

BASIC PRINCIPLE OF PRECISION™ AEROSOL VALVES AEROSOL VALVES

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PRECISION VALVE THAILAND LTD.
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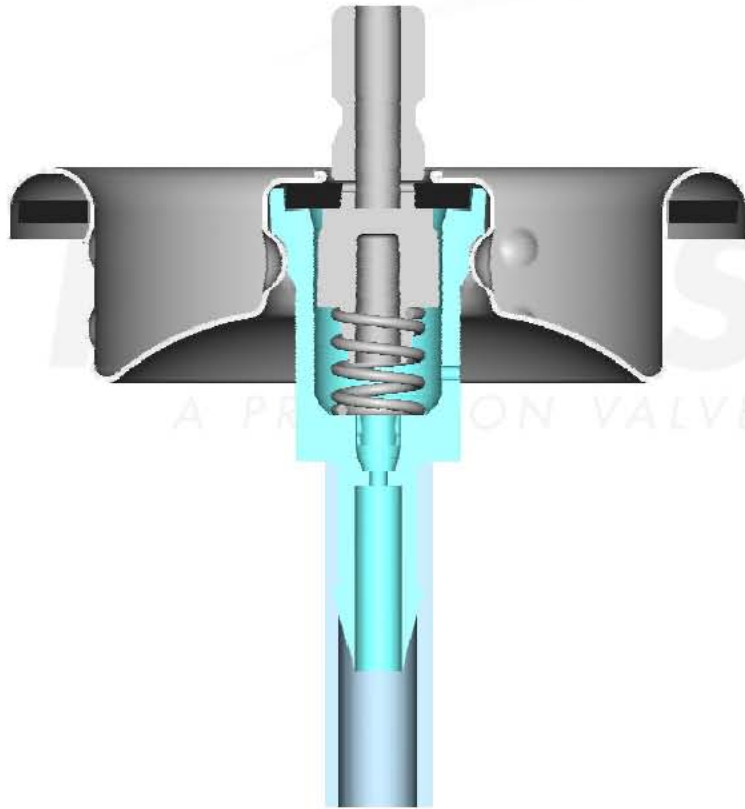


History

- **Early 1862, Metal spray cans were being tested. They were constructed from heavy steel and were too bulky to be commercially successful.**
- **In 1949, the first inexpensive and efficient models were produced as invention of a crimp on valve. It enabled liquids to be sprayed from a can under the pressure of an inert gas.**
- **Following WWII there was a rapid growth of aerosol products and many new developments occurred. Subsequently the valve industrial has remained very active.**

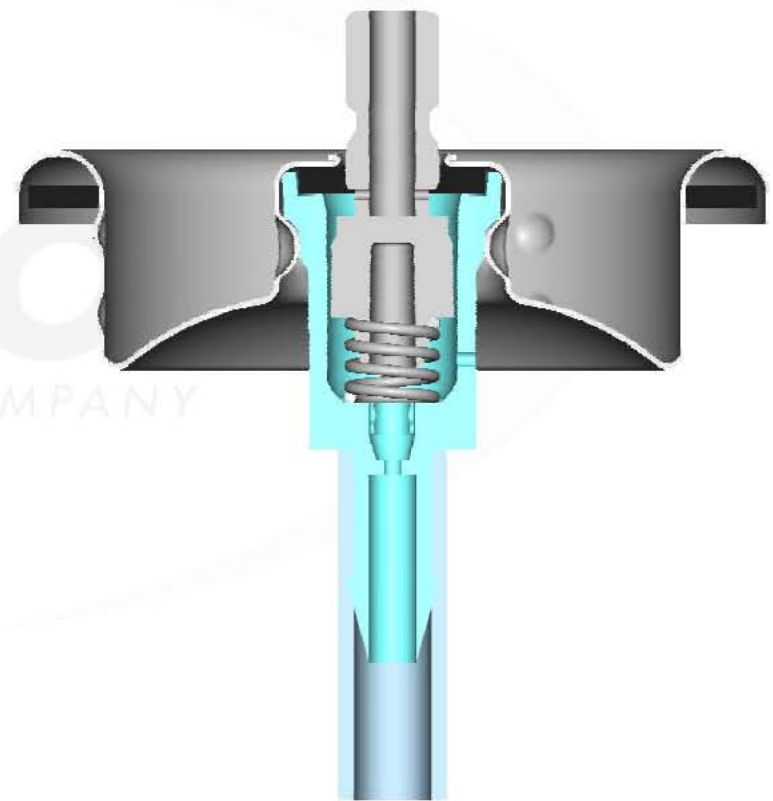


Valve Closed

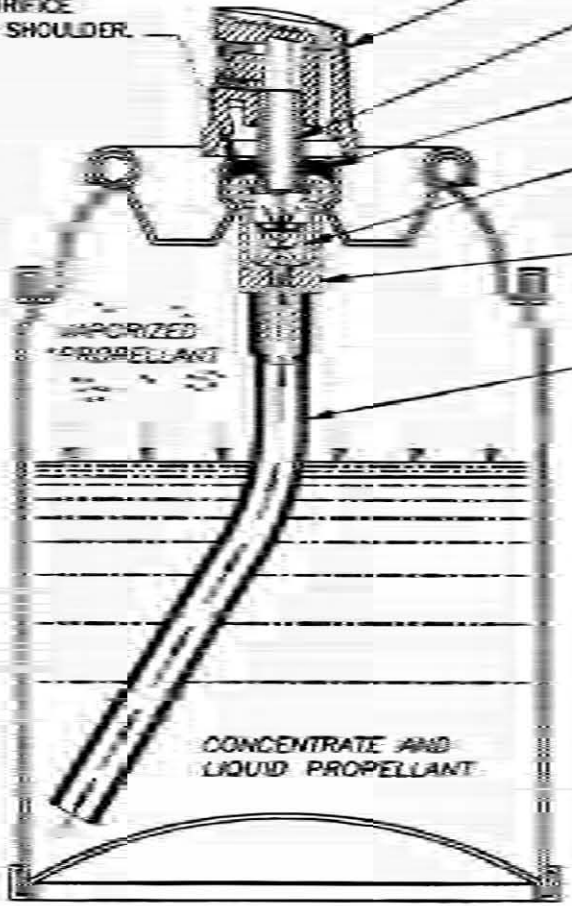


Valve Opened

DEPRESS

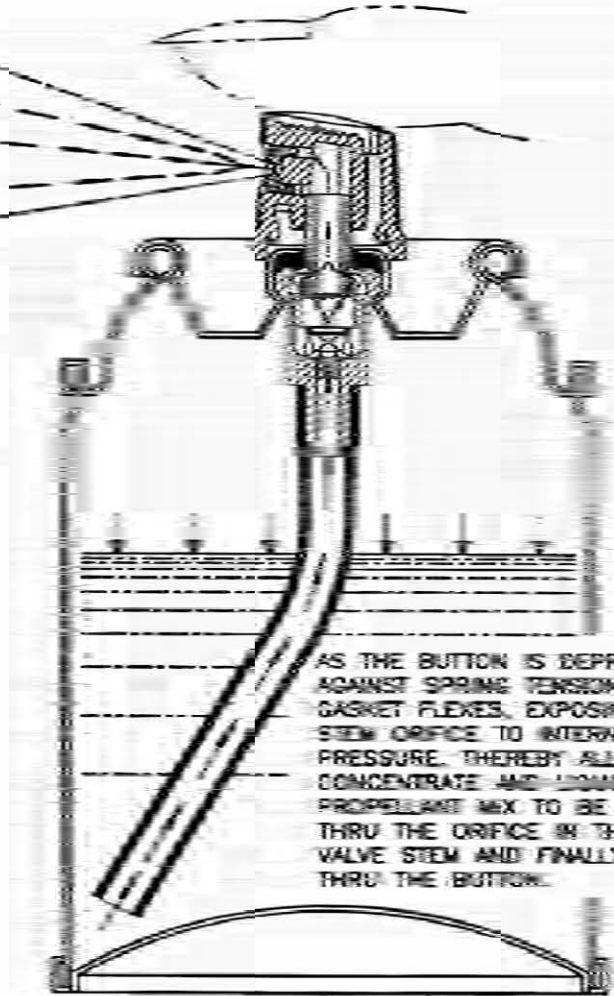


THE GASKET PREVENTS THE FLOW OF CONCENTRATE AND LIQUID PROPELLANT MIX (UNDER PRESSURE) BY SEALING THE VALVE STEM AT THE ORIFICE AND THE SHOULDER.



— VALVE CLOSED —

'BUTTON'
'VALVE STEM'
'GASKET'
'SPRING'
'HOUSING'
'DIP TUBE'



— VALVE OPENED —

AS THE BUTTON IS DEPRESSED AGAINST SPRING TENSION, GASKET FLEXES, EXPOSING STEM ORIFICE TO INTERNAL PRESSURE, THEREBY ALLOWING CONCENTRATE AND LIQUID PROPELLANT MIX TO BE FORCED THRU THE ORIFICE IN THE VALVE STEM AND FINALLY THRU THE BUTTON.

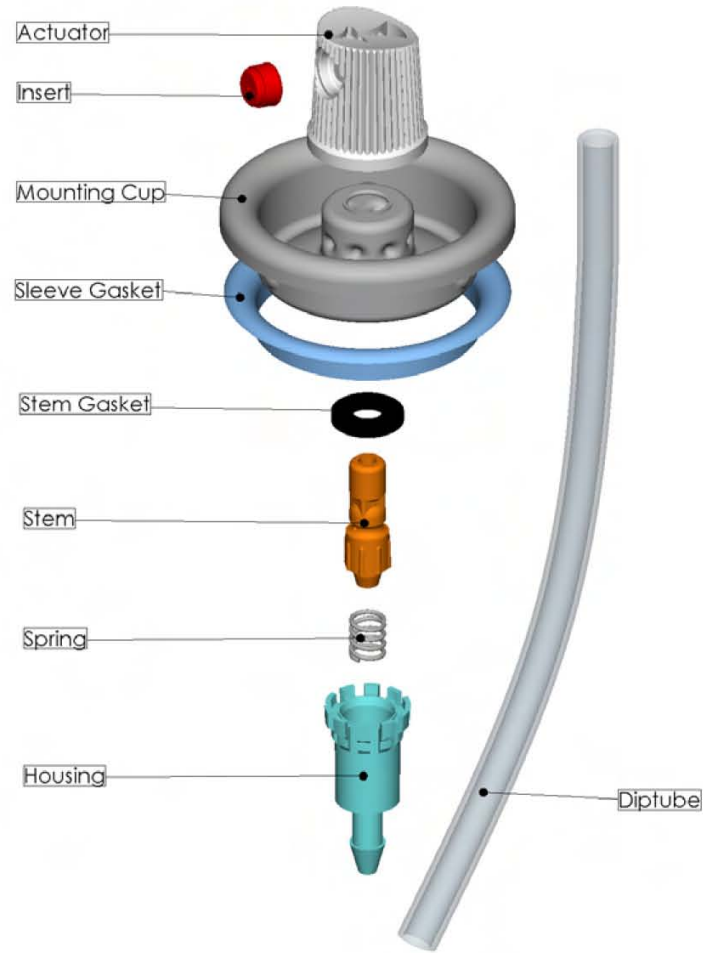
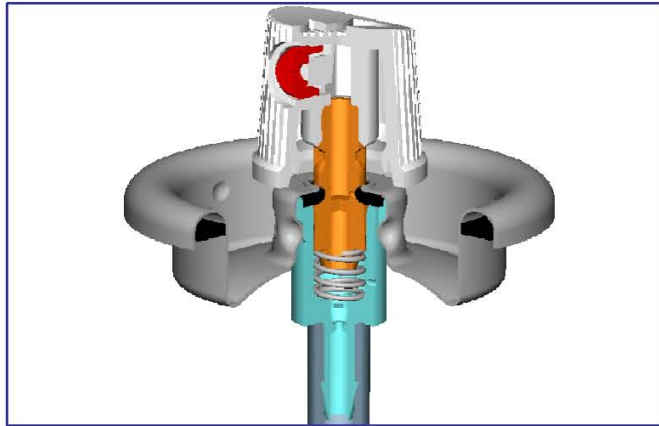


Basic function of valves

- It must provide hermetic sealing of the product when not in use
- It must be guarantee that the contents will be dispensed effectively.
- It should withstand corrosion by the aerosol formulation.
- It should meet the discharge requirements of the product.
- To meet the need for high-speed gassing in production.
- Pressure resistance of the valve.
- Strict dimensional tolerances and precise assembly are required.



Basic valve components





Mounting cup and cup sealing

Basic function:

- It serves to clamp the valve stem, stem gasket, spring and housing together.



- At the same time provides a hermetic seal to the opening can.



- Sometimes also serves as both platform and attachment area for most foam spout, some actuator skirts and several types of overcap and spray dome.





Mounting cup and cup sealing

Mounting cup types

- Tinplate cup
 - Plain tinplate
 - Lacquer tinplate
 - Laminate tinplate
- Aluminum cup



Sealing types

- Cut rubber gasket
- Polyethylene sleeve



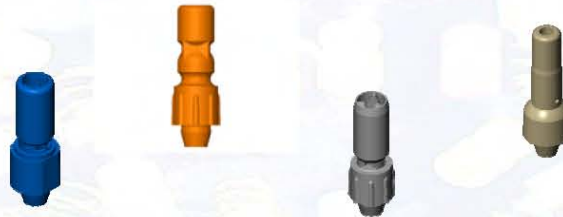


Stem assembly



Components

- Valve stem: These were initially made of brass, but were superseded by nylon in about 1955.



- Stem gasket: This is the most critical part of valve assembly. It has to maintain a reasonably gas-tight seal even when flexed during operation. It also comes into contact with the formula all the times.

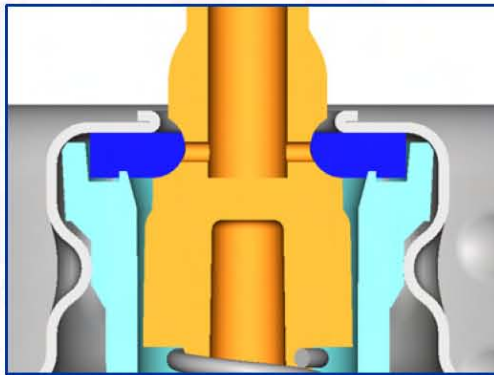


- Spring: The valve spring provides the internal force required to return the stem to the closed position after actuation of the valve.

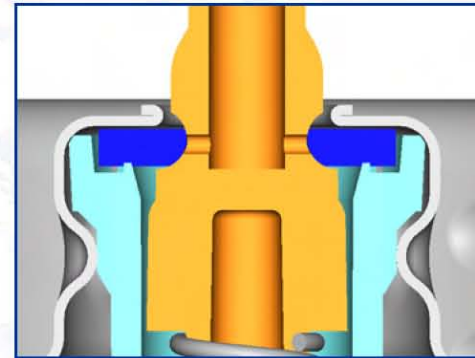


Stem gasket: Swell

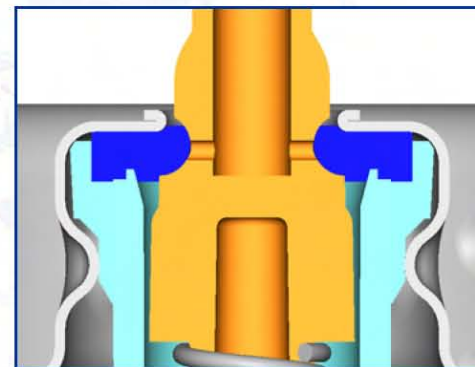
The gasket material will swell or shrink in contact with the product solvents.



Gasket size - acceptable



Gasket shrinkage - The valve may leak



Excessive swell - the valve may not open

Swell of 5 - 15% is ideal to ensure a tight seal.

Several **gasket materials** are available to suit **all solvent types**.

the hardness of the gasket ideally should not change more than 10% following stability testing.



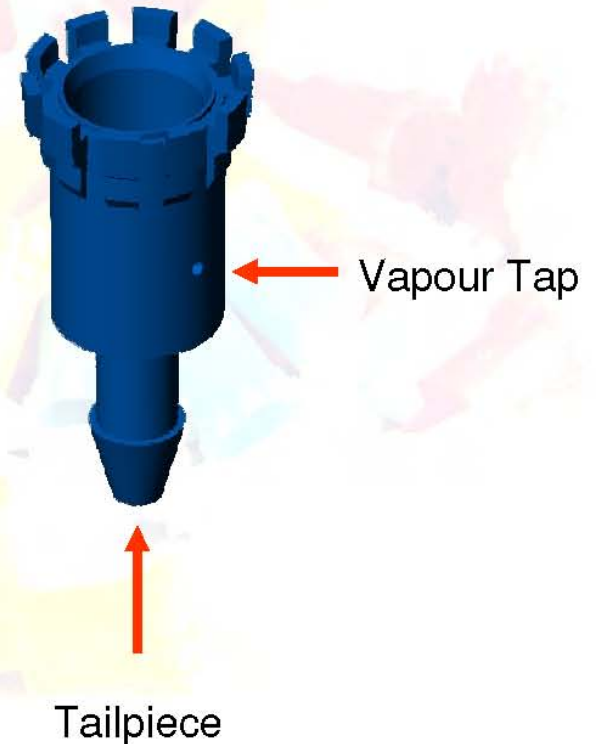
Housing (Valve body)

The role of the housing

The **housing** is the first of the metering orifices within the valve called the **tailpiece** orifice. The tailpiece orifice meters the product flow into the valve.

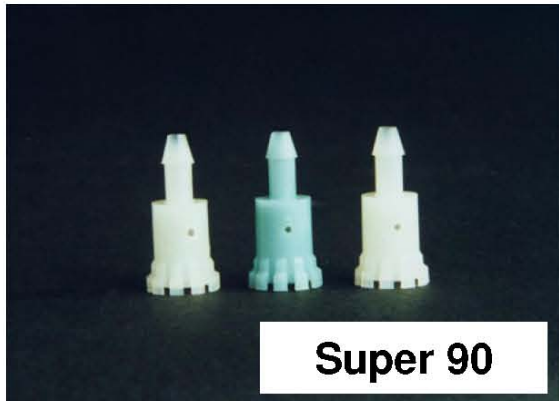
The housing may also have a second orifice known as a **vapour tap** to add small amounts of vapour to the liquid.

The housing provides the firm base for the spring and also connects with the diaphragm.





Standard Housing





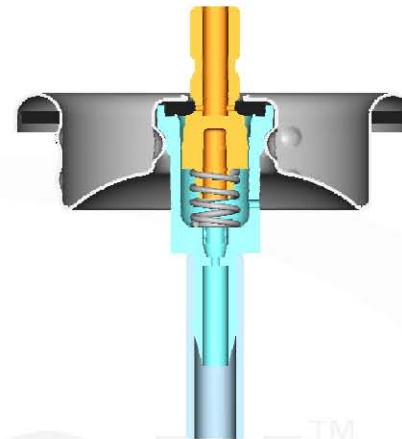
Diptube

The role of the diptube

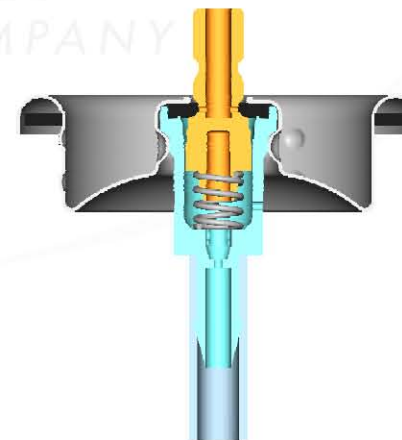
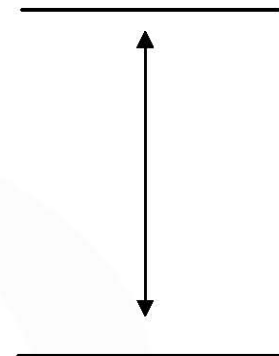
The diptube provides the transport means from the base of the can to the housing tailpiece.

In the case of capillary diptube the tubing also provides a metering function.

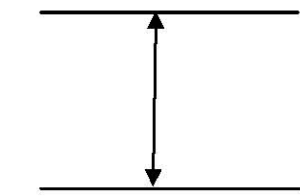
Materials used to extrude diptube are either Polyethylene or Polypropylene



FTMC Length



ACTUAL Length





INFORMATION REQUIRED BY PRECISION

to assist in valve sampling



- Can material and size
- Main solvent mix
- Product type - eg powder, foam, wet, dry
- Spray Rate / pattern / type
- Propellant type
- Formulation ratios





PRODUCT DEVELOPMENT Component Selection

STEM - Changes affect the spray rate



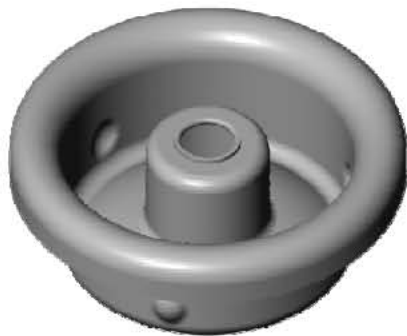
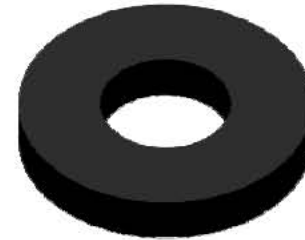
HOUSING - Changes affect the spray rate and spray particle size





PRODUCT DEVELOPMENT Component Selection

STEM GASKET - Determines long term seal and ability of valve to open and close correctly - CORRECT SELECTION HERE IS CRITICAL



MOUNTING CUP - Material and coating determine compatibility with formulation





Selection should at least take into account the following:

- i. Corrosion
- ii. Component shrinkage or swell (and subsequent gasket leakage)
- iii. Odour effects on the product
- iv. Color changes in the product
- v. Extraction of the material from components.

IMPORTANT:

In reality this aspect of valve selection is done by compatibility testing. However, even with this data to hand experience is necessary to interpret the effects and test conditions accurately.





Thank you for your attention.

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