

The invention relates to a spray head for a spray container for the delivery of foam, the spray container comprising a manually actuatable delivery valve in an outlet passage of the spray head, the spray head having downstream of the delivery valve a closure element which automatically closes the outlet passage with a delay in respect of the outlet valve, by bearing on the rim of the outlet orifice of the outlet passage, whereby the opening of the closure element is delayed in respect of the opening of the delivery valve.

In the case of a prior art spray head (US-A-44 37 592), the closure element is opened before the delivery valve and is closed hermetically after it. With regard to the delivery of foam from an aerosol or spray container (spray can), however, it is important that the aerosol product initially contained in the spray container as a liquid should not emerge from the spray head unchecked when the delivery valve is opened but should at first foam up completely. However, if the closure element opens before the delivery valve, the aerosol fluid is able at least partially to emerge before it has foamed up completely. Furthermore, it is of interest that the foam should not emerge unchecked because it has been found that foam which emerges under control has a greater foam stability. On the other hand, if the closure element closes hermetically, the residual product left between the delivery valve and the outlet orifice undergoes secondary foaming in the closed outlet passage and possibly the closure element may open again under the pressure of the foam so that foam continues to flow out.

In the case of the prior art spray head described at the outset and known from US-A-29 54 904, and which corresponds to the preamble to Claim 1, but which is not intended for foam, the end portion of the outlet passage consists of a flexible synthetic plastics material and the closure element consists of a flap which likewise consists of an elastic synthetic plastics material and is either

formed in one piece on the outlet passage or is form-lockingly connected thereto. In the case of this construction, the through-flow in the open position of the closure element is largely dependent upon the pressure inside the spray container. With increasing emptying of the spray container, this internal pressure diminishes. Then the elasticity or spring force in the closure element varies as a function of the temperature. At very low temperatures, the elastic synthetic plastics material may virtually lose its elasticity while the restoring spring force diminishes at high temperatures. Foam forming is adversely affected both by the pressure dependency and also the temperature dependency of the way the closure element functions. Furthermore, there is the danger of fluid emerging at high temperatures.

The invention is based on the problem of indicating a spray head of the type mentioned at the outset in which perfect foaming is assured and emergence of foam or fluid after closure of the closure element is avoided.

According to the invention, this problem is resolved in that in its closed position the closure element allows gases but no fluids to emerge and in that when the spray container is upright, the closure element is only held in the closed position by gravity and in that a radial projection on the closure element engages behind an undercut on the outlet passage and in that in the closed position of the closure element the radial projection is at an axial distance from the undercut in the opening direction and in that at least one through-passage traverses the radial projection or the undercut and in that the closure element consists of substantially rigid material.

In the case of this solution, the non-hermetic closure and the possibility of continued emergence of gas avoid secondary foaming and the emergence of foam. The closure element is adapted for only limited displacement in the outlet passage, between the closed position and the open position, the aforementioned interval determining the opening travel of the closure element. Likewise, the material properties of the closure element are substantially independent of temperature and pressure, by virtue of its rigid construction. Consequently, also the opening stroke and consequently the width of opening are virtually unaffected by the temperature and the pressure in the spray container.

Preferably, it is envisaged that the closure element be substantially mushroom-shaped, its stalk being inserted axially into the outlet passage, the radial projection being formed on the stalk; in the closed position, the rim of the mushroom-shaped head of the closure element bears on the rim of the outlet orifice of the outlet passage, the through-passage axially traversing the radial projection or undercut. In this way, the closure element is adapted for limited displacement in the outlet passage between the closed position and the open position, the aforesaid gap determining the opening travel of the closure element.

Thus, the closure element can form a substantially flat cover which is connected to the outer peripheral edge of the outlet orifice of the outlet passage by a film joint of which the spring force acting towards the open position of the closure element is less than the component of gravity of the closure element which acts towards the closed position of the closure element. In the case of this developed embodiment, the film joint has the advantage that the actuating attachment and the closure element remain connected to each other even after they

have been produced in a single moulding tool - in contrast to separate production of the two parts whether in separate moulding tools or in a single moulding tool - and in this way a lasting correlation with matching production tolerance of actuating attachment and closure element can be guaranteed so that as a rule there is no need for the large quantities of actuating attachments and closure elements formed in a plurality of moulding tools to be sorted according to matching production tolerances.

The invention and its further developments will be described in greater detail hereinafter with reference to preferred embodiments shown in the accompanying drawings in which:

Fig. 1 shows an axial section through a spray head according to the invention, in the closed position,

Fig. 2 shows the spray head according to Fig. 1, in the open position,

Fig. 3 shows a further embodiment of spray head according to the invention in axial section and with the closure element opened,

Fig. 4 is a plan view of the spray head shown in Fig. 3,

Fig. 5 is a side view of the spray head shown in Fig. 4,

Fig. 6 is another side view of the closure element according to Fig. 4 with the closure element closed, the drawing showing the closure element partly in cross-section and

Fig. 7 shows on an enlarged scale the detail X in Fig. 6.

The spray head according to Figs. 1 and 2 consists of an actuating attachment 1 for a (not shown) delivery valve of a spray container for the delivery of foam with a cross-sectionally substantially mushroom head-shaped closure attachment 2 into which a closure element 3 in the form of a mushroom head is inserted with a snap-action fitment, and with a protective cover 4.

The actuating attachment 1 has a vertical outlet tube 5 which forms a first portion of an outlet passage 6 and into which is inserted a tubular socket 7 of the closure attachment 2, the tubular socket 7 forming a second portion of the outlet passage 6. In this respect, the outlet tube 5 and the tubular portion 7 are held together in a tight frictional closure. The axially lower portion of the outlet tube 5 forms a fitting 8 to accommodate the outlet end of a delivery tube of the delivery valve. The outlet passage 6 is partially blocked by a baffle 9 extending crosswise therein, against which the aqueous aerosol fluid released from the spray container is able initially to foam.

The upper wall 10 of the actuating attachment 1 is only on one side (on the left in Fig. 1) of the outlet tube 5 connected in one piece to the upper edge of a radially outer peripheral wall 11 of the actuating attachment 1 which can be snap-fitted onto the upper rim of the spray container. The wall 10 consists of flexible material. Therefore, by depressing an actuating stage 12 which is diametrically opposite the connection between the walls 10 and 11, pressure can be exerted on the delivery tube of the delivery valve which engages into the fitting 8. By depressing the delivery tube which is at the same time a closure part of the delivery valve, the delivery valve is actually opened.

The closure element 3 is substantially mushroom-shaped, its stalk 13 being introduced axially into the outlet passage 6. The stalk 13 has a radial projection 14 in the form of an encircling bead which engages below a back-taper or undercut 15 which is likewise formed by a radially inwardly projecting bead in the outlet passage 6. In the closed position of the closure element 3 as shown in Fig. 1 the closure element has the rim 16 of its mushroom head 17 bearing on the rim 18 of the outlet orifice of the outlet passage 6. In the closed position, the radial projection 14 is at an axial distance d from the undercut 15 by which the travel of the closure element 3, which consists of a rigid material, is determined and restricted. Axial through-passages 19 pass through the radial projection 14 as far as the upper side of the projection which forms the undercut 15. The mushroom head 17 of the closure element 3 is sunk substantially flush in an axial depression 20 in the mushroom head-shaped widening of the closure attachment 2.

When the actuating stage 12 is depressed and the delivery valve is opened, the contents of the container flow under the pressure of a propellant through the outlet valve and its delivery tube and towards the baffle 9 by which it is diverted into the outlet tube 5 and the tubular portion 7, foaming as this happens. Here, it strikes the closure element 3 which assumes the closed position in Fig. 1, the closure element being lifted into the open position shown in Fig. 2 after a delay established against its force of gravity (or its weight) under the pressure of the foam, and acting like a foam outlet brake. The stability of the foam is enhanced by this "checked" delivery.

As soon as the pressure of the actuating key 12 is removed, the delivery valve closes while the closure

element 3 continues to stay in the open position under the pressure of the foam.

In the upright attitude of the spray container and consequently while the outlet passage 3 is vertical, the closure element drops back into the closed position as the foam pressure abates. Alternatively, the closure element 3 can also be pushed back into the closed position, the foam which has emerged being scraped off. In the closed position, gas continues to emerge through the gap between the closure element 3 and the closure attachment 2, a gap which is not hermetically sealed. The foam or liquid forming in the outlet passage 6 is retained and at the same time any residual product remaining in the outlet passage is prevented from altering its state upon ingress of air.

In the case of the spray head shown in Figs. 3 to 7, the actuating attachment 1e in principle corresponds to the actuating attachment shown in Figs. 1 and 2. The essential difference is that the actuating attachment 1e is constructed in one piece, in other words as no separately constructed closure attachment and the closure element 3f is connected to the outer peripheral edge of the outlet orifice of the outlet passage 6 in one piece by a film joint 31 and forms a substantially flat cover in the form of a flat hood, that is to say, it has no stalk like that of the mushroom-shaped closure element 3. In the bottom of the depression 20 which is formed by the radially outwardly widening outlet orifice of the outlet passage 6 are four axially projecting webs 32 each with a radially outwardly protruding projection forming an undercut 15b (Fig. 7).

After the actuating attachment 1e has been fitted onto the spray container and the closure element 3f has been folded over into the closed position shown in Figs. 5

to 7, the projection 14 which partially encircles the inner periphery of the closure element 3f engaging behind the undercut 15b on the webs 32, see particularly Fig. 7, and after the film joint 31 has engaged the recess 33 in the peripheral wall defining the depression 20, the upper part of the actuating attachment 1e can be tilted sideways by the application of pressure against the actuating button 12b, the wall 10 which is separated from the wall 11 by a slot 34 which is C-shaped in the plan view shown in Fig. 4 is pivoted downwardly about the web which connects the walls 10 and 11 between the ends of the slot 34 and thus the delivery valve is opened. The film joint 31 has so little elasticity or restoring spring force that under its own weight and prior to the valve being opened, the closure element 3f is held securely in the closed position in which it bears on the edge 38 even if the spray container is held somewhat slantwise or if the tube defining the outlet passage 6 is inclined in respect of the horizontal wall 10. Therefore, as in the case of the preceding examples of embodiment, it is only after some delay that, under the pressure of the foam forming in the outlet passage 6 during the period of the delay that the closure element 3f moves into the open position in which the projection 14 bears on the undercut 15b and the foam can emerge between radial teeth 35 (or webs) on the inner peripheral edge of the outlet passage, the radial narrow gap between rim 18 and closure element 3f and an annular gap between the peripheral wall of the depression 20 and the periphery of the closure element 3f. The width of the radial gap corresponds to the distance d.

In the case of this example of embodiment, the film joint 31 offers the advantage that the actuating attachment 1e and the closure element 3f, even after they have been produced in a single moulding tool, remain joined to each other in contrast to separate production of the two parts, whether in separate moulding tools or a

single moulding tool - and in this way a lasting relationship with matching production tolerances of actuating attachment 1e and closure element 3f is assured so that there is no need for sorting the large quantities of actuating attachments 1e and closure elements 3f moulded in a plurality of moulding tools or in a multiple moulding tool and which generally have different manufacturing tolerances, in accordance with matching production tolerances.

Instead of closure elements which, as illustrated, are circular in plan view, it is also possible to provide polygonal, e.g. rectangular, closure elements and, although the rest of the design remains the same, actuating attachments of matching form, as illustrated.



Patent Claims

1. A spray head for a spray container for the delivery of foam, the spray container comprising a manually actuatable delivery valve in an outlet passage (6) of the spray head, the spray head having downstream of the delivery valve a closure element (3; 3f) which automatically closes the outlet passage (6) with a delay in respect of the outlet valve, by bearing on the rim of the outlet orifice of the outlet passage (6), whereby the opening of the closure element (3; 3f) is delayed in respect of the opening of the delivery valve, characterised in that in its closed position the closure element allows gases but no fluids to emerge and in that when the spray container is upright, the closure element (3; 3f) is only held in the closed position by gravity and in that a radial projection (14) on the closure element (3; 3f) engages behind an undercut (15; 15b) on the outlet passage (6) and in that in the closed position of the closure element (3; 3f) the radial projection (14) is at an axial distance (d) from the undercut (15; 15b) in the opening direction and in that at least one through-passage (19) traverses the radial projection (14) or the undercut (15) and in that the closure element (3; 3f) consists of substantially rigid material.
2. A spray head according to Claim 1, characterised in that the closure element (3) is substantially mushroom-shaped, its stalk (13) being inserted axially into the outlet passage (6) and in that the radial projection (14) is formed on the stalk (13) and in that in the closed position the rim (16) of the mushroom-shaped head (17) of the closure element (3) bears on the rim (18) of the outlet orifice of the outlet passage (6) and in that the through-passage (19) axially traverses the radial projection (14) or undercut.



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3. A spray head according to Claim 1, characterised in that the closure element (3f) forms a substantially flat cover which is connected to the outer peripheral edge of the outlet orifice of the outlet passage (6) by a film joint (31) of which the spring force acting towards the open position of the closure element is less than the component of gravity of the closure element (3f) which acts towards the closed position of the closure element (3f).
4. A spray head according to one of Claims 1 to 3, characterised in that the outlet passage (6) is subdivided into a first portion (5) and a second portion (7) which comprises the closure element (3) and which can be fitted together with the first portion (5).

Two sheets of drawings