the engine, and wherein the pressure line is connected to the intake manifold.

5. A thermal fogger according to claim 4, wherein the thermal fogger is portable and has a carrying handle.

6. A thermal fogger according to claim 3, wherein the connecting means control valve has a manual adjustment means to achieve a desired insecticide flow at full output conditions.

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