

## POURING SPOUT FOR LIQUID CONTAINERS

The invention relates to a pouring spout for liquid containers with a ring-shaped upper part, which is insertable in the pouring opening or the pouring neck of a liquid container.

It is desirous to pour a liquid stream evenly when manually pouring liquid from containers to prevent the unwanted sloshing of the liquid. Bottles, canisters, Fassets®, barrels or similar containers are hereby considered as containers for temporary storage of liquids. A pouring with even liquid stream requires a proportionate venting of the container interior during the pouring process - in accordance with the discharged liquid volume. As a consequence of undefined streams of the discharged liquid or/and through "pumping" (= discontinuous breathing), the continuous venting is frequently interfered with, resulting in the uncontrolled sloshing of liquid.

The prior art to EP 0 677 445 A1 discloses a container with venting channel for transport of liquids and having a venting pipe as integral part of the canister. This canister has, however, the drawback that it can be produced only with complicated tools and is subjected to substantial distortion as a consequence of widely different shrinkage strains. Other embodiments of conventional pouring spouts are described in the publications JP 63-229 670, EP 0 047757 as well as A5-PS 313092. They suffer shortcomings because a portion of the pouring spouts projects vertically into the opening of the liquid container and is significantly bent to the side. As a result, the liquid container requires a particular tilting angle until these systems can become effective. In particular during the initial phase, when a precise pouring stream should be realized, these systems are insufficient. Moreover, a machine-based insertion of such pouring spouts is complicated because the venting pipe is curved and therefore requires a deflection of the direction of insertion.

The solution, proposed in the utility model DE 297 20 426 U1, has the drawback of requiring an additional lateral venting pipe, in particular when the opening of the liquid container has a greater diameter, in order to realize the desired effect.

Example embodiments provide a pouring spout for liquid containers which enables a steady venting of the container interior substantially independent from the tilting position of the container and thus realizes an even pouring of the liquid and which can also be placed by machine into the container opening in a very simple manner.

In one aspect, the present invention provides a pouring spout for liquid containers with a ring-shaped upper part which is insertable in the pouring opening or the pouring neck of the liquid container, wherein a tubular segment is attached to the ring-shaped upper part and extends, when installed, approximately in prolongation of the ring-shaped upper part downwards into the pouring opening, with at least one opening being formed in the tubular segment for air to enter in dosed manner, and wherein a dividing wall is provided on the inner side of the tubular segment in substantial parallel relationship to the tubular segment and connected laterally with the side facing away from the ring-shaped upper part via a bottom wall with the tubular segment, characterized in that the partition wall like the tubular segment is outwardly curved and has a slightly greater radius of curvature than the tubular segment, respectively a correspondingly smaller curvature than the tubular segment, whereby a narrow sickle-shaped "air trap" is formed and the bottom wall having a same narrow sickle shape.

In accordance with the invention, this object is attained by the features set forth in the characterizing part of claim 1.

Advantageous configurations are set forth in the subclaims.

The pouring spout according to the invention is generally inserted perpendicularly into the pouring opening of the container and includes on the side in opposition to the pouring opening a closed back wall with two (at least, however, one) opening for air to enter in a dosed manner.

In an embodiment, there is provided a partition wall, which extends in pouring direction substantially parallel to the back wall and reaches up to the lower edge of the pouring neck and which forms with its lower end together with the back wall a bottom, which includes at least one opening, preferably, however, two or more openings for air to enter in a dosed manner, defines together with the back wall and the bottom a so-called "air trap".

The pouring spout may be configured so that the attached partition wall prevents the presence of liquids streams at the ventilation openings so that especially a suction effect may be closed at these locations. The ventilation openings may be provided at the pouring spout so that air may be drawn in through at least one opening in a dosed manner in dependence on the tilting angle, while outpouring liquid can still flow through the unused openings and may be united at the upper end of the attached partition wall with the main pouring stream.

As a result of the openings formed in the back wall and at the bottom of the pouring spout, air can reach the interior to be vented only in a controlled manner thereby preventing a sloshing of liquid.

Shape (e.g. bore, oblong hole or slot) and size (diameter and length) of the various ventilation openings, provided in the pouring spout, may be freely configured and may be selected in dependence on the diameter of the opening port of the container and the hereby accompanying maximum pouring amount of liquids per time unit.

Exemplified embodiments of the invention will now be explained and described in more detail with respect to the drawings showing schematically in:

Figure 1 a vertical section through a pouring spout according to the invention, inserted in a canister;

Figure 2 a top view of the pouring spout according to Fig. 1;

Figure 3a a longitudinal section of another embodiment of the pouring spout according to the invention with slotted back wall;

Figure 3a a longitudinal section of another embodiment of the pouring spout according to the invention with slotted back wall;

Figure 3b a side view of the embodiment according to Fig. 3a;

Figure 3c a top view of the embodiment according to Fig. 3a;

Figure 4a a longitudinal section of another embodiment of the pouring spout according to the invention with several air chambers;

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Figure 4b a side view of the embodiment according to Fig. 3a; and

Figure 4c a top view of the embodiments according to Fig. 3a.

- 10 Figure 1 shows a pouring spout 10 according to the invention and inserted in the pouring neck 14 of a canister 12. The pouring spout 10 is made as injection-molded plastic part of HD-PE and includes a ring-shaped upper part 16 for connection to a downwardly directed tubular segment 18. The tubular segment 18 has a slightly smaller diameter than the upper part 16 and extends in
- 15 circumferential direction approximately over a length of  $\phi \times r$  (  $\phi \times r$  = semicircle; half pipe). The tubular segment 18 may, however, also be configured as a fully circulatory tube. The overall length of the pouring spout 10 (upper part 16 and tubular segment 18) is a slightly longer or greater than the outer diameter of the upper part 16 so as to establish a length/diameter ratio of about 1
- 20 or slightly greater than 1.

Arranged on the inside of the tubular segment 18 is a curved partition wall 20 in parallel relationship, which is secured laterally to the tubular segment 18.

- 25 This construction is clearly seen in the top view of Figure 2.

On the side facing away from the upper part 16, the inner partition wall 20 is connected via a sickle-shaped bottom wall 22 with the outer tubular segment 18 so as to define in-between a so-called "air trap". Formed in the wall of the outer

30 tubular segment 18 are two ventilation openings 24,26 which are positioned

above one another in axial direction. Furthermore, two ventilation openings 28 are arranged in the bottom wall 22.

5 A slightly conical gradation 30, which is located between the ring-shaped upper part 16 and the tubular segment 18, enables to insert the pouring spout with a certain predetermined pressure into the pouring neck 14 of the canister so that a press fit ensures a secure hold of the pouring spout 10 and renders a detachment during pouring of the canister 12 impossible.

10 In order to prevent a turning of the pouring spout 10 in the pouring neck 14, e.g. through shaking during transport, the pouring spout 10 is equipped with an anti-rotation device 32. Hereby, the upper part 16 of the pouring spout 10 is formed with an external elongated slot (dimple) and the pouring spout 14 is formed with a complementary projection to render a turning impossible.

15 Furthermore, the pouring spout 10 is also provided with a push-in inhibiting mechanism 34 which is arranged at the upper outer edge of the upper part 16 and configured as narrow, radially outwardly projecting flanged rim.

The rear wall of the tubular segment 18 ensures together with the partition wall 20, which reaches approximately to the lower edge of the pouring neck 14 of the container, that air being drawn-in can enter the container in a controlled manner via the upper ventilation opening 24 in the tubular segment 18 during the first pouring stage, i.e. the pouring stage at a slight tilted disposition of the container, so that a very slow pouring can be realized at high accuracy of the

25 pouring stream, when the canister is full.

In this first pouring stage, a small amount of liquid is able to flow through the lower ventilation opening 26 via the inner side of the partly closing partition wall 20 to the pouring stream, without adversely affecting the aspirated air at the

30 upper ventilation opening 24.

When further tilting the container to thereby pour more liquid, the second stage of the pouring spout 10, the so-called normal pouring stage, becomes effective and air is now able to enter also through the lower greater ventilation opening 26 in the tubular segment 18 into the interior space of the container.

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During this pouring stage (tilting angle about  $90^\circ$  and further feeding), some liquid to be poured flows through the ventilation openings 28 in the sickle-shaped bottom wall 20 via the inner side of the partly closing partition wall 20 into the pouring stream and is united therewith.

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The provision of a lateral or outwardly offset arrangement of the bottom-side ventilation openings 28 in relation to the ventilation opening 26 prevents the ventilation opening 7 to adversely affect the air stream. The ventilation openings 28 are provided at a right angle to the ventilation openings 24 and 26.

15 Thus, a steady venting of the container interior space in dosed manner is hereby ensured from a tilting angle of 90 degrees so that the effective cross sections of the bottom-side ventilation openings 28 increase to the same extent as a decrease of the effective cross section of the ventilation opening 26, when the tilting angle increases. Depending on requirement, e.g. two ventilation  
20 openings 28 with greater bore diameter or four ventilation openings with respective or/and smaller diameter can be provided in the sickle-shaped bottom wall 22.

As of a tilting angle of about  $120^\circ$ , the third pouring stage, the so-called extreme  
25 pouring stage, becomes effective. Air to be drawn is now able to flow also through the lowermost two or four ventilation openings 28 into the canister.

The ventilation openings are hereby so dimensioned that for the one used for pouring from the canister no or hardly noticeable transition from one into the  
30 other pouring stage is ensured.

The ventilation openings act respectively in reverse sequence, when the tilting angle is reduced up to a stoppage of the pouring process.

- 5 The embodiment shown in Figure 3a, Figure 3b, and Figure 3c includes, instead of the two superimposed ventilation bores in the tubular segment 18, a vertical narrow vent slot 36 which extends upwards beyond the upper edge 38 of the partition wall 20 almost to the conical gradation 30 and downwards up to the sickle-shaped bottom wall 22. The operation of this embodiment corresponds to  
10 the manner illustrated in Figures 1 and 2.

- A further advantageous embodiment, in particular for containers with great diameter of the pouring neck (greater 45 mm), is illustrated in Figure 4a, Figure 4b and Figure 4c. Hereby, the sickle-shaped "air trap" is subdivided by  
15 two vertical intermediate walls 40 and 42 into three chambers 44, 46 and 48.

- During "extreme pouring", it is required to so dimension the effective air column of the pouring spot that a continuous venting of the container is realized even in this severely tilted position of the container. Hereby, a prolongation of the total  
20 installation length is normally required. The embodiment shown in Figure 4 enables an increase of the necessary effective air column corresponding to the height difference of the chambers 44 and 48 in relation to the chamber 46, without changing the total installation length of the pouring spout. The operation of this embodiment corresponds to the pouring spout shown in Figure 1.

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Listing of important features essential to the invention:

- the upper edge of the partition wall of the pouring spout extends to the lower edge of the pouring neck of the container, when installed;
- the pouring spout is equipped with an anti-rotation mechanism;
- 30 - the pouring spout is equipped with a push-in inhibiting mechanism;

- the push-in inhibiting mechanism prevents that the pouring spot is pushed in too deeply into the pouring neck or even drops into it,
- the tubular segment as well as the sickle-shaped bottom wall are each formed with at least one ventilation opening for incoming air in a controlled doses,
- the partly closing partition wall extends in pouring direction,
- the partition wall extends approximately up to the upper ventilation bore,
- and the partition wall forms a flow tear-off edge at the upper end.

10 In an embodiment for a 20 liter canister, the pouring spout has an outer diameter of 48 mm at the ring-shaped upper part and overall has a height (or length) of 52 mm. The inner partition wall projects "only" by about 6 mm into the pouring cross section and has a height (or length) of 27 mm. The upper ventilation bore has a diameter of about 5 mm, and the lower ventilation bore has a diameter of about 9 mm. The ventilation bores for the third stage in the bottom wall have a diameter of about 3 to 4 mm. The plastic material of the pouring spout is HD-PE. Since the air trap is very narrow in radial direction, but extends in circumferential direction approximately over half the circumference (180°), the partition wall projects only very slightly inwardly. In this way, a comparably large free pouring cross section remains, which allows a filling of canisters with already installed pouring spouts in automatic bottling plants, when the fill pipe of the bottling plant has a tip of slightly smaller diameter.

## List of Reference Numeral

|    |    |                              |
|----|----|------------------------------|
|    | 10 | pouring spot                 |
|    | 12 | canister                     |
| 5  | 14 | pouring neck                 |
|    | 16 | ring-shaped upper part       |
|    | 18 | tubular segment (semi pipe)  |
|    | 20 | partition wall               |
|    | 22 | bottom wall 18-20            |
| 10 | 24 | upper ventilation opening    |
|    | 26 | lower ventilation opening    |
|    | 28 | ventilation opening 22       |
|    | 30 | conical gradation            |
|    | 32 | anti-rotation mechanism      |
| 15 | 34 | push-in inhibiting mechanism |
|    | 36 | slot                         |
|    | 38 | upper rim 20                 |
|    | 40 | vertical intermediate wall   |
|    | 42 | vertical intermediate wall   |
| 20 | 44 | outer chamber                |
|    | 46 | center chamber               |
|    | 48 | outer chamber                |

## Claims

1. Pouring spout for liquid containers with a ring-shaped upper part which is insertable in the pouring opening or the pouring neck of the liquid container, wherein a tubular segment is attached to the ring-shaped upper part and extends, when installed, approximately in prolongation of the ring-shaped upper part downwards into the pouring opening, with at least one opening being formed in the tubular segment for air to enter in dosed manner, and wherein a dividing wall is provided on the inner side of the tubular segment in substantial parallel relationship to the tubular segment and connected laterally with the side facing away from the ring-shaped upper part via a bottom wall with the tubular segment, characterized in that the partition wall like the tubular segment is outwardly curved and has a slightly greater radius of curvature than the tubular segment, respectively a correspondingly smaller curvature than the tubular segment, whereby a narrow sickle-shaped "air trap" is formed and the bottom wall having a same narrow sickle shape.
2. Pouring spout according to claim 1, characterized in that the narrow sickle-shaped "air trap" between the tubular segment and the tubular segment shaped inner dividing wall and closed at the bottom through the sickle-shaped bottom wall extends across half of the circumference (about 180°) of the tubular segment and is configured only very narrowly so that only a small portion projects into the interior of the diameter of the free pouring opening.

3. Pouring spout according to claim 1 or 2, characterized in that the tubular segment is configured as a half-pipe and extending across half of the circumference (about 180°) of the ring-shaped upper part.
4. Pouring spout according to claim 1, 2 or 3, characterized in that the upper edge of dividing wall of the pouring spout forms a flow tear-off edge and extends, when installed, up to the lower edge of the pouring neck of the container.
5. Pouring spout according to claim 1, 2, 3 or 4, characterized in that the pouring spout is equipped with an anti-rotation mechanism.
6. Pouring spout according to claim 1, 2, 3, 4 or 5, characterized in that the pouring spout is equipped with a push-in inhibiting mechanism.
7. Pouring spout according to one of the preceding claims 1 to 6, characterized in that the tubular segment has two vertical ventilation bores in superimposed disposition, with the lower ventilation bore having a greater diameter than the upper ventilation bore.
8. Pouring spout according to one of the preceding claims 1 to 6, characterized in that instead of the ventilation bores there is provided in the tubular segment a vertical vent slot which extends upwards almost to the conical gradation and downwards to the sickle-shaped bottom wall.
9. Pouring spout according to one of the preceding claims 1 to 8, characterized in that at least two further ventilation bores are provided in the sickle-shaped bottom wall.

10. Pouring spout according to one of the preceding claims 1 to 9, characterized by an embodiment as injection molded plastic part (HD-PE) having a greatest diameter which is greater by about 2% to 4% than the inner opening diameter of the container.
11. Pouring spout according to one of the preceding claims 1 to 10, characterized in that the "air trap" is subdivided by two vertical intermediate walls into three chambers wherein the intermediate walls as well as the partition wall extend in the area of the outer chambers to about the lower edge of the ring-shaped upper part, while the partition wall extends in the area of the center chamber only to about the lower edge of the pouring neck, respectively up to the upper ventilation bore.