

DISCHARGE PIPE FOR A CONTAINER

This invention relates to a discharge pipe for fitting onto a container such as a fuel can.

A discharge pipe of this type is described in DE-PS 25 14 278.

The pipe cross-section is divided by a partition, so that separate ducts are available for the outflowing fuel and for the air stream flowing back in compensation into the can, with the result that pouring is facilitated. A bellows-like middle section allows even awkwardly situated filler pipes to be easily reached. In the known discharge pipe, the partition continues also through this middle section, which requires some artifice; the circumferential grooves of the one part of the pipe must be arranged staggered by a half-pitch relative to the circumferential grooves of the other part of the pipe, in order that this groove arrangement can extend around the entire circumference and into the flash seam. It will be understood that the mould required for producing this discharge pipe is correspondingly complicated and expensive. It is well-known that a bar, when bending, has a so-called neutral fibre, which keeps its length unchanged while the material on one side is compressed and on the other side is stretched. In the known discharge pipe, this neutral fibre in the flexible middle section cannot, however, freely adjust itself from the force equilibrium

in the material, but is constrained by the partition, because this partition acts as a sheet hinge. This partition lies, however, in a plane offset from the central axis of the pipe, because the cross-section provided for the fuel must be larger than that for the returning air. Consequently, the forced neutral fibre of the flexible middle section does not lie where it naturally would. When the known discharge pipe is bent, therefore, the bellows-like wall regions on either side of the partition are unevenly loaded. It should also be observed that the bending is concentrated to a central third of the total length of the bellows-like middle section, whereas the remainder of the middle section furnished with circumferential grooves remains virtually unchanged. The flexibility is therefore restricted or the material is more heavily loaded locally for a given amount of bend, so that durability is at risk.

An object of the present invention is to create a discharge pipe which is simpler to manufacture and more reliable in its durability.

According to the invention there is provided a discharge pipe of plastics for fitting onto a container such as a fuel can, comprising a pipe section which in use is located nearest the can, an outlet section for insertion into a filler pipe on an automobile and a middle section made flexible by bellows-type circumferential grooves or a single helical groove, and also comprising a partition wall in the pipe cross-section, formed by axis-parallel squeezed-in zones

of the pipe wall on both sides, characterised in that the partition wall is interrupted over the length of said middle section and that the internal pipe cross-section in this middle section is circular.

Because there is no partition in the middle section that is loaded in bending and the cross-section is circular, this middle section always bends according to the natural equilibrium of forces in a bellows pipe and is therefore uniformly loaded. As a consequence of the natural force distribution, the bending is also distributed largely uniformly over the entire length of the middle section, so that concentrations of loading are avoided. Each individual

bellows segment is deformed with a fraction of the bend and can therefore be more frequently bent to and fro without fracturing or cracking. The discharge pipe therefore retains its necessary tightness in the stressed middle section even after numerous changes of load. In the middle section, the downward flowing liquid and the returning air are not separated, but this proves not to be a disadvantage, because in both the end zones as a result of the separation a sufficient stabilization of the liquid and air jets takes place, which smooths out the turbulences in the middle section in the manner of a suction or nozzle effect. Also, one should not be taken in by the illusion that a continuous partition, as in the known pipe, would always keep air and liquid clearly apart. The so carefully separated pipe zones usually lead into one single opening in the can, so that the liquid flowing out there often flows into both zones of the pipe. Consequently, the air for pressure balancing even in this system usually flows against the liquid stream of both regions of the pipe and back into the can. Particularly in the narrower cross-section, the air stream is thereby strongly retarded. In the discharge pipe according to the present invention, the liquid entering in the "wrong" region of the pipe can change over in the middle section into the "right" region of the pipe. It has therefore been found that an interruption of the partition virtually results in no notable disturbances to the liquid outflow, but does offer the manufacturing and loading advantages previously referred to.

The invention is explained in greater detail below by reference to an especially preferred example of embodiment thereof illustrated in the drawing.

The Figures in the drawings show:

Fig. 1 a lateral view of a discharge pipe according to this invention, shown full size,

Fig. 2 a cross-section in the plane 2-2 of Fig. 1 and

Fig. 3 a cross-section in the plane 3-3 of Fig. 1.

The illustration of the discharge pipe of Fig. 1 has been cut approximately across the centre, for reasons of space. At the left-hand end of the drawing, a fixing section 10 is shown, which has a length of about 2 cm and is furnished with an internal thread, which corresponds in known manner with the external thread on the outlet pipe of a conventional fuel can. This fixing section 10 is followed by a pipe section 11 nearest the can, having a length of about 4 cm with an external diameter of about 29 mm. This is adjoined by a middle section 12, which comprises approximately 25 circumferential grooves 13 distributed over a length of about 9 cm, the grooves being drawn into the pipe wall while maintaining the wall thickness. The external diameter across the resultant peaks is 32 mm, the circumferential grooves 13 being about 2 mm deep, so that with a wall thickness of 0.5 mm the internal clear cross-section of the pipe at the narrowest positions is 27 mm. By these circumferential grooves 13, the middle section 12 is formed as a bellows,

so that the discharge pipe is flexible here. The middle section 12 is adjoined, as shown in the lower part of the Figure, by an outlet section 14, which serves for introduction into a filler pipe on the automobile. The outlet section 14 is divided into a cylindrical section 15 of 1.5 cm length and approximately 28 mm external diameter, immediately adjoining the middle section 12, and which is followed by a conical transition section 16, which leads with a length of 3 cm into a cylindrical end region 17 approximately 7 cm long, which has an external diameter of 20 mm. The outlet section 14 is therefore so constructed that it pushes through the tank flap, mounted for reasons of safety in the filler pipe of automobiles that are equipped with catalysts, and fits into the reduced diameter. The discharge pipe can therefore be used for filling up both old automobiles and also those with catalysts. The discharge pipe is preferably made from thermoplastics material. The fixing section can also have the form of a radially projecting annular flange, which is pressed firmly onto the outlet pipe of the can by a coupling nut, which is then pushed loosely onto the pipe section 11 nearest the can.

As can be seen from Figure 2, the pipe blank is now given axis-parallel squeezed-in zones 18 and 19, extending over the outlet section 14 and orientated towards each other, which each have a U-shaped cross-section, the U-arms 21, 22 and 23, 24 respectively being parallel to each other and the U-curves 25, 26 bearing against each other and being fused together at the contact point. In this manner, the U-arms 21 and 23 with parts of the U-curves 25 and 26

form a partition, by which a circular arc portion extending through an angle α of 240° is defined. For this purpose, therefore, the two U-arms 21 and 23 run approximately radially towards the centre of the pipe cross-section. The clear width W between the U-arms 21 and 22, 23 and 24 respectively, which have a wall thickness of 0.5mm, is about 3 mm. The pipe cross-section is therefore divided into the aforementioned large circular sector and an upper, small sector. The two squeezed-in zones 18 and 19 are formed symmetrically about the radial plane 27 within the limits of manufacturing accuracy. As the lower part of Figure 1 shows, these squeezed-in zones 18, 19 extend parallel to the axis substantially over the entire outlet section 14.

As Figure 3 shows, in the pipe section 11 nearest the can there are also two squeezed-in zones 28 and 29, which however have a V-shaped cross-section. The V-arms 31, 32 and 33, 34 respectively make an acute angle ϕ of about 30° with each other, their V-apexes 35, 36 respectively being rounded with a radius of about 1.5 mm. Here, the V-arms 31 and 33 and parts of the V-apexes 35 and 36 form a partition, by which a circular sector having an angle of arc β of about 180° is separated from the pipe cross-section. By the squeezed-in zones 28 and 29, at this position also, the pipe cross-section is divided into the aforementioned larger circular sector and into a smaller sector between the V-arms 32 and 34. These squeezed-in zones 28, 29 also are symmetrical about the radial plane 27. In the extended position of the discharge pipe, therefore, the V-arm 32 is therefore at least approximately aligned

with the U-arm 22 of Figure 2 and the V-arm 34 aligned with the U-arm 24. It will be understood that here again the V-apexes 35 and 36 are fused together along their contact line. As Figure 1 shows, the squeezed-in zones 28 and 29 extend, in the region of the pipe section 11 nearest the can, over a length of only about 2 to 2.5 cm.

In the region of the middle section 12, of which the internal cross-section is circular, there is no squeezed-in zone or partition or the like.

Except where otherwise stated, the discharge pipe generally has a wall thickness of about 1 mm. In the condition for use, the discharge pipe has a total length of about 28 cm, but as a consequence of the bellows-like middle section 12 it can be compressed to a length of 24 cm, which represents a saving in space for factory packing and delivery.

Instead of the individual circumferential grooves 13, a single helical groove could be provided.



CLAIMS:

1. A discharge pipe of plastics for fitting onto a container such as a fuel can, comprising a pipe section which in use is located nearest the can, an outlet section for insertion into a filler pipe on an automobile and a middle section made flexible by bellows-type circumferential grooves or a single helical groove, and also comprising a partition wall in the pipe cross-section, formed by axis-parallel squeezed-in zones of the pipe wall on both sides, characterised in that the partition wall is interrupted over the length of the middle section (12) and that the internal pipe cross-section in this middle section (12) is circular.

2. A discharge pipe as claimed in claim 1, wherein, in the outlet section (14), a circular sector extending around 240° angle of arc (α) is defined by the two squeezed-in zones (18, 19), oriented towards each other and connected together in the interior of the pipe to form a partition.

3. A discharge pipe as claimed in claim 2, wherein each squeezed-in zone in the outlet section (18, 19) has a U-shaped cross-section, the sides of each zone (21, 22; 23, 24) being parallel to each other and the connection between the squeezed-in zones, orientated towards each other, being effected at their adjoining U-curves (25, 26).

4. A discharge pipe as claimed in claim 3, wherein the clear width (W) between the sides of each zone (21, 22; 23, 24) is



about 3 mm and the wall thickness of these U-arms is about 0.5 mm.

5. A discharge pipe as claimed in claim 1, wherein it has, in the outlet end region (17) of the outlet section (14), an external diameter of 20 mm over a length of about 7 cm extending to the outlet end.

6. A discharge pipe as claimed in claim 5, wherein it has, in the outlet section (14), a conical transition section (16) having a length of 3 cm, which leads into a cylindrical section (15) of 1.5 cm length and about 29 mm external diameter, which is adjoined by the middle section (12).

7. A discharge pipe as claimed in claim 1, wherein the middle section (12) furnished with circumferential grooves has a length of 9 cm for an external diameter of about 32 mm, the circumferential grooves (13) being drawn 2 mm deep and the internal pipe cross-section at the narrowest points being 27 mm.

8. A discharge pipe as claimed in claim 1, wherein, in the pipe section (11) which in use is located nearest the can, a circular sector with an angle of arc (β) of about 180° is defined by the two squeezed-in zones (28, 29) orientated towards each other and connected together in the pipe interior to form a partition.

9. A discharge pipe as claimed in claim 8, wherein each squeezed-in zone (28, 29) in the section which in use is located nearest the can has a generally V-shaped cross



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section with a curved base, the V-arms (31, 32; 33, 34) making an acute angle (γ) between them of about 30° and the connection between the squeezed-in zones, orientated towards each other, being effected at their adjoining V-curves (35, 36).

10. A discharge pipe as claimed in claim 8, wherein the pipe section (11) which in use is located nearest the can has a length of 4 cm for an external diameter of about 29 mm.

11. A discharge pipe as claimed in claim 1, wherein a fixing section (10) of about 2 cm length, furnished with an internal thread, is integrally formed on the pipe section (11) which in use is located nearest the can.

12. A discharge pipe as claimed in claim 11, wherein it is symmetrical about a radial plane (27), with the exception of the fixing section (10).

13. A discharge pipe for a container, substantially as described with reference to the accompanying drawings.
