

EP 0550409

The invention relates to a spray head for a spray container for the delivery of foam, wherein the spray container has a manually actuable delivery valve in a delivery channel adapted to be fitted to an outlet passage of the spray head, and downstream of the delivery valve the spray head has a closure element which automatically closes the outlet passage with a delay in respect of the outlet valve, and with a circumferential wall which is adapted to be mounted on the spray container with a snap action fit.

With a known spray head of this kind (US-A- 44 37 592), the closure element is opened upstream of the delivery valve and is closed hermetically downstream thereof. However, when foam is delivered from an aerosol- or spray container (spray can), it is desirable if the aerosol product which is initially contained in the spray container in liquid form does not issue from the spray head unchecked when the delivery valve is opened, but should foam up completely in the first instance. However, when the closure element opens upstream of the delivery valve, the aerosol liquid can at least partly issue out before it has completely foamed up. Furthermore, it is also desirable not to let the foam issue unchecked because it has been seen that foam which issues out under control has greater foam stability. If, on the other hand, the closure element closes hermetically, the residual product between the delivery valve and the outlet orifice is able to undergo secondary foaming in the closed outlet passage, and the closure element may open again under the pressure of the foam, so that foam continues to flow out.

The aim of the invention is to disclose a spray head of the kind in question, wherein the issuing foam has greater stability and foam is prevented from issuing out after the closure element has been closed.

According to the invention, this problem is solved in that the closure element has a diaphragm consisting of elastically resilient material, that the diaphragm has at least one through-hole disposed radially outside the opening of the outlet passage, and bears on the rim of the outlet orifice of the outlet passage under spring bias, and that the diaphragm has only one through-hole which bears with its edge under spring bias against the free end of a pin which is held in the outlet passage by a radial web with axial apertures.

With this solution, the diaphragm acts as a braking means for the delivery of the foam because the closure element opens with a delay with respect to the delivery valve opening, and in its closed position the closure element allows gases through but not liquids. The effect of the closure element which opens with a delay and which acts as a braking means for delivery of the foam is to increase the stability of the foam. At the same time, the non-hermetic closure and the way in which gas is able to continue to escape prevents subsequent foaming up and delivery of foam. In addition, the closure element is simple to manufacture and to fit.

The spray head disclosed in GB-A-1 226 565 has a diaphragm which is provided with a through-hole. Therein, when the delivery valve is open, the through-hole widens sufficiently so that if there is a blockage caused by dried up product residue issued from the container it is able to loosen in the through-hole and be blown out of it. When the diaphragm is in the closed position, a pin fixed in the outlet passage projects into the through-hole, wherein the pin and through-hole form a seal which only allows passage therethrough in the presence of a considerable excess pressure. However, the diaphragm does not bear against the pin in a prestressed condition.

With the container disclosed in US-A-3 976 216, the sole function of a diaphragm which is provided with holes radially outside the outlet bore and which covers over an outlet bore in a stopper is that of an excess pressure valve to allow gas to escape if an excess pressure builds up due to the container being heated.

The pin is preferably held coaxially in the outlet passage.

The outlet passage can be sub-divided into a first portion and into a second portion which can be fitted to the first portion and which has the closure element. Therein, the first portion can form the conventional outlet passage into which the second portion is easily able to be inserted to give the desired configuration.

The second portion of the outlet passage can be widened towards the closure element.

Furthermore, the closure element can be held by way of a snap action fit or by way of a frictional fit to the free end of the outlet passage.

In addition, care can be taken to ensure that the spray head has an upper wall which is flexibly connected to the circumferential wall on one side only of an outlet tube which is connected to the upper wall and which defines the delivery channel, wherein the outlet tube is able to be fitted onto a delivery tube which (also) serves to actuate the delivery valve of the spray container.

There will now follow a more detailed description of the invention and the further developments thereof with the aid of the drawings, wherein:

Figure 1 is an axial section through a spray head in the closed condition, which is not under stress, and will act as a basis for a description of the embodiments shown in Figures 3 to 6,

Figure 2 shows the spray head according to Figure 1 in the open condition,

Figure 3 shows an axial section through a top of an embodiment of a spray head according to the invention with an associated closure element in the closed condition,

Figure 4 shows another embodiment of a spray head according to the invention, in axial section,

Figure 5 shows a third embodiment of a spray head according to the invention, in axial section, and

Figure 6 shows a fourth embodiment of a spray head according to the invention, in axial section.

The spray head according to Figures 1 and 2 consists of an actuating attachment 1 for a delivery valve (not shown) of a spray container for delivering foam, with a closure attachment 2 of substantially mushroom head-shaped cross-section into which a closure element 3 in the form of a mushroom-head is inserted with a snap action fit, and 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, wherein the tubular socket 7 forms a second portion of the outlet passage 6. Therein, the outlet tube 5 and tubular socket 7 are held sealingly together by a frictional closure. The axially lower portion of the outlet tube 5 forms a fitting 8 to receive the outlet end of a delivery tube of the delivery valve. The outlet passage 6 is partially blocked by a baffle wall 9 extending transversely therein, against which the aqueous aerosol liquid released from the spray container can initially foam up.

The upper wall 10 of the actuating attachment 1 is connected in one piece on one side only (the left-hand side in Figure 1) of the outlet tube 5 to the upper edge of a radially outer circumferential wall 11 of the actuating attachment 1 which can be placed onto the upper edge of the spray container with a snap action fit. The wall 10 consists of a flexible material. Therefore, an actuating step 12 which is diametrically oppositely disposed to the connection location between the walls 10 and 11 can be depressed so as to apply pressure to the delivery tube of the delivery valve which engages into the fitting 8. The delivery valve is opened by depressing the delivery tube which simultaneously forms a closure portion of the delivery valve.

The closure element 3 is approximately mushroom-like in shape and its stalk 13 is guided axially in the outlet passage 6. The stalk 13 has a radial projection 14 in the form of a circumferential bead which engages under an offset portion 15 which is likewise formed by a radially inwardly projecting bead in the outlet passage 6. When the closure element 3 is in the closed position shown in Figure 1, the edge 16 of its mushroom head 17 bears against the edge 18 of the outlet orifice of the outlet passage 6. In the closed position, the radial projection 14 has an axial spacing d from the offset portion 15, which spacing defines and delimits the stroke of the closure element 3 consisting of a rigid material. Axial through

passages 19 pass through the radial projection 14 as far as the upper side of the projection forming the offset portion 15. The mushroom head 17 of the closure element 3 is sunk so that it is as flush as possible in an axial depression 20 in the mushroom head-shaped region of increased width of the closure attachment 2.

When the actuating step 12 is depressed and the delivery valve is opened, the contents of the container flow under the pressure of a propellant past the delivery valve and its delivery tube towards the baffle wall 9 whence it is diverted into the outlet tube 5 and the tubular socket 7, foaming up as this happens. Here, it strikes the closure element 3 which adopts the closed position according to Figure 1, wherein the closure element is raised into the open position according to Figure 2 against its force of gravity (or, its weight) under the pressure of the foam and acts like a braking means for delivery of the foam. This "checked" delivery of the foam increases the stability thereof.

As soon as the pressure is removed from the actuating key 12, the delivery valve closes, whilst the closure element 3 continues to retain the open position under the pressure of the foam.

When the spray container is in the upright position, and when the outlet passage 6 is accordingly in the vertical position, the closure element 3 is then lowered back into the closed position as the pressure of the foam abates. Alternatively, the closure element 3 can also be pressed manually back into the closed position, the foam which has emerged being stripped off. In the closed position, gas can continue to escape through the non-hermetically sealed closure gap between the closure element 3 and the closure attachment 2, whilst foam or liquid forming in the outlet passage 6 is retained, and any residual product remaining in the outlet passage is simultaneously prevented from undergoing change upon ingress of air.

With the spray head of Figure 3, the upper side of the actuating attachment 1a is in the form of a substantially top-like projection 21, to the bottom 22 of which the outlet tube 5 is formed. The outlet passage 6 tapers in the region of the bottom 22, and its top side is enclosed by an axially projecting sealing edge 23. The closure element 3b is placed with a snap action fit on top of the projection 21 to form a hood of elastically resilient rubber-like

material, wherein a radially inwardly projecting annular bead of the closure element 3b engages into a radially outer circumferential groove of the projection 21, and the bottom of the hood forms a diaphragm, which, under spring bias, bears against the sealing edge 23 forming the edge of the outlet orifice of the outlet passage 6. The bottom or diaphragm of the hood which forms the closure element 3b is provided with through-holes 24 radially outside the sealing edge 23, and in the closed position shown of the closure element 3b, since the diaphragm is placed against the sealing edge 23 these through-holes are closed to prevent delivery of foam or liquid but not that of gas, the pressure of which exceeds the closing force of the diaphragm.

When the actuating step 12 is depressed, the delivery valve (not shown) is initially opened, and then after foam has formed under sufficient pressure in the outlet passage 6 of the outlet tube 5, the diaphragm is raised from the sealing edge 23, so that foam is able to be delivered through the through-holes 24. Conversely, after pressure at the actuating step 12 has abated, and after the delivery valve has been closed, only then does the diaphragm move back into the closed position shown after pressure in the outlet passage 6 has decreased.

Here too, the diaphragm provided with holes has the function of a braking means for the foam. However, no baffle wall is provided.

With the actuating attachment 1b of Figure 4, the outlet tube 5a extends vertically in the region of the fitting 8 and then horizontally after a right-angled bend, in order to be able to spray the foam as horizontally as possible or easily downwardly. A circumferential groove 25 is formed concentrically to the outlet passage 6 in the front face of the outlet tube 5a. The closure element 3c, in turn, is in the form of a hood, but it is placed by a frictional fit onto the free end of the outlet tube 5a. The bottom of the closure hood 3c, in turn, forms a diaphragm of elastically resilient rubber-like material with through-holes 24 which are flush with the annular groove 25, and which, in the closed position shown, are closed due to the diaphragm being placed at the edge 23a of the outlet orifice of the outlet passage 6.

When the actuating step 12a is depressed, here too, the delivery valve (not shown) of the spray container is opened first. When this happens, the released liquid product which is

dissolved or emulsified in the propellant responsible for blowing up the liquid, flows towards the wall 9 of the outlet tube 5a extending transversely to the direction of flow, in the region of the fitting 8, wherein the wall 9, in turn, assumes the function of a baffle wall in order to allow the liquid to foam up in the outlet passage 6. Only after this has happened does the increasing pressure in the outlet passage 6 raise the diaphragm of the closure element 3c from the edge 23a of the outlet orifice of the outlet passage 6, so that the foam which forms can escape. Here too, the diaphragm of the closure element 3c, in turn, forms a braking means for the delivery of foam which assists in solidifying the foam. The diaphragm of the closure element 3c moves back into the closed position, likewise with a delay in respect of the closure of the delivery valve, depending on the pressure reduction in the outlet passage 6. Similarly, when the closure element 3c is in the closed position, only gas, but not liquid, can escape from the outlet passage 6.

With the spray head according to Figure 5, the actuating attachment 1c largely corresponds to the actuating attachment 1 of Figures 1 and 2, with the sole exception that the baffle wall 9 is omitted. The tubular socket 7b which likewise widens radially towards the upper free end contains a coaxial pin 26 which is held by a radial web 27 with axial through-holes 28 coaxially in the outlet passage 6. The closure element 3d, in turn, is in the approximate shape of a hood or a top which is held by means of its circumferential wall by way of a snap action fit in a coaxial annular groove in the front face of the tubular socket 7b, and is made of an elastically resilient rubber-like material. The bottom of the hood or top 3d forms a diaphragm which has a through-hole 24 in the centre thereof, which through-hole is closed in the closed position shown in Figure 5 due to the fact that the diaphragm is placed on the pin 26. Here too, the closure element 3d, or the diaphragm thereof, is brought into the opening- or closing position depending on the pressure in the outlet passage 6 with a delay with respect to the opening and closing of the delivery valve (not shown), with the elastic diaphragm being raised from the pin 26 or being brought back into position with respect to that pin 26 by its spring force. Here too, in the closed position, gas, but not liquid, is able to escape through the closure gap between the pin 26 and the diaphragm through the outlet orifice 24, whilst the closure attachment 2b sits sealingly on the outlet tube 5.

With the spray head according to Figure 6, the actuating attachment 1d largely corresponds to the actuating attachment 1 of Figures 1 and 2 apart from the absence of a baffle wall 9. The closure attachment 2c which is inserted sealingly into the outlet tube 5 contains an annular groove 25a which surrounds the outlet socket 7c, which annular groove is flush with delivery holes 24 in a diaphragm of the hood-like or top-like closure element 3e of elastically resilient material, which closure element engages by means of a frictional fit, by way of a radially inner circumferential wall, into the annular groove 25a and by means of a radially outer circumferential wall into an annular groove 29 in the front side of an outer wall 30 which encloses the tubular socket 7c. In the closure position, the diaphragm of the closure element 3e bears against the edge 23a of the outlet orifice of the outlet passage 6 and blocks passage to the through-holes 24 disposed radially outside the edge 23a. The mode of operation of this spray head is theoretically the same as that of the spray heads according to Figures 3 and 4.

Instead of the closure elements which are circular in the plan view, as shown, it is also possible to have polygonal closure elements, e.g. quadrilateral closure elements, and actuating attachments which are adapted in shape accordingly, the rest of the design remaining the same, as shown.



C L A I M S

1. Spray head for a spray container for the delivery of foam, the spray container comprising a manually actuatable delivery valve in a delivery channel adapted to be fitted to an outlet passage (6) of the spray head and the spray head having downstream of the delivery valve a closure element (3b-3e) automatically closing the outlet passage with a delay in respect of the outlet valve and having a circumferential wall (11) adapted to be mounted on the spray container with a snap action fit, characterized in that the closure element (3b-3e) comprises a diaphragm of elastically resilient material, that the diaphragm has at least one through-hole (24) positioned radially outside of the outlet orifice of the outlet passage (6) and engaging the edge (23; 23a) of the outlet orifice of the outlet passage (6) under spring bias or that the diaphragm has only one through-hole (24) which engages with its edge under spring bias of the diaphragm the free end of a pin (26) held in the outlet passage (6) by a radial web (27) having axial apertures (28).
2. Spray head of claim 1, characterized in that the pin (26) is held coaxially in the outlet passage (6).
3. Spray head of claim 1 or 2, characterized in that the outlet passage (6) is subdivided into a first portion (5) and a second portion (7b; 7c) comprising



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sing the closure element (3d; 3e) and adapted to be fitted to the first portion (5).

4. Spray head of claim 3, characterized in that the second portion (7b) of the outlet passage (6) widens out radially towards the closure element (3d).
5. Spray head of anyone of the claims 1 to 4, characterized in that the closure element (3b-3e) is held by a snap-action fit or frictional fit on the free end of the outlet passage (6).
6. Spray head of anyone of the claims 1 to 5, characterized in that the spray head has an upper wall (10) flexibly connected to the circumferential wall (11) on only one side of an outlet tube (5) defining the outlet passage (6) and connected to the upper wall (10), the outlet tube (5) being adapted to be fitted upon a delivery tube (also) serving the actuation of the delivery valve of the spray container.