

MULTI-FUNCTION AEROSOL VALVE ASSEMBLY

FIELD OF INVENTION

- 5 The invention relates to an aerosol valve assembly for an aerosol container. More particularly, the invention relates to an aerosol valve assembly that can support filling of content, degassing of air from the aerosol container, coalescing of content and dispensing of content.

10 BACKGROUND OF THE INVENTION

- An aerosol container typically comprises a metal container body and an aerosol valve assembly, wherein the body stores content such as a payload and propellant, while the aerosol valve assembly provides a “gate” for the said content to enter or exit the aerosol
- 15 container. The payload may be, but shall not be limited to, one-component paint or multi-component paint. In the case of multi-component paint, all components are preferably coalesced, or mixed, prior to being dispensed. The propellant may be, but shall not be limited to, pressurized air or hydrocarbons. The propellant is stored in the aerosol can at high pressure, so that exert a pressure force for the payload to be
- 20 dispensed through a nozzle when the aerosol valve assembly is actuated by an actuator.

- The aerosol valve assembly is mounted onto the body through the support of a mounting cup. It further comprises a housing, a resilient means such as a spring, and a gasket. A stem is used to form a path in the aerosol valve assembly. When an actuator of the
- 25 aerosol container is pressed, the resilient means is compressed with the stem is displaced downwardly away from the gasket, and the content shall be dispensed due to pressure differences. When the actuator is un-pressed, the resilient means is decompressed with the stem is displaced upwardly back to the upward position, preventing the content from being dispensed.

The aerosol valve assembly may come as a male-type or female-type. In the male-type aerosol valve assembly, the stem is integrated therein, protruding outwardly from the housing and the mounting cup. Whereas in a female-type aerosol valve assembly, the stem is integrated with the actuator, and it to be inserted into the housing of the aerosol valve assembly.

The stem of male-type aerosol valves tends to bend or break during the aerosol container manufacturing process, especially during the stage of crimping and filling of content through the aerosol valve assembly. This will render the aerosol container unusable. Therefore, it is preferable that a female-type aerosol valve is used as it shall reduce the failure rate during the manufacturing process.

There are a few patented technologies over the prior art that relate to an aerosol valve assembly. Among them is US3074601, which discloses a kind of female type aerosol valve assembly that includes a removable dispensing tip on its actuator that may be interchanged with another similar tip to discharge the content of the container either in the form of a stream, a spray or as foam, depending upon the nature of the product in the container.

Another patented technology is US3613960, which discloses a kind of aerosol container having a female type valve assembly that allows for refilling of the content to take place. It is capable of being filled with payload and propellant up to a predetermined level, and further comprises a cylindrical shell having a first annular disc connected to one end of the shell and a second annular disc connected to the other end of the shell. A first valve cap having a two-way dual-purpose valve positioned therein for receiving and dispensing liquids is connected to the first annular disc and a second valve cap having a second dual-purpose valve located therein for dispensing excess gases is connected to the second annular disc. Nozzle heads may be added to the dual-purpose valves so that the valves can be used to spray liquids.

Even so, the aforementioned patented technologies that relate to the female type aerosol valve assemblies lack multi-function capabilities. The valve assembly in US3074601 can only dispense content, while US3613960 requires the use of two separate valve assemblies at two ends of the aerosol container so that the refilling of content,
5 dispensing of content and degassing of the container can be done. Moreover, both prior arts are not configured to be integrated into an aerosol container containing multi-component payload.

No solutions were disclosed by the aforementioned patents that can provide a kind of
10 universal aerosol valve assembly that can support filling of content, degassing of air from the aerosol container, coalescing of content and dispensing of content. Accordingly, it would be desirable to have an aerosol valve assembly of the female type that can support the aforementioned functionalities, especially for an aerosol container having multi-component payload.

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SUMMARY OF INVENTION

The main objective of the invention is to provide an aerosol valve assembly, preferably of the female type, that can support filling of content, degassing of air from the aerosol
20 container, coalescing of content and dispensing of content, especially for an aerosol container containing multi-component payload. To achieve this objective the aerosol valve assembly is configured so that it can receive a detachable component that shall allow the aerosol valve assembly to activate a content-filling mechanism for filling content, a gas-discharging mechanism for degassing the container, a rupturing
25 mechanism for coalescing the content, a content-dispensing mechanism for dispensing content, or any combination thereof.

Advantageously, the aerosol valve assembly of the present invention can avoid damage to the stem during further aerosol container manufacturing process lines while also

being compatible with aerosol containers having multi-component payload. The most significant improvement of the invention is that the process of filling, dispensing, degassing and component coalescing can be done using the same aerosol valve assembly.

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The invention intends to provide an aerosol container comprising a body including an outer chamber and an inner chamber positioned within the outer chamber, the inner chamber having a divider that separates it from the outer chamber, and an opening, a puncture member for rupturing the divider, and an aerosol valve assembly enclosing
10 the opening of the inner chamber and including any one or a combination of a content-filling mechanism, gas-discharging mechanism, rupturing mechanism and content-dispensing mechanism. Upon activation of the aerosol valve assembly, the content-filling mechanism enables the formation of a content-filling passage to allow external content to be added into the body, the gas-discharging mechanism enables the formation
15 of a gas-discharging passage to allow unwanted or excess gas to be released out of the body, the rupturing mechanism acts on the puncture member to rupture the divider so as to allow coalescing of content within the inner chamber and outer chamber to form a coalesced content, and the content-dispensing mechanism enables the formation of a content-dispensing passage to dispense the content out of the body.

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Preferably, the aerosol valve assembly of the aerosol container comprises a mounting cup mounted to the opening of the inner chamber and having an aperture, a valve housing positioned within the inner chamber and adjacent to the aperture of the mounting cup, a valve core accommodated within the valve housing, having a cap
25 portion, and a valve shaft connected to the cap portion, and an inlet formed between the cap portion and the valve shaft where the valve shaft is movable within the valve core to expose or close the inlet.

Preferably, the aerosol container further comprises a detachable component inserted

into the aperture of the mounting cup, being either a content-filling device having a content-filling activation stem, a gas-discharging device having a discharge activation stem, a content-filling and gas-discharging device having a content-filling and a discharge activation stem, a rupturing device having a rupture activation stem, a
5 content-dispensing device having a content-dispensing activation stem, or a combination thereof.

Preferably, the content-filling mechanism includes the valve shaft, and valve core with the cap portion being configured to receive the content-filling stem therethrough for
10 supplying the external content into the valve core while pushing the valve shaft to expose the inlet of the valve core for directing the external content through the valve core and into the inner chamber.

Preferably, the content-filling passage includes the content-filling device, the valve
15 core, a channel formed by a dip tube within the puncture member that is connected to the valve core, and the inner chamber.

Preferably, the gas-discharging mechanism includes the valve shaft, and valve core with the cap portion configured to receive the discharge activation stem for moving the valve
20 core away from the aperture of the mounting cup to create a gap therebetween to allow exit of the unwanted or excess gas from the body of the aerosol container through the gas-discharging device.

Preferably, the gas-discharging passage includes, either or both, a combination of the
25 inner chamber, valve housing and discharge conduit within the gas-discharging device, and a combination of the inner chamber, a passageway formed between the puncture member and valve housing, the valve core, and the discharge conduit of the gas-discharging device.

- Preferably, the content-filling mechanism and gas-discharging mechanism are configured to operate simultaneously upon activation of the aerosol valve assembly by the content-filling and discharge activation stem which allows the external content to be supplied from the stem through the cap portion while moving the valve shaft to
- 5 expose the inlet of the valve core for directing the external content into the valve core, and moving the valve core away from the aperture of the mounting cup to create a gap therebetween to allow exit of the unwanted or excess gas from the body of the aerosol container through the content-filling and gas-discharging device.
- 10 Preferably, the rupturing mechanism includes the valve core, and valve housing which sits within a recess formed at one end of the puncture member that is slidable along the valve housing such that upon activation of the valve assembly by the rupture activation stem, the valve core is pushed to displace the puncture member towards the direction of the divider to rupture it.
- 15 Preferably, the aerosol container further comprises a dip tube forming a channel inside the puncture member that or moves along with the puncture member to reach the outer chamber upon rupturing the divider.
- 20 Preferably, the valve core is configured to substantially or fully return to its original position within the valve housing upon removal of the rupture activation stem, that disconnects the valve core and the channel of the puncture member, forming a cavity within the puncture member by having the recess covered by the valve housing.
- 25 Preferably, the content-dispensing mechanism includes the valve housing, and valve core with the cap portion being configured to receive the content-dispensing activation stem that displaces the valve core away from the aperture of the mounting cup, leaving a gap therebetween to allow content to be dispensed out of the aerosol container through the content-dispensing device. Preferably as well, the puncture member is formed with

a recess at one end that is covered by the valve housing to create a cavity within the puncture member, and has a dip tube forming a channel inside the puncture member.

Preferably, the content-dispensing passage includes the body of the aerosol container,
5 the channel within the puncture member, the cavity of the puncture member, the valve housing, conduits between the cap portion of the valve core and the content-dispensing activation stem, and the content-dispensing device. Preferably as well, the content-dispensing activation stem is formed with a dimension to fix the position of the valve core during the formation of the gap.

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The present invention further intends to provide an aerosol valve assembly for a body of an aerosol container, that includes any one or a combination of a content-filling mechanism, gas-discharging mechanism, rupturing mechanism and content-dispensing mechanism. Upon activation of the aerosol valve assembly, the content-filling
15 mechanism enables formation of a content-filling passage to allow external content to be added into the body of the aerosol container, the gas-discharging mechanism enables formation of a gas-discharging passage to allow unwanted or excess gas to be released out of the body of the aerosol container, the rupturing mechanism allows coalescing of content within the body of the aerosol container to form a coalesced content, and the
20 content-dispensing mechanism enables formation of a content-dispensing passage to dispense the content out of the body of the aerosol container.

Preferably, the aerosol valve assembly comprises a mounting cup mounted to an opening of the body of the aerosol container and having an aperture, a valve housing
25 positioned within the body of the aerosol container and adjacent to the aperture of the mounting cup, a valve core accommodated within the valve housing, having a cap portion, and a valve shaft connected to the cap portion, and an inlet formed between the cap portion and the valve shaft where the valve shaft is movable within the valve core to expose or close the inlet.

One skilled in the art will readily appreciate that the invention is well adapted to carry out the objects and obtain the ends and advantages mentioned, as well as those inherent therein. The embodiments described herein are not intended as limitations on the scope of the invention.

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BRIEF DESCRIPTION OF THE DRAWINGS

To facilitate an understanding of the invention, there is illustrated in the accompanying drawing the preferred embodiments from an inspection of which when considered in connection with the following description, the invention, its construction and operation and many of its advantages would be readily understood and appreciated.

FIG. 1 is a diagram illustrating the cross-sectional view of the aerosol container and the aerosol valve assembly in an inert state being sealed by a seal lock device placed.

FIG. 2 is a zoomed-in diagram of **FIG. 1** focusing on the aerosol valve assembly on the aerosol container.

FIG. 3 is a diagram illustrating the cross-sectional view of the aerosol container and the aerosol valve assembly in an activated state that allows operation of the content-filling mechanism and gas-discharging mechanism.

FIG. 4 is a zoomed-in diagram of **FIG. 3** focusing on the aerosol valve assembly on the aerosol container for illustrating the content-filling path and the gas-discharge path.

FIG. 5 is a diagram illustrating the cross-sectional view of the aerosol container and the aerosol valve assembly in a non-activated state, with the

rupturing mechanism yet to be operated.

5 **FIG. 6** is a diagram illustrating the cross-sectional view of the aerosol container and the aerosol valve assembly in an activated state that allows operation of the rupturing mechanism.

FIG. 7 is a zoomed-in diagram of **FIG. 6** focusing on the aerosol valve assembly on the aerosol container for illustrating the positions of the components after the rupturing mechanism is activated.

10 **FIG. 8** is a diagram illustrating the cross-sectional view of the aerosol container and the aerosol valve assembly in an activated state that allows operation of the content-dispensing mechanism.

15 **FIG. 9** is a zoomed-in diagram of **FIG. 8** focusing on the aerosol valve assembly on the aerosol container for illustrating the content-dispensing path.

DETAILED DESCRIPTION OF THE INVENTION

20 The present invention relates to an aerosol valve assembly for an aerosol container. More particularly, the invention relates to an aerosol valve assembly that can support filling of content, degassing of air from the aerosol container, coalescing of content and dispensing of content, especially for an aerosol container containing multi-component payload. The invention may also be presented in a number of different embodiments
25 with common elements.

According to the concept of the invention, the aerosol container is preferably configured to accommodate multi-component payload, with a body with an inner chamber and an outer chamber. The aerosol container further has an aerosol valve assembly that

encloses the opening of the inner chamber and is configured to receive a detachable component that shall allow the aerosol valve assembly to activate a content-filling mechanism for filling content, a gas-discharging mechanism for degassing the aerosol container, a rupturing mechanism for coalescing the content, a content-dispensing
5 mechanism for dispensing content, or any combination thereof.

From hereon, in the context of the present invention, it shall be understood that the term “content” may refer to aqueous or gaseous fluids, which may include the payload and the propellant. The payload may be multi-component having one or more paints, or any
10 kind of pigmented liquids or fluids, mastic compositions, polyurethane enamels, or any kind of chemical compounds related to colouring applications. It shall be established that aerosol valve assembly shall be used in an aerosol container having two-component payload, or a payload with two components. The two components preferably being a resin component and a hardener component. Preferably, the resin component is stored
15 in an outer chamber of the aerosol container and the hardener component is stored in an inner chamber of the aerosol container. As for the propellant, it may be, but shall not be limited to pressurized air, hydrocarbons, organic compounds or the likes.

From hereon, it will be understood that, although the terms first, second, etc. may be
20 used herein to describe various elements, components, regions, layers or sections, these elements, components, regions, layers or sections should not be limited by these terms. These terms are only used to distinguish one element, component, region, layer or section from another region, layer or section. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region,
25 layer or section without departing from the teachings of the present invention.

From hereon as well, spatially relative terms, such as “upper”, “lower”, and the like, may be used herein for ease of description to describe one element or feature's relationship to another element or feature as illustrated in the figures. It will be

understood that the spatially relative terms are intended to encompass different orientations of the assembly in use or operation in addition to the orientation depicted in the figures. For example, if the assembly in the figures is turned over, elements described as “upper” other elements or features would then be oriented “below” the other elements or features. Thus, the exemplary term “upper” can encompass both an orientation of above and below. The device may be otherwise oriented and the spatially relative descriptors used herein interpreted accordingly.

The invention will now be described in greater detail, by way of example, with reference to the drawings. It should be noted that these figures illustrate longitudinal cross-sections of the aerosol container, which are symmetrical. As such, components of the aerosol container and processes that occur within that are labelled shall also be mirrored and applies to their unlabelled counterparts.

FIG. 1 illustrates a cross-sectional view of the aerosol container, comprising the body **100** and the aerosol valve assembly **200**. Whereas **FIG. 2** is an illustration that specifically focuses on the aerosol valve assembly **200** and its related components.

From **FIG. 1** as well, the body **100** is preferably cylindrical, having a hollow outer compartment **110**, and the inner walls of the outer compartment **110** make up an outer chamber **110a**. Preferably, the outer compartment **110** is of metallic material that is strong enough to withstand the pressure exerted by the propellant. The upper portion of outer compartment **110** is tapered and further comprises an opening that allows the accommodation of a hollow inner compartment **120**, with the aperture of the inner compartment **120** supported by the rims of the opening. Preferably, before the inner compartment **120** is accommodated within the outer compartment **110**, it is pre-filled with content, particularly a payload being a resin component, and the propellant. The inner compartment **120** is substantially smaller in diameter and volume compared to the outer compartment **110**, and the inner walls of the inner compartment **120** make up

the inner chamber **120a**. The bottom end portion of the inner compartment **120** is a divider **121** that is preferably made of thin or soft material that is easily punctured or perforated. This may be, but shall not be limited to rubber, polyethene terephthalate (PETE) or the likes.

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From **FIG. 1** as well, it can be seen that the aerosol valve assembly **200** further comprises a mounting cup **201** and a valve housing **210**. The mounting cup **201** seals the opening of the inner compartment **120** through a crimping process, thus creating a leak-proof space in the inner chamber **120a** and outer chamber **110a**. Directly below
10 the aerosol valve assembly **200** is a puncture member **300**. When coalescing, by means of mixing, of the content of the inner chamber **120a** and outer chamber **110a** is desired, the puncture member **300** shall rupture the divider **121** of the inner compartment **120** so that the content of the inner chamber **120a** shall flow into the outer chamber **110a** and coalesce. One or more agitator balls **111** may be included within the outer
15 compartment **110** to aid in this process.

From **FIG. 1**, it can be seen that aerosol valve assembly **200** is seated on a recess **310** formed at an upper portion of the puncture member **300**. Preferably, the aerosol valve assembly **200** is slidable along the walls of the recess **310**, with its conduit connected
20 to a channel **320** of the puncture member **300** that may be formed by a dip tube **321**. Alternatively, the dip tube **321** may not be present, and the channel **320** is integrated to be part of the puncture member **300**. The lower-end portion of the puncture member **300** further contains one or more projections **330** that would allow the puncture member **300** to rupture the divider **121** of the inner compartment **120** when coalescing of
25 content, which are payload components, is required.

From **FIG. 1** and **FIG. 2**, with the aerosol valve assembly **200** in full view, it can be seen that the mounting cup **201** has another aperture **201a**. Adjacent to said aperture **201a** and within the inner compartment **120** there is a valve housing **210** that is

conjoined to the aperture **201a** with a first gasket seal **202** in-between. The valve housing **210** has a hollow cylindrical body that houses the principle components of the valve of the aerosol container, and within it, there is a tubular valve core **220** that is sleeved within a first resilient member **211**, which may be a spring or any form of elastic device. Such a configuration shall allow a vertical displacement of the valve core **220** within the confines of the valve housing **210**. The valve housing **210** is formed with an annular base protruding inwardly at its lower-end portion, where the first resilient member **211** rests thereon with a third gasket seal **212** in-between. Furthermore, disposed around middle portion of the valve housing **210** and slightly above the recess **310** is a side hole **213**.

From **FIG. 2**, The valve core **220** itself has a hollow cylindrical body, but having different diameters at each of its upper-end and lower-end portions to assume a shape similar to a reducing socket. The valve core **220** further comprises cap portion **221** and a valve shaft **222** disposed within, with a second gasket seal **223** in-between the cap portion **221** and the valve shaft **222**. The valve shaft **222** is tubular and is sleeved within a second resilient member **224** within the valve core **220**. The second resilient member **224** is similar to the first resilient member **211**, being a spring as well. Such a configuration allows a vertical displacement of the valve shaft **222** within the confines of the valve core **220**. As the valve shaft **222** is displaced vertically downwards, an inlet is formed between the valve shaft **222** and the second gasket seal **223** that allows an inflow of external content, preferably a payload being a hardener component, into the body **100**. Furthermore, the cap portion **221** is configured to be able to influence the displacement of the entire valve core **220** or just the valve shaft **222** in the valve core **220**. This is because the cap portion **221** is formed with an annular base protruding inwardly from its bottom end portion. Finally, near the bottom end portion of the valve core **220** with a smaller diameter, there are areas on the external walls of the valve core **220** that are formed with indented portions **225**.

From **FIG. 1** and **FIG. 2**, it is shown that the aerosol container is in an inert state suitable for storage after being manufactured. To configure the aerosol container to be in such a state, it is required that a fastening device **500** is rested on the top of the aerosol container, in particular, on top of the mounting cup **201** of the aerosol valve assembly **200**. The fastening device **500** does not have any stem of sorts that would cause a positional change in the entire valve core **220** or just the valve shaft **222** in the valve core **220**. As the resilient members **211**, **224** of the aerosol valve assembly **200** actively pushes the components of the aerosol valve assembly **200** against the gasket seals **202**, **223**, there is no leakage of the content from the aerosol container. The fastening device **500** also protects the aperture **201a** of the aerosol valve assembly **200** from any foreign objects, especially rod-like objects, which may cause accidental displacement of the components of the aerosol valve assembly **200**.

With reference to **FIG. 3** and **FIG. 4**, the content-filling mechanism (I) and gas-discharging mechanism (II) involving the aerosol valve assembly **200** and a content-filling-and-gas-discharging device **410** shall now be described in detail. **FIG. 3** illustrates a cross-sectional view of the aerosol container and the aerosol valve assembly **200**, activated by the attached with content-filling-and-gas-discharging device **410**. **FIG. 4** illustrates a zoomed-in view of **FIG. 3** that shows the flow of external content, preferably a payload being a hardener component, entering the aerosol container and excess gas exiting the aerosol container when said device **410** activates the aerosol valve assembly **200**. While the content-filling mechanism (I) and gas-discharging mechanism (II) that are to be described to operate simultaneously, it is not limited to such an embodiment. In an alternative embodiment, the content-filling mechanism (I) and gas-discharging mechanism (II) may operate independently from each other through the use of a content-filling device or a gas-discharging device separately.

Referring to **FIG. 3**, the content-filling-and-gas-discharging device **410**, having a content-filling-and-discharge activation stem **411**, is shown. This device **410** allows for

the simultaneous operation of the content-filling mechanism (I) and gas-discharging mechanism (II). Preferably, the content-filling-and-gas-discharging device **410** is part of a filling tank **T**. The aerosol container may be in the aerosol container manufacturing line where a component (such as the hardener component) is to be filled into the inner
5 chamber **120a**. Preferably, before activation, the content-filling-and-discharge activation stem **411** is to be directly positioned to be above the aperture **201a** of the mounting cup **201** of the aerosol valve assembly **200** that leads to the valve housing **210** within the aerosol container.

- 10 Referring to **FIG. 3**, the aerosol valve assembly **200** is activated when the aperture **201a** of the mounting cup **201** is penetrated by the activation stem **411** of the content-filling-and-gas-discharging device **410**. This allows content-filling mechanism (I) and gas-discharging mechanism (II) to operate. Preferably, the activation stem **411** is tapered, or extends telescopically, for its body has varying diameters to allow it to vertically
15 displace both the valve core **220** and the valve shaft **222** in the valve core **220**.

Referring to **FIG. 4**, the thinner portion of the activation stem **411** vertically displaces the valve shaft **222** of the valve core **220**, forming a gap between the valve shaft **222** and the second gasket seal **223**. With this, the content-filling-and-gas-discharging
20 device **410** provides an inflow of external content, preferably a payload being a hardener component, into the aerosol container as per the content-filling mechanism (I).

Referring to **FIG. 4** as well, the thicker portion of the activation stem **411** vertically
25 displaces the valve core **220** itself until its bottom end portion slightly extrudes outwardly from the valve housing **210**, leaving behind a gap between the first gasket seal **202** and the upper-end portion of the cap portion **221** of the valve core **220**. The length of the activation stem **411** configured so that it does not vertically displace the valve core **220** until it displaces the puncture member **300** to cause the divider **121** to

rupture. Moreover, as the activation stem **411** vertically displaced the valve core **220**, its indented portions **225** slightly protrudes out from the valve housing. With this, the content-filling-and-gas-discharging device **410** provides degassing of the aerosol container as per the gas-discharging mechanism (II).

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FIG. 4 further illustrated the flow passages that are formed. In particular, there are two flow passages shown in **FIG. 4**: a content-filling passage (the path shown in the “→” arrows) and a gas-discharge passage (the path shown in the “➔” arrows). The components involved in the content-filling passage forms the content-filling mechanism (I), while the components involved in the gas-discharge passage form the gas-discharging mechanism (II).

Regarding the content-filling passage shown in **FIG. 4**, it is the passage where the external content from the tank **L** undertakes to fill the inner chamber **120a**. The path of the content-filling passage begins at the gap is formed between the valve shaft **222** and the second gasket seal **223**. Next, the external content flows through the internal walls of the valve core **220** (since the valve core **220** is hollow) and reaches the bottom end portion of the valve core **220**. Finally, the external content flows through the channel **320** of the puncture member **300** so that it fills the vicinity of the inner chamber **120a**. With this, the description of the content-filling mechanism (I) is complete.

Regarding the gas-discharge passage shown in **FIG. 4**, it is the passage where excess gas, which may be present in the inner chamber **120a**, exits the aerosol container. This creates a pseudo-vacuum environment within the inner chamber **120a** with little to no gas that may cause oxidation of the external content filled in the inner chamber **120a**. The path of the gas-discharge passage begins at gap formations between the mounting cup **201** and the puncture member **300** whereby the excess gas enters therein. Next, the excess gas travels through the walls of the recess **310** of the puncture member **300** and the external walls of the valve housing **210**. Following this, the excess gas enters the

valve housing **210** through the indented portions **225** of the valve core (since the indented portions **225** have protruded out as well). After this, the excess gas travels within the valve housing **210** of the aerosol container, through the internal walls of the valve housing **210** and the external walls of the valve core **220**. Also, the presence of the side hole **213** may serve to further enhance gas-discharging mechanism (II) by allowing the discharge of the excess gas through the provision of a direct path for the excess gas to enter the valve housing **210**. Then, the excess gas travels upwards until it reaches the gap between the first gasket seal **202** and the upper-end portion of the cap portion **221** of the valve core **220**. Once the excess gas reaches this area, it exits the aerosol container through a discharge conduit **412** incorporated with the activation stem **411**. Finally, this discharge conduit **412** leads the excess gas out into the environment where it shall be discharged. With this, the description of the gas-discharging mechanism (II) is complete.

With reference to **FIG. 5** to **FIG. 7**, the rupturing mechanism (III) involving the aerosol valve assembly **200** and a rupturing device **420** shall now be described. **FIG. 5** illustrates a cross-sectional view of the aerosol container and the aerosol valve assembly **200** in a non-activated state, but ready to be attached with the rupturing device **420**. **FIG. 6** illustrates a cross-sectional view of the aerosol container and the aerosol valve assembly **200** in an activated state, attached with the rupturing device **420**. **FIG. 7** illustrates a zoomed-in view of **FIG. 6** that shows positions of the components of the aerosol valve assembly **200** when in the said activated state.

Referring to **FIG. 5**, the rupturing device **420**, having a rupture activation stem **421**, is shown. This device **420** allows for the operation of rupturing mechanism (III). Preferably, before activation as shown in **FIG. 5**, the rupture activation stem **421** is directly positioned to be above the aperture **201a** of the mounting cup **201** of the aerosol valve assembly **200** that leads to the valve housing **210** within the aerosol container.

Referring to **FIG. 6**, the aerosol valve assembly **200** is activated when the aperture **201a**

of the mounting cup **201** is penetrated by the activation stem **421** of the rupturing device **420**. This allows rupturing mechanism (III) to operate. Preferably, the activation stem **421** is not tapered and having a constant diameter. The diameter of the activation stem **421** is large enough such that it at least slightly encompasses the annular base of the cap portion **221** of the valve core **220**. This shall allow the activation stem **421** to only vertically displace the valve core **220**.

Referring to **FIG. 7**, the rupture activation stem **421** shall force the entirety of the valve core **220** to displace downwards. The length of the activation stem **421** is long enough to enable the valve core **220** to protrude out from the valve housing **210** and provide a vertical displacement to the puncture member **300** (since the aerosol valve assembly **200** rests within the recess **310**). This causes the projections **330** to rupture the divider **121** of the inner compartment **120** so that content of the inner chamber **120a** coalesces, or mixes, with content of the outer chamber **110a**. In particular, the hardener component in the inner chamber **120a**, and the resin component and propellant in the outer chamber **110a**, coalesce or mix. This forms a coalesced content. When the puncture member **300** punctures the divider **121**, the dip tube **321** reaches the base of the outer compartment **110**. With this, the description of the puncture mechanism (III) is complete.

As the rupturing device **420** is taken off from the aerosol container (not shown), the valve core **210** retracts back into its valve housing due to the first resilient member **211** and re-assumes a position similar to **FIG. 2**. However, there will be a permanent positional change for the puncture member **300** within the aerosol container. Unlike **FIG. 2**, the valve housing **210** of the aerosol container will not be rested on the recess **310** of the puncture member **300** anymore. As the puncture member **300** has been displaced downwardly in a permanent manner, the recess **310** forms a cavity **310a**.

With reference to **FIG. 8** and **FIG. 9**, the content-dispensing mechanism (IV) involving the aerosol valve assembly **200** and a content-dispensing device **430** shall now be

described. **FIG. 8** illustrates a cross-sectional view of the aerosol container and the aerosol valve assembly **200** in an activated state, attached with content-dispensing device **430**. **FIG. 9** illustrates a zoomed-in view of **FIG. 8** that shows the flow of content exiting the aerosol container when the said device **430** is in the activated state.

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Referring to **FIG. 8**, the content-dispensing device **430**, having a content-dispensing activation stem **431**, is shown. This device **430** allows for the operation of the content-dispensing mechanism (IV). Preferably, the content-dispensing device **430** is similar to a conventional aerosol container spray head, including having a nozzle **432** and
10 conduits leading to it. Preferably, before activation, the activation stem **431** is to be directly positioned to be above the aperture **201a** of the mounting cup **201** of the aerosol valve assembly **200** that leads to the valve housing **210** within the aerosol container.

Referring to **FIG. 9**, the aerosol valve assembly **200** is activated when the aperture **201a**
15 of the mounting cup **201** is penetrated by the activation stem **431** of the content-dispensing device **430**. This allows content-dispensing mechanism (IV) to operate. Preferably, the activation stem **431** is not tapered and having a constant diameter. The diameter of the activation stem **431** is large enough such that it at least slightly encompasses the annular base of the cap portion **221** of the valve core **220**. This allows
20 the activation stem **431** to only vertically displace the valve core **220**.

Referring to **FIG. 9** as well, the content-dispensing activation stem **431** in particular vertically displaces the valve core **220** itself until its bottom end portion extrudes outwardly from the valve housing **210** with the indented portions **225** of the valve core
25 **220** is exposed as well. The activation stem **431** also leaves behind a gap between the first gasket seal **202** and the upper-end portion of the cap portion **221** of the valve core **220**. With this, the content-dispensing device **430** provides degassing of the aerosol container as per the content-dispensing mechanism (IV).

FIG. 9 further illustrates flow passages that are formed. In particular, there is one flow

passage shown in **FIG. 9**, which is a content-dispensing passage (the path shown in the “→” arrows). The components involved in the content-dispensing passage forms the content-dispensing mechanism (IV).

- 5 Regarding the content-dispensing passage shown in **FIG. 9**, it is the passage where the coalesced content within the aerosol container undertakes to be dispensed out into the environment through the nozzle **432**. In the activated state as per **FIG. 8**, a differential pressure is created between the environment and the pressurized interior of the aerosol container due to the presence of the propellant. As such, the path of the content-
- 10 dispensing passage begins at the bottom end portion of the dip tube **321** that is now located at the base of the inner compartment **120** where the coalesced content is drawn thereto. Next, the coalesced content travels upwards along the channel **320** of the dip tube **321** to reach the cavity **310a**. Following this, the coalesced content enters the valve housing **210** through the indented portions **225** of the valve core **220**. Then, the
- 15 coalesced content travels through the internal walls of the valve housing **210** and the external walls of the valve core **220**. While it does so, propellant may enter into the valve housing through the side hole **213** to be further mixed, or undergo secondary mixing, with the coalesced content.
- 20 Once the coalesced content reaches the gap formed between the first gasket seal **202** and the upper-end portion of the cap portion **221** of the valve core **220**, the coalesced content then squeezes through conduits formed between the external walls of the content-dispensing activation stem **431** and the walls of the cap portion **221** to reach an inlet of the activation stem **431**. Finally, the coalesced content goes through the conduit
- 25 of the content-dispensing device **430** to reach the nozzle **432** for it to be dispensed out into the environment. The further mixing, or secondary mixing between the coalesced content and the propellant that had entered through the side hole **213** may provide a uniform dispensation of the coalesced content for a better spray effect. With this, the description of the content-dispensing mechanism (IV) is complete.

The aerosol valve assembly **200** of the aerosol container of the present invention may allow the aerosol container to be refilled in the future after its content have been used up. However, by the time the rupturing mechanism (III) is actuated, the positional
5 configuration of components within the aerosol container undergoes an irreversible change, and as such the aerosol container may only be refilled with content such as a payload being single-component paint.

Ultimately, the present invention has provided an aerosol container, which is
10 compatible to have multi-component payload, being able to support filling of content, degassing of air from the aerosol container, coalescing of content and dispensing of content using the same aerosol valve assembly **200**. Said aerosol valve assembly provides means to activate a content-filling mechanism, a gas-discharging mechanism, a rupturing mechanism, a content-dispensing mechanism, or any combination thereof.

15

The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in
20 the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.

25

CLAIMS

1. An aerosol container comprising
a body (100) including an outer chamber (110a) and an inner chamber (120a)
5 positioned within the outer chamber (110a), the inner chamber (120a) having a divider
(121) that separates it from the outer chamber (110a), and an opening;
a puncture member (300) for rupturing the divider (121); and
an aerosol valve assembly (200) enclosing the opening of the inner chamber
(120a) and including any one or a combination of a content-filling mechanism, gas-
10 discharging mechanism, rupturing mechanism and content-dispensing mechanism;
wherein, upon activation of the aerosol valve assembly (200), the content-filling
mechanism enables formation of a content-filling passage to allow external content to
be added into the body (100), the gas-discharging mechanism enables formation of a
gas-discharging passage to allow unwanted or excess gas to be released out of the body
15 (100), the rupturing mechanism acts on the puncture member (11) to rupture the divider
(121) so as to allow coalescing of content within the inner chamber (120a) and outer
chamber (110a) to form a coalesced content, and the content-dispensing mechanism
enables formation of a content-dispensing passage to dispense the content out of the
body (100).
20
2. The aerosol container according to claim 1, wherein the aerosol valve assembly
(200) comprises
a mounting cup (201) mounted to the opening of the inner chamber (120a) and
having an aperture (201a);
25 a valve housing (210) positioned within the inner chamber (120a) and adjacent
to the aperture (201a) of the mounting cup (201);
a valve core (220) accommodated within the valve housing (210), having a cap
portion (221), and a valve shaft (222) connected to the cap portion, and an inlet formed
between the cap portion (221) and the valve shaft (222) where the valve shaft (222) is

movable within the valve core (220) to expose or close the inlet.

3. The aerosol container according to claim 2, further comprising
a detachable component inserted into the aperture (201a) of the mounting cup
5 (201), being either a content-filling device having a content-filling stem,
a gas-discharging device having a discharge activation stem,
a content-filling and gas-discharging device (410) having a content-filling and
a discharge activation stem (411),
a rupturing device (420) having a rupture activation stem (421),
10 a content-dispensing device (430) having a content-dispensing activation stem
(431),
or any combination thereof.
4. The aerosol container according to claim 3, wherein the content-filling
15 mechanism includes the valve shaft (222), and valve core (220) with the cap portion
(221) being configured to receive the content-filling stem therethrough for supplying
the external content into the valve core (220) while pushing the valve shaft (222) to
expose the inlet of the valve core (220) for directing the external content through the
valve core (220) and into the inner chamber (120a).
20
5. The aerosol container according to claim 3 or 4, wherein the content-filling
passage includes the content-filling device, valve core (220), a channel (320) formed
by a dip tube (321) within the puncture member (300) that is connected to the valve
core (220), , and inner chamber (120a).
25
6. The aerosol container according to claim 3, wherein the gas-discharging
mechanism includes the valve shaft (222), and valve core (220) with the cap portion
(221) configured to receive the discharge activation stem for moving the valve core
(220) away from the aperture (201a) of the mounting cup (201) to create a gap

therebetween to allow exit of the unwanted or excess gas from the body (100) of the aerosol container through the gas-discharging device.

7. The aerosol container according to claim 3 or 6, wherein the gas-discharging passage includes, either or both, a combination of the inner chamber (120a), valve housing (210) and discharge conduit within the gas-discharging device, and a combination of the inner chamber (120a), a passageway formed between the puncture member (300) and valve housing (210), valve core (220), and the discharge conduit of the gas-discharging device.
- 10
8. The aerosol container according to claim 3, wherein the content-filling mechanism and gas-discharging mechanism are configured to operate simultaneously upon activation of the aerosol valve assembly (200) by the content-filling and discharge activation stem (411) which allows the external content to be supplied from the stem (411) through the cap portion (221) while moving the valve shaft (222) to expose the inlet of the valve core (220) for directing the external content into the valve core (220), and moving the valve core (220) away from the aperture (201a) of the mounting cup (201) to create a gap therebetween to allow exit of the unwanted or excess gas from the container (100) of the aerosol container through the content-filling and gas-discharging device (410).
- 15
- 20
9. The aerosol container according to claim 3, wherein the rupturing mechanism includes the valve core (220), and valve housing (210) which sits within a recess (310) formed at one end of the puncture member (300) that is slidable along the valve housing (210) such that upon activation of the valve assembly by the rupturing activation stem (421), the valve core (220) is pushed to displace the puncture member (300) towards the direction of the divider (121) to rupture it.
- 25
10. The aerosol container according to claim 9, further comprising a dip tube (321)

forming a channel (320) inside the puncture member (300) that moves along with the puncture member (300) to reach the outer chamber (110a) upon rupturing the divider (121).

5 11. The aerosol container according to claim 10, wherein the valve core (220) is configured to substantially or fully return to its original position within the valve housing (210) upon removal of the rupture activation stem (421), that disconnects the valve core (220) and the channel (320) of the puncture member (300), forming a cavity (310a) within the puncture member (300) by having the recess (310) covered by the
10 valve housing (210).

12. The aerosol container according to claim 3, wherein the content-dispensing mechanism includes the valve housing (210), and valve core (220) with the cap portion (221) being configured to receive the content-dispensing activation stem (431) that
15 displaces the valve core (220) away from the aperture (210a) of the mounting cup (201), leaving a gap therebetween to allow content to be dispensed out of the aerosol container through the content-dispensing device (430).

13. The aerosol container according to claim 12, wherein the puncture member
20 (300) is formed with a recess (310) at one end that is covered by the valve housing (210) to create a cavity (310a) within the puncture member (300), and has a dip tube (321) forming a channel (320) inside the puncture member (300).

14. The aerosol container according to claim 13, wherein the content-dispensing
25 passage includes the body (100) of the aerosol container, the channel (320) within the puncture member (300), the cavity (310a) of the puncture member (300), the valve housing (210), conduits between the cap portion (221) of the valve core (221) and the content-dispensing activation stem (431), and the content-dispensing device (430).

15. The aerosol container according to claim 13 or 14, wherein the content-dispensing activation stem (431) is formed with a dimension to fix position of the valve core (220) during formation of the gap.

- 5 16. An aerosol valve assembly (200) for a body of an aerosol container as claimed in any one of claims 1 to 15, including
- any one or a combination of a content-filling mechanism, gas-discharging mechanism, rupturing mechanism and content-dispensing mechanism;
- wherein, upon activation of the aerosol valve assembly (200), the content-filling
- 10 mechanism enables formation of a content-filling passage to allow external content to be added into the body of the aerosol container, the gas-discharging mechanism enables formation of a gas-discharging passage to allow unwanted or excess gas to be released out of the body of the aerosol container, the rupturing mechanism allows coalescing of content within the body of the aerosol container to form a coalesced content, and the
- 15 content-dispensing mechanism enables formation of a content-dispensing passage to dispense the content out of the body of the aerosol container.

17. The aerosol valve assembly (200) according to claim 16, comprising
- a mounting cup (201) mounted to an opening of the body of the aerosol container and
- 20 having an aperture (201a);
- a valve housing (210) positioned within the body of the aerosol container and adjacent to the aperture (201a) of the mounting cup (201);
- a valve core (220) accommodated within the valve housing (210), having a cap portion (221), and a valve shaft (222) connected to the cap portion, and an inlet formed
- 25 between the cap portion (221) and the valve shaft (222) where the valve shaft (222) is movable within the valve core (220) to expose or close the inlet.