New Aerosol Valve Technology

............... For the Next Generation

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ADVANTAGES OF NEW GENERATION AEROSOLS

- Look, Feel, Spray and Perform like current Consumer Aerosols
- No Butane or other Liquefied Gas Propellants
- Safe Compressed Gas Propellants (Air, Nitrogen etc)
- Step-change in performance over current compressed gas technology
- Cover all aerosol formats including bag-on-valve and metered aerosols
- No Cost or Manufacturing Penalties
  - Utilise standard components or standard component sizes
  - Easy filling
- Strong IPR Protection;
  - Several interlocking Patents cover new range of steady and metered flow valves
- Extensive Know-How and design data backing by the University of Salford
- Development to Extend Technology to different products is straightforward
THE CHALLENGES THAT HAVE BEEN MET

- Current Liquefied Gas aerosol propellants (mainly butane-propane blends) release tremendous energy when they flash-vaporise on leaving the aerosol:
  - Fine atomization is easy, as is producing a near constant product flow rate
  - However all liquefied gases are either VOC’s or greenhouse gases; they are increasingly “undesirable”
- Safe compressed gas propellants (e.g. air or nitrogen) provide relatively little atomizing energy and the power available reduces as the can empties
  - This makes obtaining fine sprays very difficult
  - In addition flow rate may vary unacceptably during can lifetime
- The inventors have found that new Valve Designs are required to meet these challenges
THE NEW PRODUCTS

- **“Metering Valves”** for compressed gas aerosols
  - For automatic air-freshener and insecticide dispensers
  - Pharmaceutical products (i.e. Inhaler, Neubliser)
    (PCT/GB2010/051689)

- **“Bi-Valves”** for Gas-Assisted Atomization with matched actuators and inserts;
  - For air-fresheners, deodorants, insecticides, polish, hairspray etc
    (PCT/GB2010/052028)

- **“Low-Loss Valves”** optimum compressed gas sprays for difficult products, including for bag-on-valve formats
  - For gels, antiperspirants, Veet, oil etc
    (PCT/GB2010/002101)
Continuous Spray EcoValves
SSG Valve for Gas Assisted Atomization

- Gas is available for bleeding from the can to help atomization; but gas/liquid mass flow rate ratio is less than 1%
- Previous attempts have failed to give sufficient spray improvement, partly because the gas is mixed with the products before passing through a valve (thus causing the bubbly flow to become non-ideal and large pressure loss)
- The new patented systems use valves as shown where a novel housing introduces gas and liquid products into the valve stem after separately valving, thus producing excellent spray quality (with correct choice of gas and liquid inlet sizes, stem bore diameter, and exit insert type)
Super Single Gasket for Gas Assisted Atomization

Conventional

Super Single Gasket (50% Fill Ratio Water)

Super Single Gasket (50% Fill Ratio Water/Ethanol)
Bi-Valves for Gas Assisted Atomization

Conventional with Butane

UoS_SRG with Comp. Gas
Single Gasket for Gas Assisted Atomization

Spray @ Beginning

Spray @ End

Conventional

SRG - WATER
THE NEW PRODUCTS

Continuous Spray

High Viscous Products

Low Loss EcoValves
Low Loss Valves for Viscous Products

Stem

Top Housing

Bottom Housing

Stem
Low Loss Valves for Viscous Products

- Current aerosol valves have not changed significantly in design for 50 years:
  - They are simple but inefficient, giving losses in pressure and flow quality for flows through them.
  - This is undesirable for Compressed Gas Aerosols particularly if a bubbly flow is passing up the stem and/or for viscous products.

- The new patents cover a wide range of Low-Loss valve designs which are ideal for atomizing products such as antiperspirant, cooking oil, gels, Veet, etc.
  - They may simply incorporate gas assisted atomization if required.
  - They can easily be used with bag-on-valve technology (thus permitting air to be used as the propellant).
Low Loss Valves for Viscous Products

Conventional Veet

Low Loss Valve Using Veet
Low Loss Valves for Viscous Products

Conventional Olive Oil (Beginning of the Can)

Conventional Olive Oil (End of the Can)

Low Loss – Olive Oil (Beginning of the Can)

Low Loss – Olive Oil (End of the Can)
Metering EcoValves
This new patented ball-in-stem technology is the solution to producing metered spray volumes, when compressed gas propellants are used.

The volume per spray burst is simply controlled by limiting the movement of the ball or by changing chamber length.

The valves are simple and low cost and give less than 5% variation in volume per spray burst when used in, for example, an Airwick Freshmatic, device.

Pharmaceutical applications exist for these valves.
METERING VALVES FOR COMPRESSED GAS

Open

Closed

Annulus Ridge

Refilling Position
METERING VALVES FOR COMPRESSED GAS

Airwick

SRG - Water
CONCLUDING REMARKS

- New consumer aerosol valve designs have successfully addressed the bleed-off of inert gas from the can to assist atomisation and modify the flow rate.
  - Philosophy behind the new consumer aerosol valve designs is to control the liquid product and bleed-off gas by their own separate valving arrangements.
  - Using a VPT in a conventional aerosol valve passes a two-phase flow through valve stem orifices and makes pressure losses upstream of the insert which cause low flow rate and non-optimal atomisation.

- Several new compressed gas consumer aerosol valve designs have been tested.
  - It has been found that these valves spray well with water, ethanol and a range of “real” liquid products and using conventional commercial inserts.
  - Both very viscous products and metered products are successfully sprayed.
  - The new valves fit into standard valve cups using standard gaskets and crimping methods.