United States Patent

[11] 3,558,099

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[21] Appl. No. **853,782**
[22] Filed **Aug. 28, 1969**
[45] Patented **Jan. 26, 1971**

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[54] **SOLENOID ACTUATED VALVE**
1 Claim, 4 Drawing Figs.

[52] **U.S. Cl.** **251/129,** 222/504
[51] **Int. Cl.** **F16k 31/02**
[50] **Field of Search** 222/70, 76, 189, 504; 251/129, 141, 130

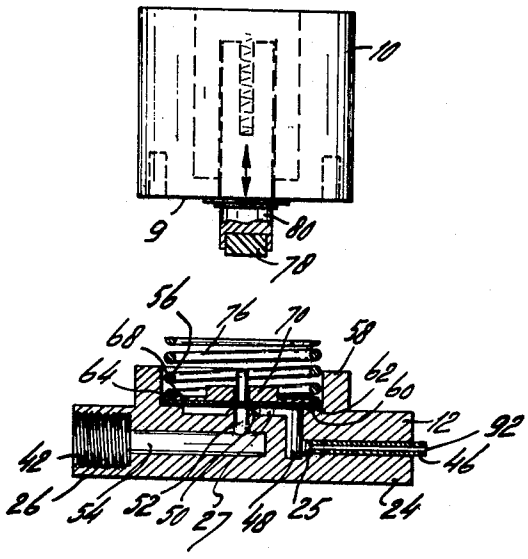
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ABSTRACT: An assembly for dispensing portions of a gaseous vapor and including a valving body having a dispensing conduit, which is opened and closed by means of a solenoid-actuated plunger contactable with a valving diaphragm. As the solenoid reciprocates the plunger, pressure is relieved upon the adjoining valving pin which, in turn, enables gaseous pressure to urge the diaphragm away from the dispensing conduit permitting gaseous flow.



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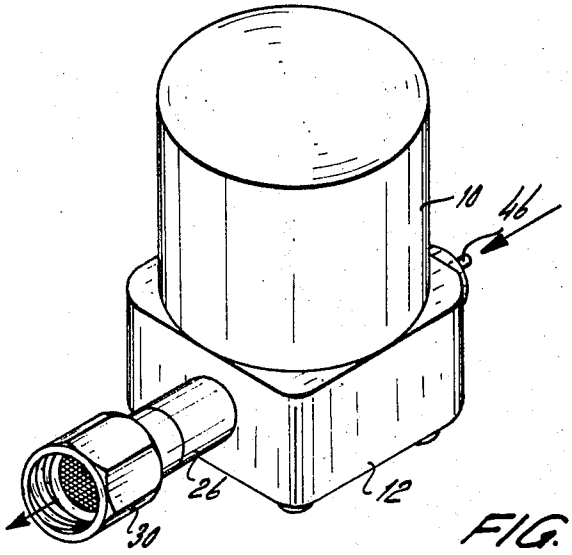


FIG. 1

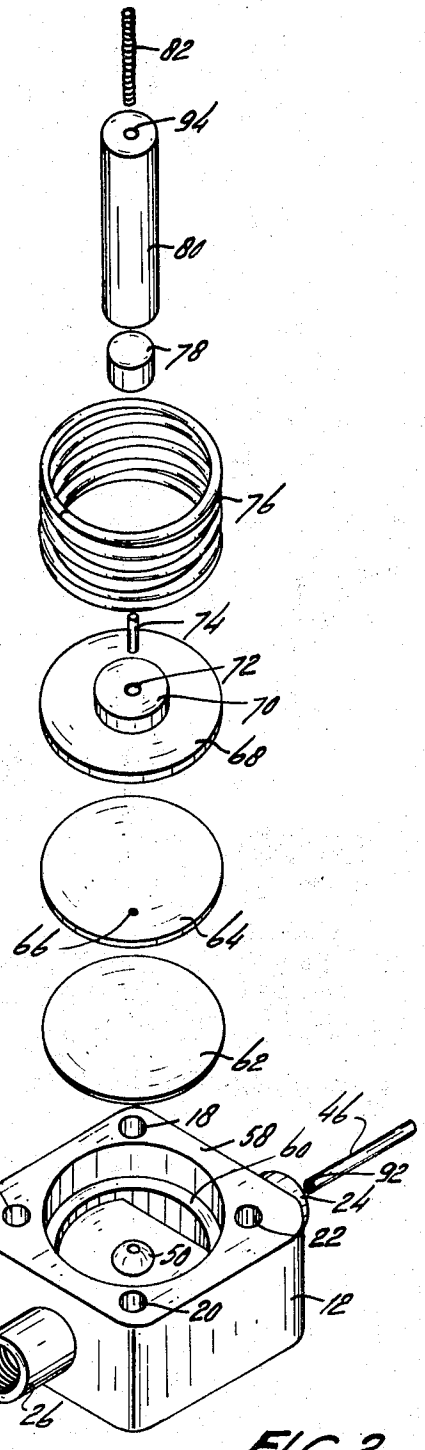


FIG. 2

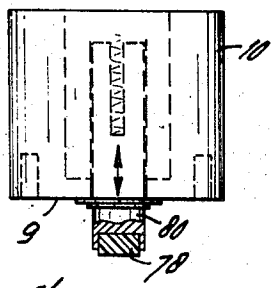
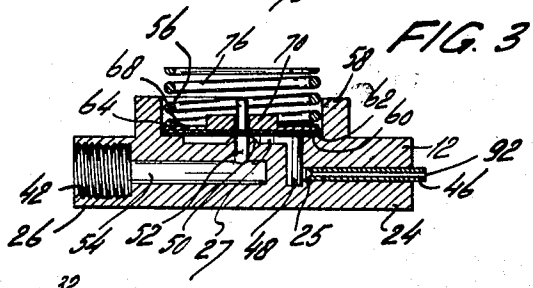


FIG. 3



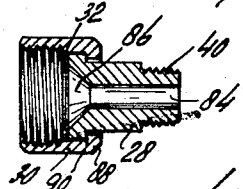
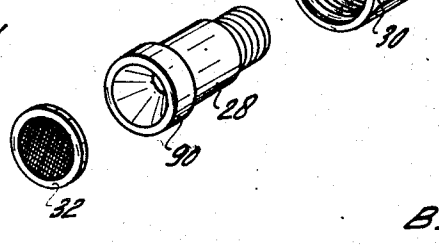


FIG. 4



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SOLENOID ACTUATED VALVE

CROSS-REFERENCES TO RELATED APPLICATIONS

An improvement upon the solenoid-activated dispensing device disclosed in U.S. Pat. 3,209,950 entitled AUTOMATIC DISPENSING DEVICE.

In U.S. Pat. 3,209,950 the solenoid was employed to activate a valve from closed to open position. In the present construction, the valve is held closed by tension of a compression spring within the solenoid assembly. As the solenoid reciprocates the plunger, pressure is relieved upon the adjoining valving pin allowing the diaphragm to be urged away from the dispensing conduit by means of gaseous pressure. The valve, being in the open position, gaseous flow is instigated and maintained until such time as solenoid is deactivated.

BACKGROUND OF THE INVENTION:

1. Field of the Invention

A great deal of recent attention has been given to automatic and intermittent dispensing of gaseous fluids, such as insecticides, for example, the dispensing of insecticides in a tobacco warehouse or public enclosures such as restaurants and auditoriums:

2. Description of the Prior Art

Earlier inventors have developed fluid dispensers in which the nozzle and valve mechanisms are actuable by a clock mechanism or a solenoid. Prior art searching has developed:

Kraus 2,613,108
Gubelin 2,686,944
Edlestein 2,928,573
Kus 3,189,014

The present invention is distinguished from these in the simplified, strengthened, and improved structure for the valving mechanism and including the solenoid-actuated plunger contactable with a valving diaphragm.

SUMMARY OF THE INVENTION

According to the present invention, the solenoid-actuated valve assembly includes a valving body having a fluid-flow conduit extending therethrough, a valving seat defined medially of the body so as to intersect the fluid-flow conduit. A diaphragm is supported upon the seat so as to intersect the conduit and s solenoid-actuated plunger is supported above the diaphragm so as to hold the diaphragm closed and intersecting the conduit, except as the plunger is released. As the plunger is released, the superatmospheric pressure of the gas urges the diaphragm to open the conduit, so long as the plunger is removed from the diaphragm. As the plunger closes against the diaphragm, the conduit is intersected and gaseous flow is cut off. Positive cutoff is effected by directing the conduit axially beneath the diaphragm and having an axial plunger engageable on the other side of the diaphragm so as to urge an axial portion of the diaphragm into the conduit.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the solenoid valve assembly, showing the solenoid-actuated plunger unit secured to to the valving body;

FIG. 2 is an exploded perspective view of the valving body and plunger components;

FIG. 3 is a vertical section of the valving body with the solenoid assembly superposed with respect thereto; and

FIG. 4 is a vertical section of the outlet nozzle adapter.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1, solenoid unit **10** is shown as secured on top of valving body **12**, having inlet **46** and outlet **30**.

As illustrated in FIGS. **2** and **3**, valving body **12** includes a plurality of vertical apertures **16**, **18**, **20** and **22** wherein pins (not illustrated) may be used to secure solenoid unit **10** and valving body **12** together.

Valving body **12** includes gaseous fluid-flow inlet **24** and outlet **26**. Inlet **24** includes lateral passage **25** into which a stainless steel tube **46** having a drilled axial passage **92** may be press-fitted or otherwise secured therein. The diameter of axial passage **92** may be of a constant size such as 0.024 inches, so as to insure constant flow rate and particulate size. Outlet **26** includes interior threads **42** for engagement with exterior threads **40** upon adapter nozzle **28**. Adapter nozzle **28** includes axial conduit **84**, terminating in a radially outwardly tapered area **86**. A monel or like fine mesh strainer **32** may be secured adjacent area **86** by means of threaded cap **30**. Cap **30** has radially inwardly extending flange **88** abutting outer shoulder **90** adapter nozzle **28**. Screen **32** may be held in compression by threaded engagement with another conduit not shown.

The gaseous fluid-flow conduit is defined by tube **46** in lateral inlet **25**, vertical entry passage **48**, horizontal valving seat chamber **27**, vertical exit passage **52**, and lateral exit chamber **54**.

Illustrated in FIG. **3**, Teflon valving diaphragm **62** which inherently passes some of said gaseous fluid by osmosis rests upon annular shoulder **60** enclosed by upstanding wall **56** in the body top **58**. A Neoprene or like diaphragm **64**, having substantial strength to reinforced valving disc **62** and including a vent hole **66** is secured coextensively upon diaphragm **62**, by means of an aluminum or like rigid backup plate **68** having hub **70** and axial passage **72**.

Valving pin **74** is supported reciprocably in passage **72**, so as to contact that portion of the diaphragms **62—64** registering with axial passage **52**. A compression spring **76** is fitted within walls **56** so as to abut the top of backup plate **68** at its lower end and its top abutting the bottom of solenoid assembly housing **10**. A solenoid assembly mounted within housing **10** includes a reciprocable plunger **80** which may be made of stainless steel or the like and have an axial recess **94** at its top for supporting compression spring **82**. Plunger **80** may include, at its bottom, tip **78**, made of Neoprene or the like, so as to be replaceable as it wears in reciprocating contact with pin **74** and eliminating the necessity for change of the entire solenoid and plunger assembly.

The device is constructed such that plunger **80** in normal position closes downwardly against pin **74** so as to close exit passage **52**. As it is desired to eject fluid or gaseous spray through the outlet, the solenoid retracts plunger **80**, permitting the pressure of the gas to flex the diaphragm and open the conduit for flow through vertical entry passage **48**, chamber **27**, vertical exit passage **52**, and lateral conduit **54**. The solenoid may be activated in this respect by any one of a number of conventional timing devices.

The reverse taper radially outwardly expanding chamber **86** in nozzle adapter **28** prevents dripping of liquified chemicals. The manufacture of the valving body in a single piece eliminates the leakage inherent in conventionally articulated valve housings. Venting of Neoprene disc **64** avoids trapping of gases which can rupture the diaphragms **62—64**. The use of a continuous duty solenoid, as opposed to an intermittent duty solenoid, avoids the damage inherent in accidental activation by the assembly.

Manifestly, the valving body orifice and diaphragm structure may be modified without departing from the spirit of the invention.

We claim:

1. A solenoid actuated valve comprising:

A. a valve body enclosing a fluid flow conduit having inlet and outlet ports in said body and said valve body including:

i. a valving seat communicant with said conduit;

B. said conduit extending laterally from said inlet, vertically towards and away from said valve seat and laterally through said outlet and said valving seat including:

i. an annular shoulder for supporting the periphery of said diaphragm as a top seal above a valving chamber;

ii. an axial hub extending upwardly from the bottom of said valve chamber;

iii. a fluid-flow entry passage extending vertically from said conduit into said valving chamber ; and

iv. a fluid-flow exit passage extending vertically through said axial hub from said valve chamber to said conduit;

C. a resilient diaphragm supported in said valving seat, so as to intersect said conduit, so as to be sealed upon said annular shoulder and contacting said exit passage in said hub, said diaphragm being resiliently responsive to the pressure of fluid flowing in said conduit so as to open said conduit;

D. a solenoid assembly supported upon said body adjacent said diaphragm and including:

i. a reciprocable plunger assembly engaging said diaphragm on the opposite side of said conduit, said plunger assembly urging said diaphragm to close said conduit and permitting said diaphragm to open said conduit responsive to gas pressure, as said plunger is released;

ii. a rigid backup plate having a vertically disposed core defining an axial aperture aligned with said exit passage;

iii. a resilient reinforcing plate secured coextensively between said diaphragm and said backup plate and having a vent hole;

iv. a pin supported in said aperture so as to extend through said backup plate aperture to engage said resilient plate at its lower end and engage said plunger at its upper end; and

E. a compression medium supported in said valve body intermediate said backup plate and said solenoid assembly, including a spring encircling said plunger and said hub and seated upon the periphery of said backup plate above said diaphragm, so as to urge the periphery of said diaphragm onto said annular shoulder.