

April 12, 1966

W. ROTH ETAL
PRESSURE CONTAINER

3,245,582

Filed July 2, 1964

2 Sheets-Sheet 1

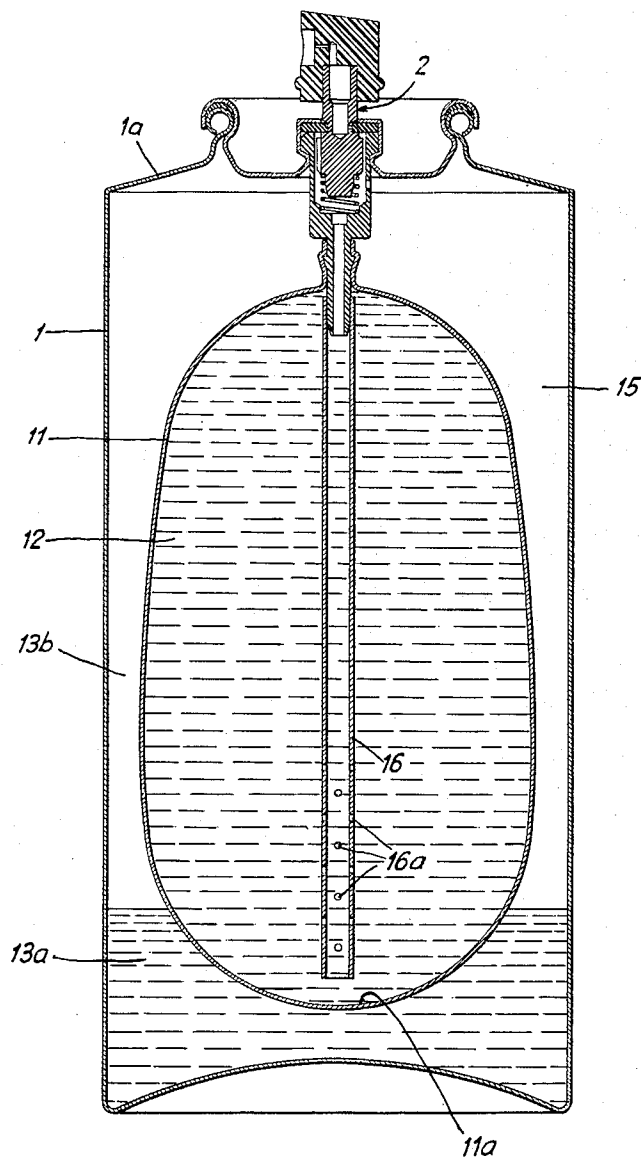


FIG. 1

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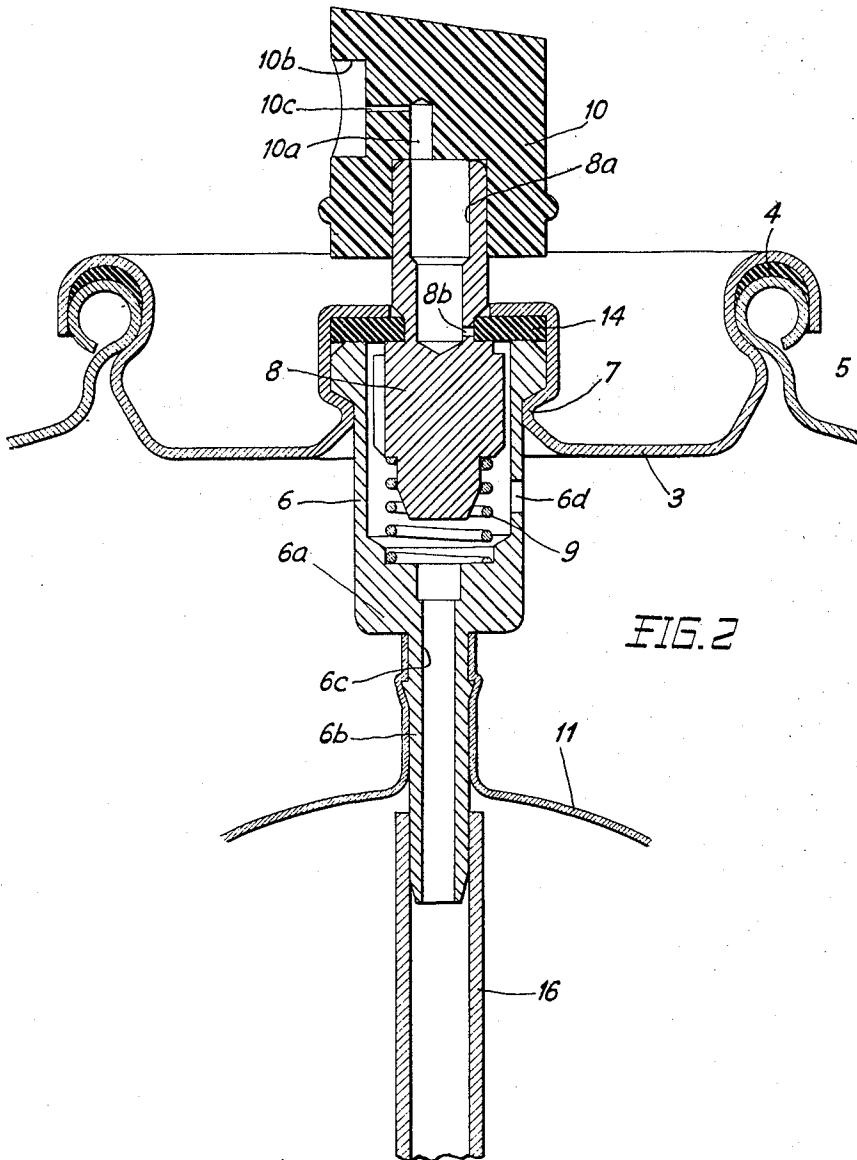
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PRESSURE CONTAINER

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Filed July 2, 1964, Ser. No. 379,858

Claims priority, application Switzerland, July 6, 1963, 8,377/63

5 Claims. (Cl. 222—4)

The present invention relates to a pressure container, i.e., an aerosol container, containing an aqueous preparation and a pressure or propellant gas. If, as is usually the case, the latter consists of a liquid phase and a gas phase and the two liquids are immiscible, the aerosol is termed a three-phase aerosol. Depending upon its specific gravity, the liquefied propellant is situated above or below the aqueous phase for spraying and the gas phase of the propellant is in every case situated above the two liquid phases.

If the attempt is made to improve the spraying properties of the aqueous phase by the addition of conventional wetting agents in order to reduce surface tension, varying intermixing of the liquid aqueous and organic phases occurs in the three-phase aerosol because of the reduced surface tension and this results in undesirable foaming on actuation of the aerosol valve. Three-phase aerosols containing conventional wetting agents are unusable because of this foaming. To prevent it, the attempt has been made to separate the preparation for spraying from the pressure gas, either by a piston or a diaphragm or some other subdivision of the container interior, for example by means of a sac. Experience has shown that this step really can prevent foaming but it has the great disadvantage that spraying is no longer satisfactory. The pressure container according to the present invention does not have this disadvantage, the container being intended for fine spraying of an aqueous preparation, more particularly an oil-in-water emulsion, comprising a pressure-tight container which is closed by an aerosol valve and which contains a flexible sac which communicates with the valve via a duct and which contains the aqueous preparation for spraying, while the space bounded by the sac outside and the container inside contains the propellant gas. It is characterized in that the second space is also so connected to the aerosol valve that when the latter is open both aqueous preparation and pressure gas escape therefrom.

In the drawing:

FIG. 1 is a section through a pressure container according to the invention, and

FIG. 2 is a detail of this container to an enlarged scale.

In the drawing, reference numeral 1 denotes a pressure-tight cylindrical container which may advantageously consist of metal, for example tinned sheet iron or aluminium, and which reliably withstands an internal operating pressure of at least 5 atmospheres gauge. An aerosol valve 2 is inserted in the top 1a of the container 1. The valve may, for example, be of the type shown in FIG. 2, in which the valve disc is a round ring 3, for example of tinned sheet iron or aluminium, which is secured to the container bead 5 with the interposition of a ring gasket 4 of any suitable material. The plastic or metal valve housing 6 is retained in the middle of the valve disc 3 by means of a flanged portion 7 thereof. The valve cone 8 is accommodated in the hollow valve housing 6 and may consist of a plastic material, for example a nylon, and is pressed by the coil spring 9 against the ring gasket 14 so as to close the valve. The valve cone 8 is formed with a longitudinal bore 8a with a diameter of 0.75 mm.,

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for example, and a transverse bore 8b. The press button 10 is disposed on the valve cone 8 and is formed with a bore 10a communicating with the bore 8a and an aerosol jet 10c of a diameter, for example, of 0.4 mm., communicating with the recess 10b. The valve connection or riser connection 6b is connected to the base 6a of the valve housing 6 and to it is secured the sac 11 which is in the form of a balloon of any flexible material, for example a 20 μ thick polyethylene foil or some other material, elastic materials being used if required. The inside diameter of the bore 6c in the riser connection 6b is advantageously about 0.4 mm. to 0.65 mm. so that its cross-sectional area is about $\frac{1}{10}$ sq. mm. to $\frac{1}{3}$ sq. mm. The bore 6c together with the interior of the valve housing 6 forms a duct which connects the interior of the flexible sac 11 to the actual valve formed by the bore 8b and the ring gasket 14. A riser 16 can be fitted over the connection 6b and extends almost to the bottom 11a of the sac 11 and, if necessary, can be formed with individual transverse perforations 16a so that even if the flexible sac 11 is partially compressed the liquid 12 can always escape. The hollow valve housing 6 is also formed with a lateral transverse bore or valve inlet 6d whose cross-section is of about the same size as the cross-section of the bore 6c, i.e., also has a cross-section area of $\frac{1}{10}$ sq. mm. to $\frac{1}{3}$ sq. mm. This bore 6d connects the interior of the valve housing 6 to the space 15 between the sac 11 and the container wall 1. This space 15 contains the pressure or propellant gas. In FIG. 1 reference 13a denotes its liquid phase, 13b its gas phase and 12 the aqueous liquid for spraying. The propellant gas may be any of the gases used in aerosol technique, advantageously a pressure-liquefiable halogenated or unhalogenated gas or a mixture of such gases, having a pressure of at least 0.5 atmosphere gauge at 20° C., for example propane, butane, etc., or a fluorine-containing hydrocarbon, for example dichlorodifluoromethane. The aqueous preparation may, for example, be an oil-in-water emulsion, for example an insecticide of the following composition:

	Percent
Pyrethrum extract, 25%	0.8
Piperonylbutoxide	1.2
γ -isomer hexachlorocyclohexane	0.5
Acetone	5.0
Ethylene oxide condensation product with nonyl phenol	7.5
Water	Remainder

The sac 11 is filled, for example, with 160 g. of this oil-in water emulsion while the space 15 between the sac and the container wall is filled with 40 g. of a mixture of n-butane and iso-butane (at a gas pressure of 2.4 atmospheres gauge at 20° C.). If the aerosol valve is then opened by the press button 10 being pressed in until the transverse bore 8b is no longer sealed by the washer 14, so that the interior of the valve housing 6 communicates with the bore 8a, the oil-in-water emulsion, i.e., the aqueous preparation, flows through the connection 6b to the transverse bore 8b and then into the longitudinal bore 8a. At the same time the propellant gas flows through the aperture 6d to the transverse bore 8b. A first mixing occurs inside the valve housing 6 and the mixture is atomised very finely as it leaves the jet 10c so that flying insects, for example flies and gnats can be readily controlled. The effect of this spray corresponds to that of a spray having the same composition of active substance and obtained by spraying a mixture of 20% active substance concentrate in organic solvents and 80% of propellant gases of the fluorinated hydrocarbon type. In the present device according to the invention the proportion is the economically much more favourable one of 80% active substance concentrate and 20% propellant

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gases, the active substance concentrate being made up of 85% of water and hence more favourable as regards toxicology and smell. Despite the use of combustible propellant gases the spray produced by the unit according to the invention is non-combustible, and this is a further advantage. Although numerous other aqueous preparations and the most diverse propellant gases were tried out, no danger of foaming could be found or of any other effects to disturb atomisation. The mixture of active substance concentrate and propellant gas given as an example hereinbefore cannot be sprayed without the use of a sac 11, because without the use of a partition the propellant gas is emulsified into the active substance concentrate and a thick foam escapes on actuation of the valve.

Of course the flexible wall need not be in the form of a balloon or sac; any other construction is possible assuming that the two spaces separated by the flexible wall are so connected to the aerosol valve that when the latter is opened both the aqueous preparation and the propellant gas can escape therethrough. Depending on the type of aqueous preparation and the pressure of the propellant gas the flow cross-section 6c in the connection 6b and the cross-section of the lateral bore 6d will be increased or reduced.

The sprayable mixture in the unit according to the invention may contain active substances of any type, for example pesticides, weed-killers, fungicides, bactericides, pharmaceutical agents, cosmetics, domestic chemicals, etc., in either dissolved or dispersed form.

An air freshener for the aerosol according to the invention may consist of the following:

150 g. of active substance concentrate consisting of—

	Percent
Perfume combination	0.5
Propyleneglycol	2.5
Formaldehyde solution, 35%	0.1
Ethylene oxide condensation products with nonyl phenol	5.0
Water	Remainder

50 g. of a 50-50 mixture of trichlorofluoromethane and dichlorodifluoromethane.

Unpleasant smells can be controlled and suspended particles, for example smoke and micro-organisms, can be deposited with the fine mist produced with the unit according to the invention. Aqueous active substance concentrates are of course very suitable for this purpose, more particularly because finely sprayed water has a more refreshing effect than any other sprayed solvent.

A dry bright wax aerosol may contain the following substances:

160 g. of active substance concentrate consisting of—

	Percent
Self-emulsifying wax	10
Water	90

40 g. of a mixture of n-butane and propane (with a gas pressure of 2.6 atmospheres gauge at 20° C.)

Actuation of the valve gives a fine mist which when sprayed uniformly over a floor covering consisting of polyvinyl chloride tiles gives a wax film having an ex-

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cellent shine after drying. The shine given by the wax film produced with the unit according to the invention corresponds to that of the same active substance concentrate applied to the floor in the conventional way by means of a cloth. It was hitherto impossible to fine-spray wax emulsions just with water as dispersant, because without the device according to the invention the propellant gas would emulsify into the emulsion and intensive and undesirable foaming would occur at the valve.

What is claimed is:

1. A pressure container for fine spraying an aqueous preparation, in particular an oil-in-water emulsion, comprising a hollow pressure-tight container internally providing a compartment bounded by inner walls, aerosol valve means for closing said pressure-tight container, a flexible sac which remains intact and unruptured during the spraying operation disposed within said compartment of said hollow pressure-tight container, said flexible sac containing the aqueous preparation to be sprayed and being bounded by outer walls which cooperate with the inner walls of said pressure-tight container to provide a space containing a propellant gas which is disposed externally of said flexible sac so that the pressure of the propellant gas is capable of at least partially compressing said flexible sac, said aerosol valve means including a hollow valve housing connected to said sac, means providing a bore for communicating the interior of said flexible sac with said hollow valve housing in order to enable the aqueous preparation to move from said flexible sac into said hollow valve housing, said hollow valve housing incorporating means providing an inlet for movement of the propellant gas located in said space into the interior of said hollow valve housing, so that when said aerosol valve means is open both aqueous preparation and propellant gas escape therefrom, said valve inlet-providing means being located externally of the intact and unruptured flexible sac.

2. A pressure container according to claim 1, further including a riser secured to said bore-providing means, said riser extending practically to the bottom of the flexible sac.

3. A pressure container according to claim 1 wherein the cross-sectional area of said bore and said valve inlet are substantially equal.

4. A pressure container according to claim 3 wherein said cross-sectional areas of said bore and said valve inlet lie in the range of about $\frac{1}{10}$ square millimeter to $\frac{1}{3}$ square millimeter.

5. A pressure container according to claim 1 wherein said bore-providing means and said valve inlet each provide an unobstructed passageway which continually communicates the interior of said flexible sac and the space for the propellant gas, respectively, with the interior of said hollow valve housing.

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