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(54) Aerosol power system.

(57) This invention is directed to a novel bladder-type aerosol power system which can be used in a standard aerosol spray container. More particularly, this invention pertains to an aerosol powering system which utilizes a rubber-type bladder to generate the expulsion power for the aerosol. This system circumvents the need to use volatile propellants which have been demonstrated to be harmful to the protective ozone layer of the earth. A power system for an aerosol spray generating nozzle comprising a) nozzle means adapted to generate an aerosol vapour spray; and b) a hollow resilient means connected to the nozzle means, the resilient means being adapted to contain the liquid used to generate the aerosol spray, and generate a pressure on the liquid when filled with the liquid.

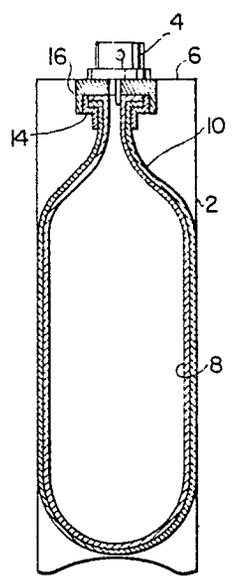

FIG.1

EP 0 361 091 A1

AEROSOL POWER SYSTEM

FIELD OF THE INVENTION

This invention is directed to a novel bladder-type aerosol power system which can be used in a standard aerosol spray container. More particularly, this invention pertains to an aerosol powering system which utilizes a rubber-type bladder to generate the expulsion power for the aerosol. This system circumvents the need to use volatile propellants which have been demonstrated to be harmful to the protective ozone layer of the earth.

BACKGROUND OF THE INVENTION

In recent years, there has been alarming evidence that the protective ozone layer of the earth is shrinking in thickness. The ozone layer is critical to the health of living organisms inhabiting the earth because the ozone layer filters out deadly ultra-violent rays, and other rays, emitted by the sun. Considerable evidence has been gathered to demonstrate that the damage that is occurring to the ozone layer is caused by a number of mankind generated free radicals and Freeon-type propellents which have been used in aerosol container spray systems for many years. These propellents are lighter than the atmosphere and rise to the elevation of the ozone layer. Chemical reactions then take place between the radicals and the ozone in the ozone layer thereby forming other compounds and complexes and diminishing the free ozone in the ozone layer There has even been recent evidence to indicate that deadly holes have appeared in certain portions of the ozone layer, for example, over Antarctica. If this trend continues, then the health of mankind will be jeopardized.

Recently, industrialized nations of the world have agreed to an international molatorium on the use of substances which have been demonstrated to have a destructive effect on the ozone layer of the earth. In 1987, the United Stated enacted some sunset-type legislation which will force companies who are manufacturing substances which are demonstrated to have a destructive effect on the ozone layer, to phase out production of such harmful substances over a specified number of years. One of the most ozone layer destructive family of substances being manufactured are fluorocarbons (Freons), which are widely used as coolants in refrigeration systems, and as propellents in aerosol spray containers holding products such as hair spray, cleaning compounds, and the like.

Because of the mounting evidence that fluorocarbon propellents, and similar type propellents, in aerosol contained spray system, have accumulative damaging effect on the ozone layer, it is critical to the long term health of living beings on the earth to develop alternative aerosol generating containers which do not rely upon ozone destroying propellents. As an alternative, many aerosol-type consumer products recently introduced on the market use a pump type aerosol spray generating system, rather than the volatile propellent contained in an aerosol container However, such manually operated aerosol pump systems are not entirely satisfactory because they are incapable of generating a fine consistent spray similar to the type that is generated by an aerosol container employing a fluorocarbon propellent.

A number of patents have been granted in recent years for aerosol generating pump systems, and the like. These are useful as alternatives to volatile propellent aerosol generating systems. U.S. Patent No. 3,993,069, for example, illustrates a pumping system which utilizes a natural rubber bladder which is inflated and thereby generates pumping action from the force created by the bladder in seeking to return to its original size and shape.

SUMMARY OF THE INVENTION

I have invented an aerosol spray generating system which utilizes a special rubber tube to generate the power required to create the aerosol spray, when the liquid contents in the aerosol can are forced into a spray nozzle.

A power system for an aerosol spray generating nozzle comprising: (a) nozzle means adapted to generate an aerosol vapour spray; and (b) a hollow resilient means connected to the nozzle means, the

resilient means being adapted to contain the liquid used to generate the aerosol spray, and generate a pressure on the liquid when filled with the liquid.

In the apparatus as defined, the resilient means may have a liner which separates the resilient means from the liquid. The resilient means may be formed of natural rubber. In the apparatus, the liner is separate from the resilient means. The liner may be formed of a material selected from the group of materials consisting of food grade silicone rubber, natural latex, and Neoprene.

In the apparatus as defined, the resilient means can be capable of expanding at least about 600%. The liner can be capable of expanding at least about 800%. The resilient means can be constructed in the form of a elongated tube which is closed at one end, is open at the other end, and has a collar around the open end.

In the apparatus as defined, the liner tube can be adapted to fit into the interior of the resilient tube means. The apparatus can include a connector means which connects the collars of the liner tube and the resilient tube means with the nozzle means.

In the apparatus as defined, the resilient tube means and the liner tube can be housed in a container, and the nozzle means can be located at the top of the container and attached to the container and the pair of tubes.

DRAWINGS

In the drawings, which represent specific embodiments of the invention, but which should not be regarded as restricting the spirit or scope of the invention in any way..

Figure 1 illustrates a side elevation partial section view of a liner-power tube combination in inflated condition inside an aerosol can;

Figure 2 illustrates a side elevation view of a liner tube;

Figure 3 illustrates a side elevation view of a power tube;

Figure 4 illustrates a side elevation view of a liner tube inserted into a power tube;

Figure 5 illustrates a side elevation partial section view of a liner-power tube-aerosol valve arrangement;

Figure 6 illustrates a graph of pressure against air volume behaviour for an inflated and re-inflated power tube.

DETAILED DESCRIPTION OF SPECIFIC EMBODIMENTS OF THE INVENTION

Referring to the drawings, Figure 1 illustrates a side elevation partial section view of the components that make up the bladder powered aerosol can 2. As seen in Figure 1, a conventional aerosol can 2 has at the top thereof a stamped metal can top 4. Inserted into the interior of the can 2 through can top 4, is a rubber power tube 10, which embraces an inner liner tube 8. A conventional aerosol spray nozzle-cap 6 is positioned above the liner tube 8 and the power tube 10. A connector 16 and a collar 14 combination is used to enable the various components to be assembled together.

Figure 1 illustrates a side partial-section view of the manner in which the liner tube 8 and the power tube 10 inflate within the interior of aerosol can 2, when the liner tube 8 is pumped full of an appropriate consumer product. As seen in Figure 1, which can be interpreted somewhat as a stylized representation in order to illustrate the function of the invention, the outside of liner tube 8 remains juxtapositioned against the inside of power tube 10. When the spray top 6 is manually activated, the energy stored in the expanded power tube 10 forces a small portion of the contents of liner tube 8 out to the nozzle of the spray top 6. The size of the power tube 10 and the liner tube 8 gradually decrease as the contents of the liner tubes are gradually expelled through repeated activations of nozzle 6.

Figure 2 illustrates a side elevation view of the liner tube 8. This liner tube 8 may be constructed of a number of suitable liquid impermeable resilient materials, depending upon the nature of the contents that are to be packaged in the interior of the liner tube 8. The liner tube 8 has a flange 9 around the top thereof. If food items are to be contained in the liner tube, then a food grade quality silicone can be used for construction the liner tube 8. For non-food contents, the liner tube can be manufactured of natural latex, or a synthetic rubber such as Neoprene, manufactured by Thiokol.

Figure 3 illustrates a side elevation view of the power tube 10, with top flange 11. The power tube 10 is

critical to the successful operation and performance of the aerosol generating power system. The power tube 10 is preferably constructed of a natural formulated rubber obtained from Malaysia. The natural rubber from which the power tube 10 is formed, should be capable of expanding at least 600%. Proportionately, the liner 8 should be constructed of a resilient material which can expand in the order of 800 to 1,000%. This is necessary in order to permit the liner tube 8 to remain abutted against the interior of the power tube 10 when inflation or deflation occurs. In other words, the liner tube 8 must be able to expand proportionately greater than the power tube 10, in order that the two items can remain closely juxtapositioned when the power tube 10 and the liner tube 8 are inflated with the contents that are to be held in the aerosol container.

Figure 4 illustrates side elevation view the manner in which the liner tube 8 is positioned in the interior of the power tube 10. The orientation illustrated in Figure 4 is in the "at-rest" position.

Figure 5 illustrates in side elevation partial-section view a valve connection arrangement that can be utilized for the liner tube 8-power tube 10 combination. The liner tube 8 and power tube 10 are held in place by a collar 14. This collar 14 can be molded of a suitable polymer material. The liner 8-power tube 10-collar 14 combination are fitted into a connector 16, which is secured to the underside of the can top 4 of the aerosol container. Connector 16 has a fill-hole formed therein, which can be utilized for top-filling the liner 8 with the product that is to be packaged in the aerosol container. A one way valve is secured to the bottom part of the fill-hole 18 in order to prevent the contents of the aerosol container from exiting through the fill-hole 18 once the aerosol container has been filled.

Figure 6 illustrates a graphical depiction of the relationship between pressure and air volume as the bladder-like means (power tube 10) is inflated with air. The solid line depicts the pressure behaviour of the tube 10 upon first inflation up to 100 millimeters of air. The dotted line depicts the pressure behaviour of the tube 10 upon reinflation up to 100 millimeters of air after the power tube 10 has been deflated following the first inflation. As can be seen in Figure 6, the pressure rises in a linear manner until a threshold "set" peak is reached. At that point, the pressure drops to a certain extent while the power tube is being inflated with additional air. Once the threshold peak has been passed, and a consistent pressure has been reached, a generally horizontal relationship between air volume and pressure is realized, up to the full inflation volume of 100 millimeters of air. Interestingly, upon re-inflation, the same relationship is noted except that the pressure-air volume gradient follows a lower path.

An important advantage of an aerosol powering system according to the invention is that it can be used in any position. It is not necessary to hold the aerosol can upright. Moreover, it operates efficiently at pressures lower than those typically used for propellent powered aerosol container system. Thus, with an aerosol power system according to the invention, it is not necessary to mark the containers as explosive or inflammable. Another important advantage of the aerosol power system of the invention is that no solvent dilution of the consumer product that is contained in the inner liner takes place because there is no propellant or solvent.

Example 1

Prototypes of the invention have been constructed utilizing a natural rubber obtained and formulated in Malaysia, and a liner tube 8 formed of natural latex. Normally, aerosol containers are pressurized to about 60 psi in order to obtain the desired aerosol spray effect. This high pressure can be somewhat dangerous, particularly if the aerosol can is heated, eg. thrown into a fire. In distinction, the prototype, it has been discovered need only pressurize the contents of the inner liner 8, and power tube 10 to about 22 psi. Moreover, it has been found that the pressure-size gradient for the power tube, as it is inflated and then deflated, once it passes a threshold peak, is nearly horizontal. There is a rise in pressure as the power tube 10 is initially inflated or returns to its original uninflated condition. The virtually horizontal pressure gradient, throughout most of the inflation-deflation cycle of the power tube 10 is advantageous because it provides consistent pressure and enables a consistent fine aerosol spray to be obtained from the time the liner 8 and power tube 10 are fully inflated with the consumer product and then subsequently deflated in stated, by actuating the aerosol cap 6, until the point is reached where the contents of the liner tube 8 are almost fully evacuated.

Example 2

For demonstration purposes, and to evaluate the viability of the power system of the invention, a liner tube-power tube combination was repeatedly inflated with 100 millimeters of air. (See Figure 8 for an example.) Various combinations of new power tube and new liner tubes, together with used power tubes and used liner tubes were used. The objective of these tests was to determine and record the different elongation and performance properties which the various brands of latex rubber that were used to produce the power tubes and the liner tubes. It was observed that after the third or fourth inflation, there was essentially no significant change in the pressure-volume relationship from further repeated inflations and deflations. To provide consistency in the test results, all inflations were maintained for thirty minutes with fifteen minute intervals between inflations. The results of these tests are summarized in Table 1 below. The heading "Laminated" means power tube and liner tube in combination. "Set" means the threshold state of the power tube before expanding under increased pressure.

TABLE 1

	PRESSURE REQUIRED TO OVERCOME "SET"	(DELIVERY) "STATIC" PRESSURE	CAPACITY
Tubing #1	Standard Outer (Dark Orange Inner Liner)		
First Inflation			
Outer Tube #1 Inner Tube #1 Laminated #1	37 psi 20 psi 57 psi	26 psi 10 psi 36 psi	100 ml
Tubing #1			
Second Inflation A			
Outer Tube 1A Inner Tube 1A Laminated 1A	35 psi 18 psi 53 psi	25 psi 9 psi 34 psi	100 ml
Tubing #2	Standard Outer (Light Orange Inner Liner)		
First Inflation			
Outer Tube #2 Inner Tube #2 Laminated #2	37 psi 23 psi 60 psi	26 psi 12 psi 38 psi	100 ml
Tubing #2			
Second Inflation A			
Outer Tube 2A Inner Tube 2A Laminated 2A	35 psi 21 psi 56 psi	24 psi 11 psi 35 psi	100 ml
Tubing #3	Standard Outer (Red Inner Liner)		
First Inflation			
Outer Tube #3 Inner Tube #3 Laminated #3	37 psi 26 psi 63 psi	26 psi 14 psi 40 psi	100 ml
Tubing #3			
Second Inflation A			
Outer Tube 3A Inner Tube 3A Laminated 3A	35 psi 24 psi 59 psi	25 psi 13 psi 38 psi	100 ml
Note:			
1 Observed that third and fourth inflation bring no significant change to results from inflation #2 for all samples 2 All inflations were maintained for 30 minutes with 15 minute interval between inflations 1 and 2			

As will be apparent to those skilled in the art in light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

Claims

1. A power system for an aerosol spray generating nozzle comprising
a) nozzle means adapted to generate an aerosol vapour spray; and
b) a hollow resilient means connected to the nozzle means, the resilient means being adapted to contain the liquid used to generate the aerosol spray, and generate a pressure on the liquid when filled with the liquid.

2. An apparatus as defined in claim 1 wherein the resilient means has a liner which separates the resilient means from the liquid.

3. An apparatus as defined in claim 1 wherein the resilient means is formed of natural rubber.

4. An apparatus as defined in claim 2 wherein the liner is separate from the resilient means.

5. An apparatus as defined in claim 4 wherein the liner is formed of a material selected from the group of materials consisting of food grade silicone rubber, natural latex, and Neoprene.

6. An apparatus as defined in claim 3 wherein the resilient means is capable of expanding at least about 600%.

7. An apparatus as defined in claim 5 wherein the liner is capable of expanding at least about 800%.

8. An apparatus as defined in claim 1 wherein the resilient means is constructed in the form of an elongated tube which is closed at one end, is open at the other end, and has a flange around the open end.

9. An apparatus as defined in claim 4 wherein the liner is constructed in the form of an elongated tube which is closed at one end, is open at the other end, and has a flange arcund the open end.

10. An apparatus as defined in claim 9 wherein the liner tube is adapted to fit into the interior of the resilient tube means.

11. An apparatus as defined in claim 10 wherein connector means connects the flanges of the liner tube and the resilient tube means with the nozzle means.

12. An apparatus as defined in claim 10 wherein the resilient tube means and the liner tube are housed in a container, and the nozzle means is located at the top of the container, and attached to the container and the pair of tubes.

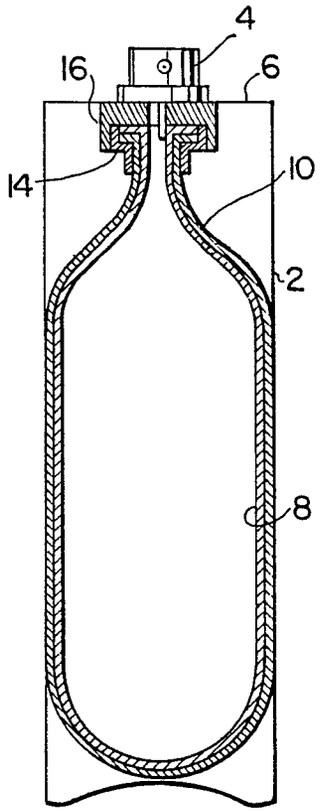

FIG.1

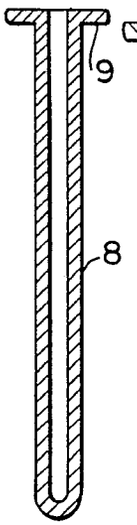

FIG.2

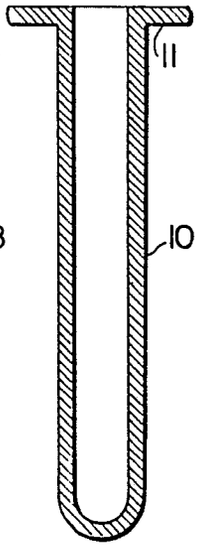

FIG.3

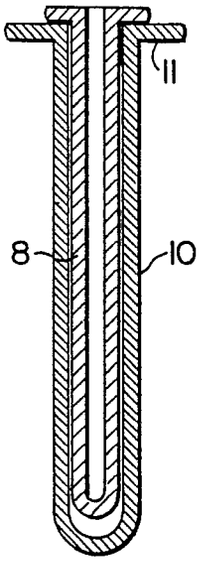

FIG.4

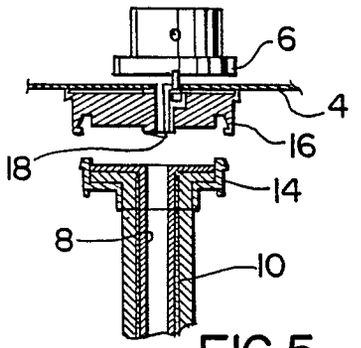

FIG.5

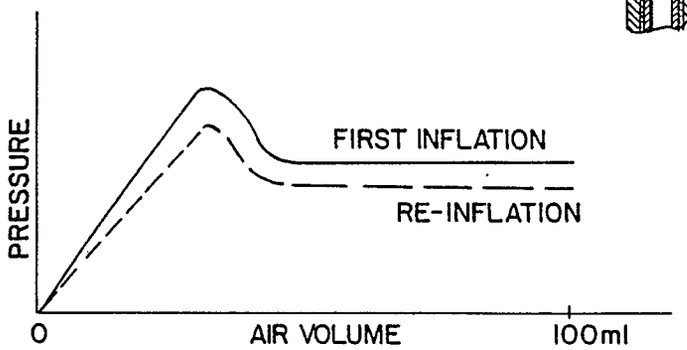

FIG.6

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 11 5703

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	US-A-4 121 737 (KAIN) * Whole document * ---	1-12	B 65 D 83/00
X	US-A-4 222 499 (KAIN) * Whole document * ---	1-12	
A	FR-A-2 371 238 (WERDING) * Page 33, lines 15-40; figure 29 * -----	6,7	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	06-12-1989	NEWELL P.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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