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REUSABLE AEROSOL DISPENSER

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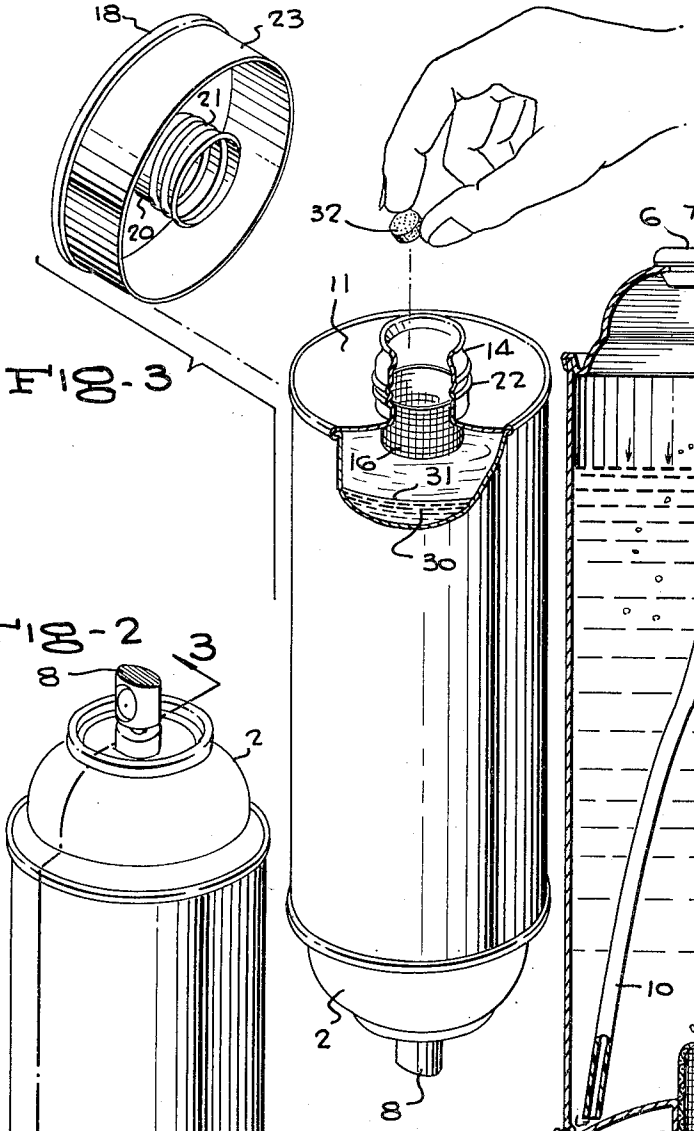

FIG-3

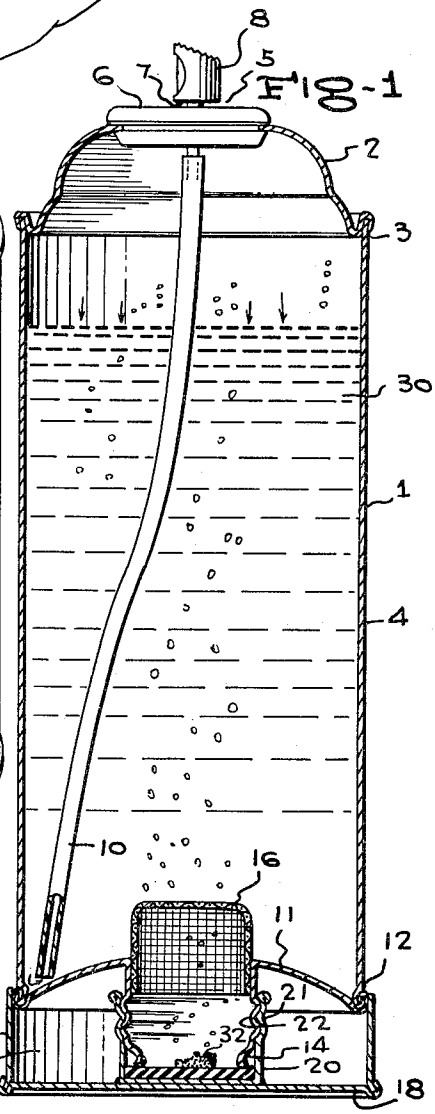

FIG-1

FIG-2

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REUSABLE AEROSOL DISPENSER

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This invention relates to aerosol dispensers and in particular to such a dispenser which may be refilled and reused easily and conveniently.

The most common type of aerosol dispenser which presently is in extensive commercial use is a single charge or "one shot" device. Such a dispenser or "bomb," is filled at the factory with a charge of material that is to be dispensed, generally a liquid formulation which is effective as an insecticide, paint, deodorant, or the like. A valve is then set in place to close the container and special apparatus is utilized to inject a propellant into the container through the valve. The propellant is usually a material that is gaseous at ambient temperatures and pressures and so special equipment must be employed to liquefy it so that it may more readily be introduced through the valve into the container. Such apparatus generally depends upon the application of extremely high pressures and the maintenance of low temperatures to liquefy the propellant material and facilitate its injection into the bomb. In any event, the usual apparatus for filling aerosol dispensers is quite expensive and is generally within the economic range of only large-scale manufacturers and certainly is not available to the average person.

Other aerosol dispensers have been developed which rely upon an internally generated gaseous propellant. Such devices normally have a removable top closure which supports a dispensing valve, a dip tube, and means for receiving a tablet or pellet compounded from chemicals which generate gas in contact with the liquid contained in the dispenser.

Up to the present, however, the use of devices of the latter type has been attended by certain disadvantages. First, the location of the gas generating tablet at the end of a supporting rod depending from the top closure causes it to be brought in contact with the liquid in the container before the closure is properly seated. The unfavorable aspects of this type of structure are two-fold. Initially, there is a loss of propellant gas which is generated as soon as the tablet contacts the liquid and which escapes through the top of the container before the closure is in place. Later, when the closure is in position to be effective but is not securely screwed down or locked on, there is a build-up of pressure against the closure which tends to interfere with its being properly seated and secured.

A further disadvantage of such devices employing an internally generated propellant stems from the nature of the propellant tablet. Such pellets or tablets are essentially self-disintegrating, since, on contact with water, gas is generated within the interstices of the pellet and the force of this escaping gas cracks the pellet into fragments. It frequently happens, therefore, where the dispenser is used soon after the insertion of the gas generating tablet, that fragments of the pellet may be sucked up through the dip tube and be expelled through the valve. In such a case the full propellant value of the tablet is sharply diminished, perhaps to the extent that the entire liquid charge within the container cannot be forced out against atmospheric pressure. Or, it is possible that such fragments may become lodged in the dip tube and, temporarily at least, render the device inoperable by clogging the dip tube, valve and/or dispenser head.

According to the present invention, we have provided

an aerosol dispenser structure of the internally generated gas propellant type which is a significant improvement over such prior art structures and which completely overcomes and eliminates the foregoing disadvantages normally incident to the use of such devices.

Therefore, it is an object of the present invention to provide an aerosol dispenser of the refillable, reusable type which can very simply and safely be manipulated by the average household user with out special equipment, training or more than ordinary dexterity.

It is a further object of the present invention to provide an aerosol bomb of the reusable, refillable type, adapted for use with gas generating pellets, which may be refilled without loss of any of the propellant gas or other active ingredients which may be contained in the propellant tablet.

An additional object of the present invention is to provide an aerosol dispenser of the type set forth above which may be opened, refilled and reclosed easily and without intereference from pressure generated prematurely within the dispenser.

A still further object of the invention is to provide an aerosol dispenser structure of the type set forth above which will substantially prevent fragments of the gas generating tablet from being expelled before they are fully disintegrated and also prevent such fragments from becoming lodged in the dip tube, valve and/or valve head.

Other advantages and objects of the invention will become apparent from the following detailed description and claims taken in connection with the accompanying drawings which disclose, by way example, the principles of this invention and the best mode which has been contemplated for the application of these principles.

In the drawings:

FIGURE 1 is a sectional view of the aerosol dispenser taken along line 3 of FIGURE 2;

FIGURE 2 is a perspective view of the aerosol dispenser in the vertical or upright position, with the bottom closure in place; and

FIGURE 3 is an exploded, perspective view of a preferred embodiment of the aerosol dispenser in the inverted position.

Referring to FIGURE 1, we see that the aerosol container or canister **1** is provided with a convex, dome top end wall **2** which is sealed by crimping to the upper peripheral edge **3** of the cylindrical container body **4**. The dome or top end wall **2** has a central aperture in which a valve assembly **5** is permanently seated. Valve assembly **5** comprises a valve support **6**, a valve **7** and a dip tube **10**. Valve **7** is of a type conventional in such aerosol dispensers and is of the normally closed variety which may be manually actuated or opened for dispensing of the contents by sideward or downward pressure upon the dispensing button **8**. Dip tube **10** depends from the valve inside the container body and extends to the lowermost portion of the container where concave bottom end wall **11** is crimped to the lower peripheral edge **12** of the container body **4**. The concave bottom **11** is also centrally apertured and has mounted in the aperture a tubular filling conduit **14** and a cup-shaped tablet receiving screen **16**.

The preferred tablet receiving member is shown as a cup or dish-shaped screen **16**. This screen may be formed from a metallic or plastic mesh, or other materials found suitable for the purpose. Essentially the tablet receiving member should restrain the passage of solids of large size, but should always permit the passage of gases and liquids. Others skilled in the art may well be able to devise substitutes for the screen shown in the primary embodiment without departing from the scope of the invention.

The tubular filling conduit **14** is closed by threaded cap **20**. The threads **21** of cap **20** cooperate with threads **22** carried by the filling tube **14** so that cap **20** may be screwed onto the filling conduit in closing engagement therewith.

Cap **20** is carried on a flat disc **18** which provides a base for the dispenser. An upstanding circular flange **23** extends from the edge of disc **18** to the juncture or seam between bottom end wall **11** and the edge **12** of container body **4**. The flange **23** encloses the cap **20** and filling tube **14** when cap **20** is fully screwed onto the tube and also improves the utility of the dispenser by providing the canister with generally smooth and continuous sidewalls for better handling by the user and a better appearance.

In operation, the dispenser may be furnished at the outset with an initial charge already mixed in the dispenser. If this is the case, such charge is expended before use is made of the unique refilling and recharging features contemplated by the present invention.

If the dispenser is supplied empty, with only a supply of gas generating tablets, or if an initial charge has been exhausted, the dispenser is refilled in the following manner.

First, the empty container is inverted, as shown in FIGURE 3, and the closure cap **20** is unscrewed and removed, so as to expose the tubular filling conduit **14**. Next, a liquid solvent or dispersing medium **30**, usually water, is poured through the filling tube into the container. Since valve **7** is normally closed, the water is retained in the vessel without loss during the filling. The container is normally filled with liquid up to a level somewhat below the tablet receiving screen **16** such as level **31**.

Next, the user inserts through the filling tube onto the screen a tablet **32** containing gas generating and chemical supplying ingredients which are to be dissolved in the liquid in the container. It will be noted that the passage of the tablet into the body of the container will be intercepted by the screen **16** so that contact between he tablet **32** and he liquid **30** is prevented. The closure cap **20** is then replaced by screwing onto the filling tube **14**. The container is then inverted or brought right side up. If desired, it may be shaken lightly to hasten disintegration of the pellet.

Referring again to FIGURE 1, it will be seen that in the early stages of distintegration, fragments from the pellet or tablet will be restrained within a chamber or cage formed cooperatively by the pellet receiving screen **16**, the filling tube **14** and the closure cap **20**, so that detached particles of the tablet cannot be prematurely dispensed and are not available to clog up or interfere with the proper operation of the valve dispensing mechanism.

In a most useful application of the present invention, the tablets or gas producing pellets which are used with the device are responsible not only for the evolution of gas but they also contribute a soluble active ingredient which is rapidly put into solution upon disintegration of the pellets. For example, one highly useful formulation for such pellets results in the production of a very effective insecticidal spray. A preferred formulation for this is:

	Percent
Citric acid	36.40
Sodium bicarbonate	52.33
Chlordane, 40% technical, wettable	6.82
Rice starch (fine)	4.45
	100.00

The size of the propellant tablets employed in a given case will be dependent upon a number of factors including, (*a*) the volume of liquid to be dispensed, (*b*) the concentration of active ingredients to be imparted to the liquid, and (*c*) the volume of gas necessary to be derived from the tablet in order to completely dispense the liquid contents of the bomb.

Other formulations for such tablets will be readily apparent and could easily be formulated by a person skilled in the art. For example, boric acid or tartaric acid might be substituted for citric acid in the above formula. Likewise, other alkaline carbonates, such as potassium bicarbonate, might be substituted for sodium bicarbonate.

Also, a wide variety of other insecticidal ingredients could be substituted for chlordane, or the active ingredient in the tablet could be of an entirely different nature, such as a deodorant, an antiseptic, a detergent, a perfume or the like.

It is also within the skill of one familiar with this are to experiment and to find other entirely different systems based upon nonaqueous solvents or dispersants which could still be employed in the present apparatus, relying upon the same fundamental concept of invention. For example, a therapeutic or antiseptic alcohol solution might be formed and dispensed in the present apparatus or, in a similar manner, a paint might be compounded by dispersing a dye or pigment in an oil or latex medium.

In commercial practice, it may be advantageous for a manufacturer to supply, with the initial sale of the dispenser, a number of tablets for use when recharging of the aerosol dispenser is required. The tablets could be of the type or formulation illustrated above and might be wrapped or sealed in plastic envelopes to prevent spontaneous deterioration due to absorption of atmospheric moisture. Obviously, the tablets could all be of a similar formulation, which would impart insecticidal properties to the solution, or they could be of a variety of types, each contributing a different active ingredient to the liquid in the aerosol bomb. Thereafter, the manufacturer only needs to supply the additional pellets as needed, since the container is reusable indefinitely and the water or other liquid medium with which the bomb is filled would be readily available to the user.

The manufacturer might also supply a tablet which only evolves gas and contains no active ingredient. With such tablets, the user could formulate his own concoctions for dispensing and then propel his formulations by use of the gas producing tablets. The amount of gas producing ingredients in the tablets of course would be selected so as to produce just the proper gas pressure for completely dispensing the contents of a given size container when filled with liquid to a predetermined level.

An extra supply of tablets might be stored separately or could conveniently be carried in the compartment or chamber **35** formed between the bottom of the container **11**, flange **23** and disc member **18**.

Returning briefly to the primary advantages achieved by use of the structure which is the subject of the present invention, we see that all of the features of the invention contribute to a most convenient, safe and simple operation by the purchaser or user.

The user can readily determine when a charge has been exhausted by manipulating the valve operating button with the can in upright position. If the valve is operating properly and no liquid or vapor is dispensed, the propellant supply and probably the liquid contents have both been exhausted. The user then inverts the can and unscrews the bottom closure. Next, the dispenser is filled with liquid, such as water, to a predetermined level and one of the prepared gas generating tablets containing an insecticidal or other active ingredient is dropped through the filling tube onto the mesh screen.

The tablet does not immediately contact the water since the predetermined liquid level is arranged to be located below the screen when the can is held in inverted position. Thus, no gas is evolved and lost through the open filling tube and no pressure build-up is experienced within the container as the closure is replaced. This feature clearly overcomes some of the serious disadvantages of prior devices. Although it has been attempted to provide features in certain of these devices which would delay the evolution of gas until the container could be reclosed,

none has actually solved the problem. In all, there has been the possibility of premature evolution of gas with the consequent loss of propellant, pressure build-up and difficulty in reclosing the device.

Furthermore, none of the prior art devices has overcome the problem of loss of the propellant tablet or clogging of the dispensing mechanism resulting from small fragments of the disintegrating pellet being forced up through the dip tube. The structure of the present invention clearly and efficiently overcomes this disadvantage.

Other embodiments and modifications of the disclosed device may be constructed by those skilled in the art without departing from the spirit of the invention or the scope of the following claims.

We claim:

1. A refillable aerosol dispenser of the type adapted for use with gas generating tablets comprising, a cylindrical container having top and bottom end walls, said top end wall having an aperture, a dispensing valve assembly mounted in said aperture; said dispensing valve assembly comprising a normally closed valve providing fluid communication between the inside and the outside of said container, manually actuated means outside said container for operating said valve and a tube inside said container, one end of said tube communicating with said valve and the other end of said tube communicating with the region of said container adjacent said bottom end wall of said container, said bottom end wall including an aperture, a dish-shaped screen member within said container extending across said aperture in said bottom end wall and providing a recess for receiving a gas generating tablet, a filling tube mounted in said second aperture and extending outwardly from said container and

a removable closure member for closing both said filling tube and said second aperture.

2. In combination, a refillable aerosol dispenser and a solid tablet containing ingredients capable of generating gas upon contact with water and ingredients capable of forming an insecticidal solution upon contact with water, said dispenser comprising a cylindrical container having top and bottom end walls, said top end wall having an aperture, a dispensing valve assembly mounted in said aperture; said dispensing valve assembly comprising a normally closed valve providing fluid communication between the inside and the outside of said container, manually actuated means outside said container for operating said valve and a tube inside said container, one end of said tube communicating with said valve and the other end of said tube communicating with the region of said container adjacent said bottom end wall of said container, said bottom end wall including an aperture, a dish-shaped screen member within said container extending across said aperture in said bottom end wall and providing a recess for receiving said gas generating tablet, a filling tube mounted in said second aperture and extending outwardly from said container and a removable closure member for closing both said filling tube and said second aperture.

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