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APPARATUS FOR DISCHARGING FLUID AT AMBIENT TEMPERATURE AND A SELECTED PRESSURE, USING A GAS CONDENSIBLE AT SAID TEMPERATURE AND PRESSURE AND ACTING ON A FLEXIBLE WALL CONTACTING SAID FLUID

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FIG. 1

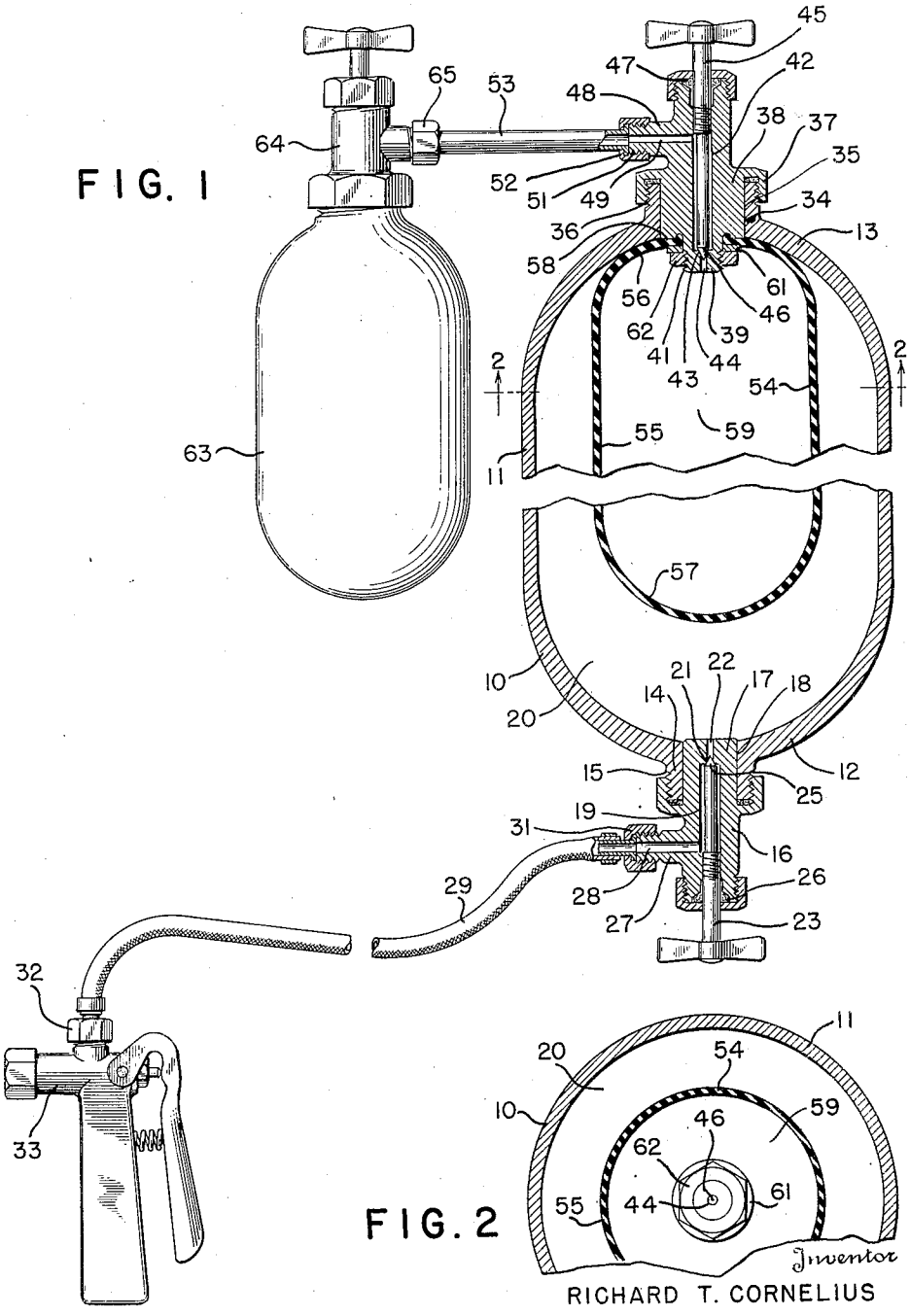

FIG. 2

Inventor

RICHARD T. CORNELIUS

By Caswell & Eagan

Attorneys

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APPARATUS FOR DISCHARGING FLUID AT AMBIENT TEMPERATURE AND A SELECTED PRESSURE, USING A GAS CONDENSABLE AT SAID TEMPERATURE AND PRESSURE AND ACTING ON A FLEXIBLE WALL CONTACTING SAID FLUID

Richard T. Cornelius, Minneapolis, Minn.

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My invention relates to fluid discharge apparatus and has for an object to provide an apparatus having a container for the fluid to be discharged and from which the fluid may be discharged under pressure.

Another object of the invention resides in providing a fluid discharge apparatus in which the entire contents of the container are discharged at a substantially uniform pressure.

A still further object of the invention resides in providing an apparatus having pressure producing means for creating pressure on the fluid, said means including a gas condensible substantially at the discharge temperature and pressure of the fluid.

An object of the invention resides in providing an apparatus having a container for a condensible gas situated contiguous to the container for the fluid, said containers having a common movable wall adapted upon movement in one direction to increase the volume of the chamber in one of said containers and to decrease the volume of the chamber in the other of said containers.

Other objects of the invention reside in the novel combination and arrangement of parts and in the details of construction hereinafter illustrated and/or described.

In the drawings:

Fig. 1 is an elevational sectional view of a fluid discharge apparatus illustrating an embodiment of my invention.

Fig. 2 is a plan sectional view taken on line 2—2 of Fig. 1.

In the dispensing of fluids such as insecticides and similar liquids, it becomes desirable to provide an apparatus whereby substantially constant pressure may be maintained upon the fluid without bringing the fluid in direct contact with any gas or other fluid. The instant invention provides an apparatus whereby this result may be procured.

For the purpose of illustrating my invention, I have shown a container 10 which may be of metal tubing having a side wall structure 11 and end walls 12 and 13 integral therewith. This container has a chamber 20 within the same which receives and holds the fluid to be discharged. The end wall 12 of the said container has a boss 14 which is threaded at 15 to receive a plug 16. Plug 16 has a portion 17 which fits within an opening 18 in the boss 14 and lies substantially flush with the interior surface of the end wall 12 of container 10. The plug 16 is provided with a bore 19 and is formed near the end

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of the same with a valve seat 21. Said plug has an inlet 22 lying in continuation of the bore 19. A valve stem 23 extends along the bore 19 and is formed with a valve head 25 which is adapted to seat against the seat 21. A gland 26 forms a fluid-tight connection between the valve stem 23 and the plug 16. A neck 27 extends angularly from the plug 16, and has an outlet passageway 21 therein which communicates with the bore 19. This neck provides the discharge connection from the container 10.

In the particular form of the invention illustrated, a flexible hose 29 is connected to the neck 27 by means of a coupling 28. A similar coupling 32 connects the said hose with a spray nozzle 33. Such devices being well known in the art, the same will not be described in detail and it can readily be comprehended that any suitable construction may be used for the purpose.

The end wall 13 of the container 10 is formed with a boss 34 having a bore 35 therein. This boss is threaded at 36 to receive a nut 37 formed on a plug 38 similar to the plug 16. The plug 38 fits into bore 35 and completely fills the same. This plug has an extension 39 which is threaded as designated at 41 and which projects into the interior of the chamber 20 formed within the container 10. The plug 38 is constructed with a valve seat 43 near its lowermost end. An inlet passageway 44 communicates with the bore 42. Within the bore 42 is mounted a valve stem 45 which is provided with a valve head 46 adapted to seat against the seat 43. A gland 47 forms a fluid-tight connection between the valve stem 45 and the plug 38. The plug 38 is also constructed with a neck 48 having a passageway 49 therein communicating with the bore 42. This neck is threaded at 51 to receive a tube fitting 52 by means of which a tube 53 may be connected thereto.

Within the interior of the container 10 is provided another container 54 which is constructed of a suitable flexible material such as rubber or the like. This container is formed of a shape corresponding with that of the container 10 having a side wall structure 55 and end walls 56 and 57. These walls form an expansible chamber 59 within the container 54. The wall 56 has an opening through it and through which the extension 39 of the plug 38 extends. This wall rests against a shoulder 58 which is formed on the plug 38 adjacent the extension 39 and which lies in continuation of the inner surface of the end wall 13 of the container 10. A washer 61 encircles the extension 39 and overlies the end

wall 56 of container 54 upon the interior thereof. A nut 62 screwed upon the extension 39 clamps the container 54 to the plug 38. It will be noted that the diameter of the washer 61 is considered less than the diameter of the opening 35, so that by collapsing the container 54, the same may be inserted into the container 10.

My invention utilizes for procuring pressure in the chamber 20 a condensible gas which is disposed within the chamber 59 of container 54. This gas is directed into the said receptacle through the tube 53 and the various passageways formed in the associated structure and when the desired amount of pressure is procured within the container, the valve stem 45 may be rotated to close the passageway leading to the container 54. A particular gas is employed which condenses substantially at the desired pressure and temperature at which the fluid in the container 10 is to be discharged. This gas is discharged into the chamber 59 until the desired pressure is procured. When this occurs, the walls 55, 56 and 57 of the container 54 expand and follow along the corresponding walls 11, 13 and 12 of the container 10. For delivering the desired gas into the chamber 59, a tube 63 of the desired gas is employed which has a discharge plug 64 similar to the plug 38 and associated structure used in conjunction with the receptacle 54. The tube 53 is connected to the plug 64 by means of a coupling 65. When the desired amount of gas has been introduced into the container 54, the inlet 44 to the same is closed by the valve head 46 and the tube 63 and pipe 53 removed. Neck 48 may be now capped and the device is ready for use.

For the purpose of expanding the container 54, several different gases may be used which have differing condensation pressures. When the desired pressure has been determined, a gas having a corresponding condensation pressure is selected. The gas will then condense at the condensation pressure and temperature and produce the desired result. Where a pressure of around one hundred pounds is desired, propane gas may be used. This gas produces a pressure of 92.4 pounds per square inch at 60° Fahrenheit and 109.3 pounds at 70° Fahrenheit. Other gases suitable for use in conjunction with my fluid discharging apparatus are sulphur dioxide which condenses at 34.9 pounds per square inch at 70° Fahrenheit, methyl chloride which condenses at 58.7 pounds per square inch at 70° Fahrenheit, butane which condenses at 16.9 pounds per square inch at 70° Fahrenheit, and dichloromonofluoromethane which condenses at 8.4 pounds per square inch at 70° Fahrenheit.

In the filling of the device with the fluid to be discharged, the hose 29 is removed and the neck 27 connected to a suitable source of said fluid. Where the fluid is a liquid, the same is pumped in under pressure through the inlet opening 22 and into the chamber 20 within the container 10. This causes the container 54 to collapse and the gas within the same to be compressed. The inlet 22 is now closed by means of the valve head 25 and valve stem 23. The heat produced by the pressure of the gas within the chamber 59 is gradually transferred through the wall of the container 54 to the fluid in chamber 20 and from the same to the walls of the container 10. From said container the heat is dissipated to the surrounding atmosphere. When the temperature of the compressed gas reaches ambient temperature, a portion of the gas condenses and the pressure returns to the desired value. The device is then ready for use.

In the use of the device the hose 29 is connected to neck 27 as shown in Fig. 1 and, the valve head 25 is moved into opening position. The nozzle 33 can then be operated and, due to the pressure within the container 20, caused by the gas in chamber 59, the liquid in chamber 20 is forced out through the nozzle 33 in a spray. As the fluid in container 20 is consumed, container 54 expands and the liquid within the same vaporizes and returns to its original gaseous state. During discharge the temperature of the gas in chamber 59 drops slightly and likewise the pressure. However, as heat is absorbed by the gas from the exterior through the medium of the walls of container 11, the fluid in chamber 20 and the walls of container 54, the pressure in chamber 59 is again reestablished. Where the use of the sprayer is intermittent, and where the amount of the fluid sprayed is not great, the amount of the fluid sprayed at a time is not great, the pressure of the fluid discharged is substantially constant, thus permitting of spraying the entire contents of the container at substantially the desired pressure. It will thus be seen that the gas within the container 54 may be kept intact, and the container 10 repeatedly filled and discharged. During such use, the cycle is merely repeated.

If desired, the fluid within the container 20 may be filled into said container prior to the filling of the container 54 with the condensible gas. Where a liquid is used, the initial volume of liquid within the chamber 20 in such case would be sufficiently less than the volume of said chamber, so that when the container 54 was subsequently filled with the pressure-producing gas, that the same might expand sufficiently to discharge the entire contents of the chamber 20 at the desired pressure. In the event that the chamber 20 is completely filled with liquid, it becomes necessary to maintain the tube 63 attached to the container 10 during use of the device. As the fluid in the chamber 20 is discharged, the gas in the container 54 functions in the same manner to maintain a constant pressure upon the fluid during discharge of the same.

My invention has numerous uses. If desired, the same may be used to discharge a liquid disinfectant in spray form to be sprayed upon objects and surfaces to be disinfected. In such case, the gas is filled within the container 54 prior to the use of the device, so as to obviate the necessity of having the tube 63 connected to the same during use. If desired, the entire structure may be made in an inexpensive manner and filled with the gas under pressure at the time of use. In such case, the containers may be discarded and the gas within the interior container wasted. Such an arrangement would be particularly useful where the container was used for containing paint and the paint sprayed on the surface to be painted. Numerous other uses in which a fluid or liquid is to be discharged under pressure may be found for the invention.

The advantages of my invention are manifest. A substantially constant pressure is at all times maintained on the fluid to be discharged. This is particularly advantageous when the fluid passes through a spray nozzle or other similar device in which the form of the spray is dependent upon the pressure employed. With my invention, the entire contents of the container for the fluid may be discharged therefrom. The fluid

or liquid to be discharged is kept separate from the gas producing the pressure, so that contamination, evaporation or other injury to the fluid is prevented. The device can be constructed in an inexpensive manner and where desired can be repeatedly used.

Changes in the specific form of my invention, as herein described, may be made within the scope of what is claimed without departing from the spirit of my invention.

I claim:

1. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a certain pressure and temperature comprising a container having a chamber for holding the fluid, a second container contiguous thereto, and having a chamber therein, said containers having a movable wall common to both chambers, and movable to cause the volume of one chamber to increase and the volume of the other chamber to decrease, and a gas condensible at substantially the discharge pressure and temperature of said fluid disposed within the chamber of said second named container said gas and fluid being in heat exchange transfer relation with each other and one thereof being in heat transfer relation with the medium adjacent the container therefor.

2. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a certain pressure and temperature comprising a container having a chamber for holding the fluid, a second container contiguous thereto, and having a chamber therein, said containers having a movable wall common to both chambers, and movable to cause the volume of one chamber to increase and the volume of the other chamber to decrease in proportion to the rate of increase of the volume of said other chamber and a gas condensible at substantially the discharge pressure and temperature of said fluid disposed within the chamber of said second named container.

3. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a certain pressure and temperature comprising a container having a chamber for holding the fluid and pressure producing means for creating a pressure in said chamber to discharge the fluid therefrom, said means including a gas condensible substantially at the discharge temperature and pressure of the fluid said gas and fluid being in heat exchange transfer relation with each other and one thereof being in heat transfer relation with the medium adjacent the container therefor and means for conducting heat to said condensible gas.

4. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a certain pressure and temperature comprising a container having a chamber for holding the fluid, an expansible sack within said chamber and a gas within said sack condensible substantially at the discharge pressure and temperature said gas and fluid being in heat exchange relation with one another through said sack and said container being in heat exchange relation with the atmosphere.

5. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a temperature above a predetermined minimum and at a pressure above a predetermined minimum pressure, said apparatus comprising a container having a chamber for holding the fluid, a second container contiguous thereto, and having a chamber therein, said containers having a movable wall common to both chambers, and movable to cause the volume of one chamber to increase and the volume of the other chamber to decrease, and a gas condensible at substantially the minimum discharge pressure and temperature of the fluid disposed within the chamber of said second named container said gas and fluid being in heat exchange transfer relation with each other and one thereof being in heat transfer relation with the medium adjacent the container therefor.

6. A discharge apparatus for intermittently discharging small quantities of a fluid under pressure comprising a container having a chamber for holding the fluid, a second container contiguous thereto, and having a chamber therein, said containers having a movable wall common to both chambers, and movable to cause the volume of one chamber to increase and the volume of the other chamber to decrease and a gas condensible at substantially 50° Fahrenheit and at a pressure between ten and two hundred pounds pressure per square inch, disposed within the chamber of said second named container said gas and fluid being in heat exchange transfer relation with each other and one thereof being in heat transfer relation with the medium adjacent the container therefor.

7. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a selected pressure at ambient temperatures comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, and a gas condensible at ambient temperatures at substantially the selected pressure disposed in the expansible chamber, and heat transfer means for conducting heat to said gas.

8. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at about 109.3 pounds pressure at a temperature of about 70 degrees Fahrenheit, said apparatus comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, propane condensable at about said pressure and temperature contained in said expansible chamber and heat transfer means for conducting heat to the propane.

9. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at about 34.9 pounds pressure at a temperature of about 70 degrees, said apparatus comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, sulphur dioxide condensable at about said pressure and temperature contained in said expansible chamber and heat transfer means for conducting heat to the sulphur dioxide.

10. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at about 58.7 pounds pressure at a temperature of about 70 degrees Fahrenheit, said apparatus comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, methyl chloride condensible at about said pressure and temperature contained in said expansible chamber and heat transfer means for conducting heat to the methyl chloride.

11. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at

a selected pressure at 70 degrees Fahrenheit comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, and a gas condensible at 70 degrees Fahrenheit at substantially the selected pressure disposed in the expansible chamber, and heat transfer means for conducting heat to said gas.

12. Fluid discharge apparatus for intermittently discharging small quantities of a fluid at a pressure below about 110 pounds at a temperature of about 70 degrees Fahrenheit, said apparatus comprising fluid operated pump means including an expansible chamber and a contractible chamber, the fluid to be discharged being contained in said contractible chamber, and a gas condensible at a pressure below 110 pounds pressure at 70 degrees Fahrenheit contained in said expansible chamber and heat transfer means for conducting heat to said gas.

RICHARD T. CORNELIUS.

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