

[54] **DEVICE FOR THE VENTING OF JERRY CANS**

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[51] Int. Cl..... **B67d 3/00**

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222/567, 568; 141/308, 309

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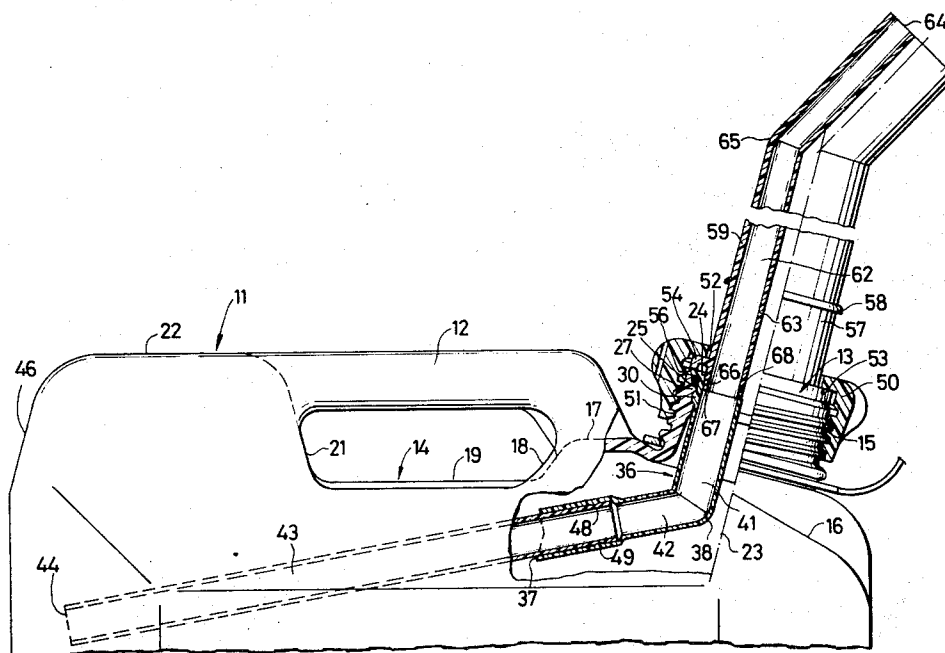
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[57]

ABSTRACT

A molded plastic jerry can has a ring insert fitted at its spout. The insert has a nipple starting at about the inner perimeter of the spout and extending first parallel to the axis of the spout and then bending towards the upper part of the rear wall of the can. A long tube is press fitted on the end of the nipple with its free end terminating close to the rear wall. The spout can have a discharge pipe extending from it. The discharge pipe has a vent tube which runs from the top of the nipple to the discharge end of the pipe.

13 Claims, 8 Drawing Figures



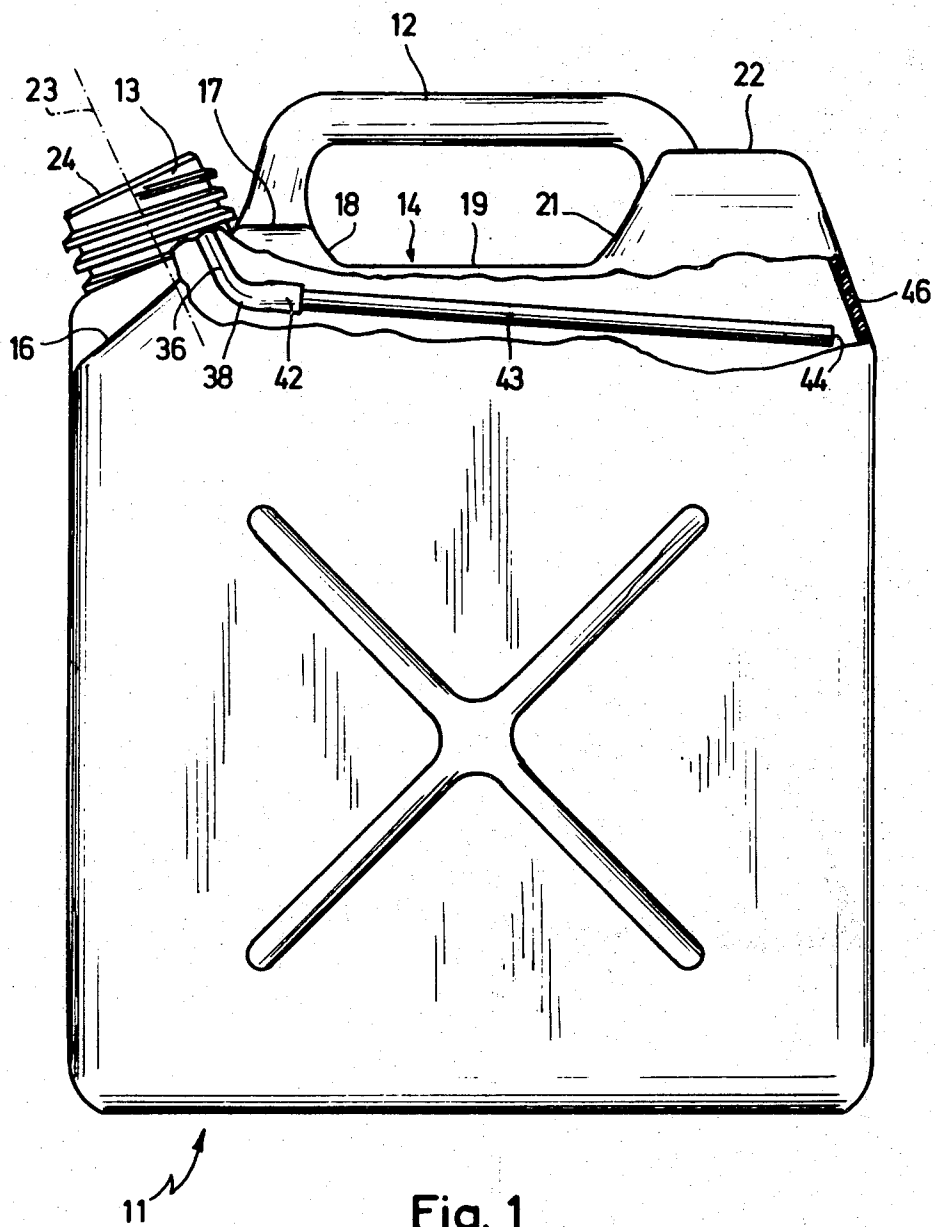
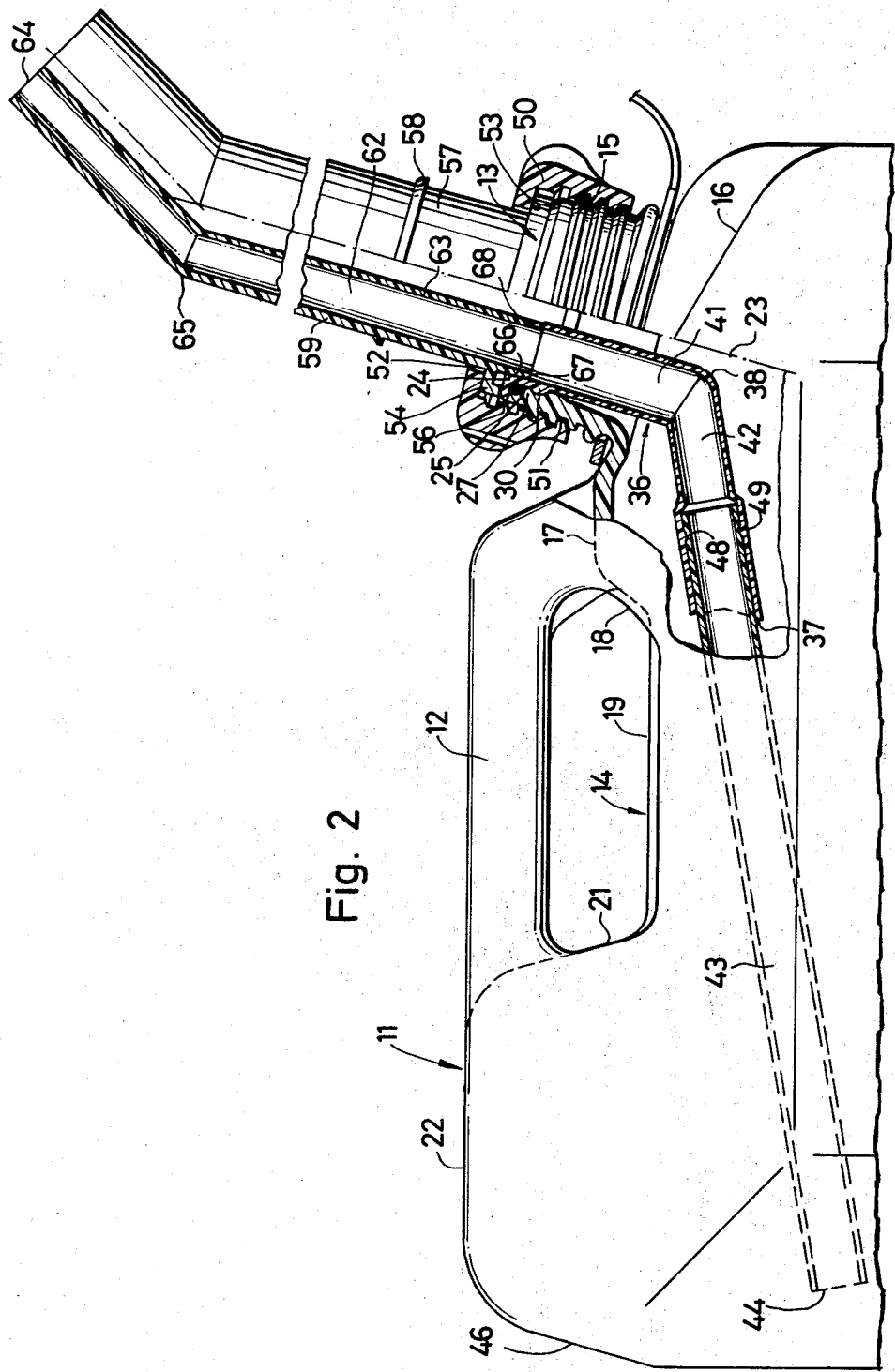


Fig. 1



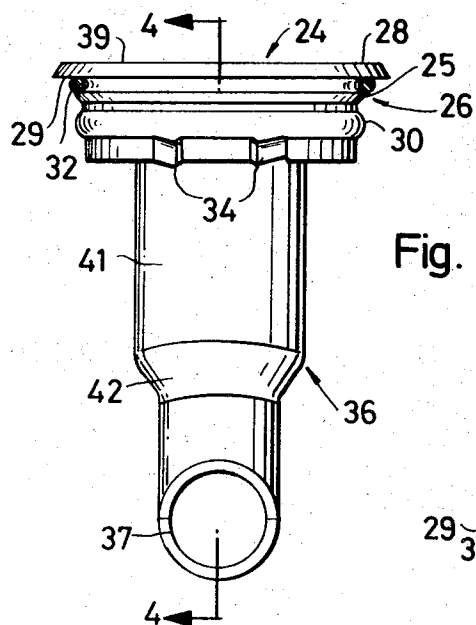


Fig. 3

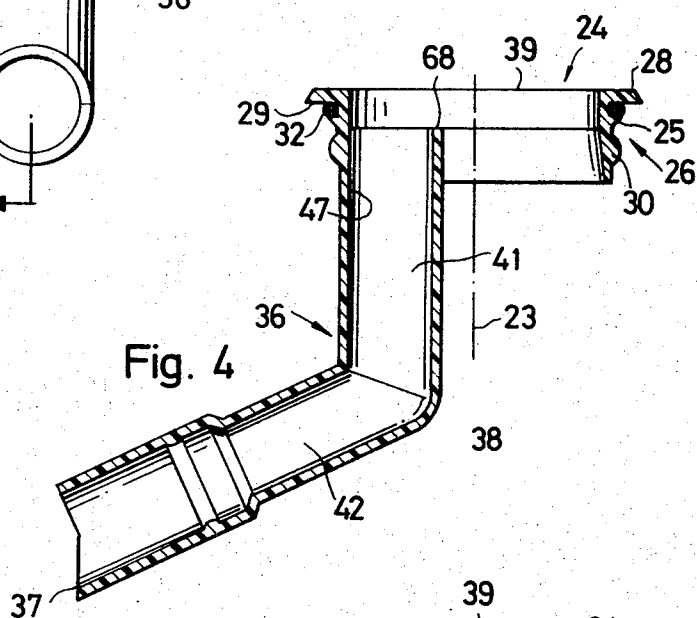


Fig. 4

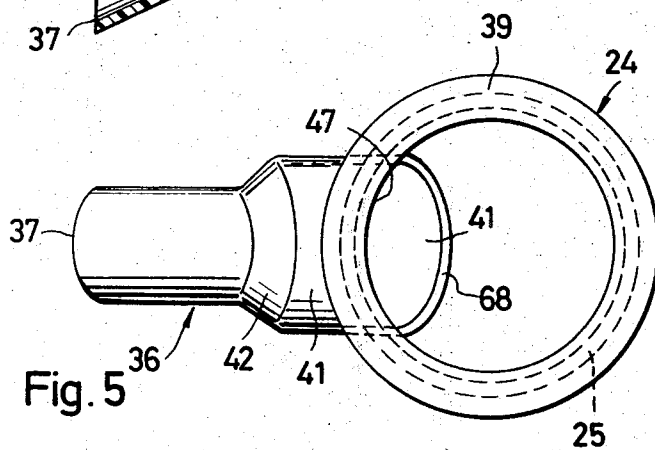
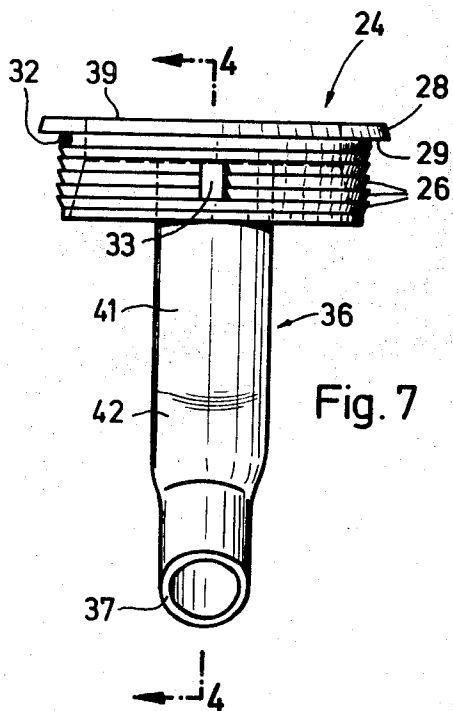
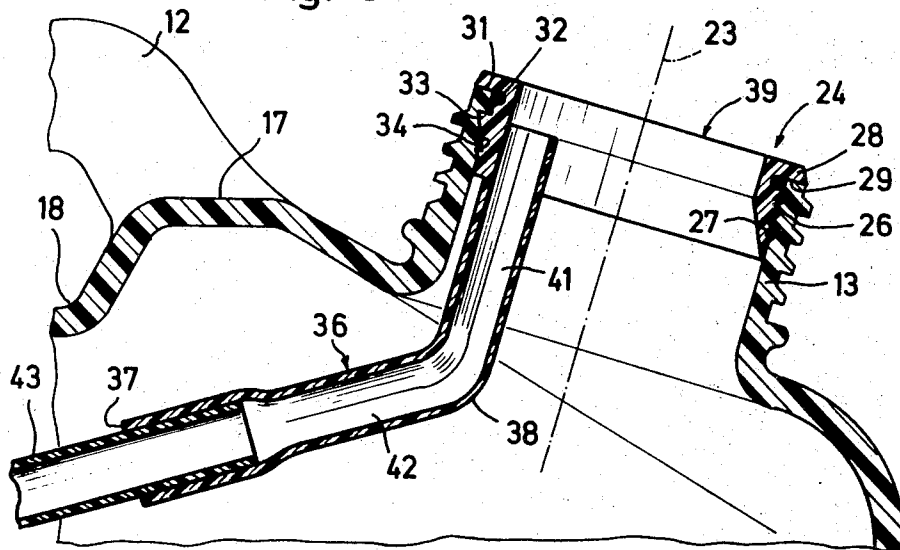


Fig. 5

Fig. 6



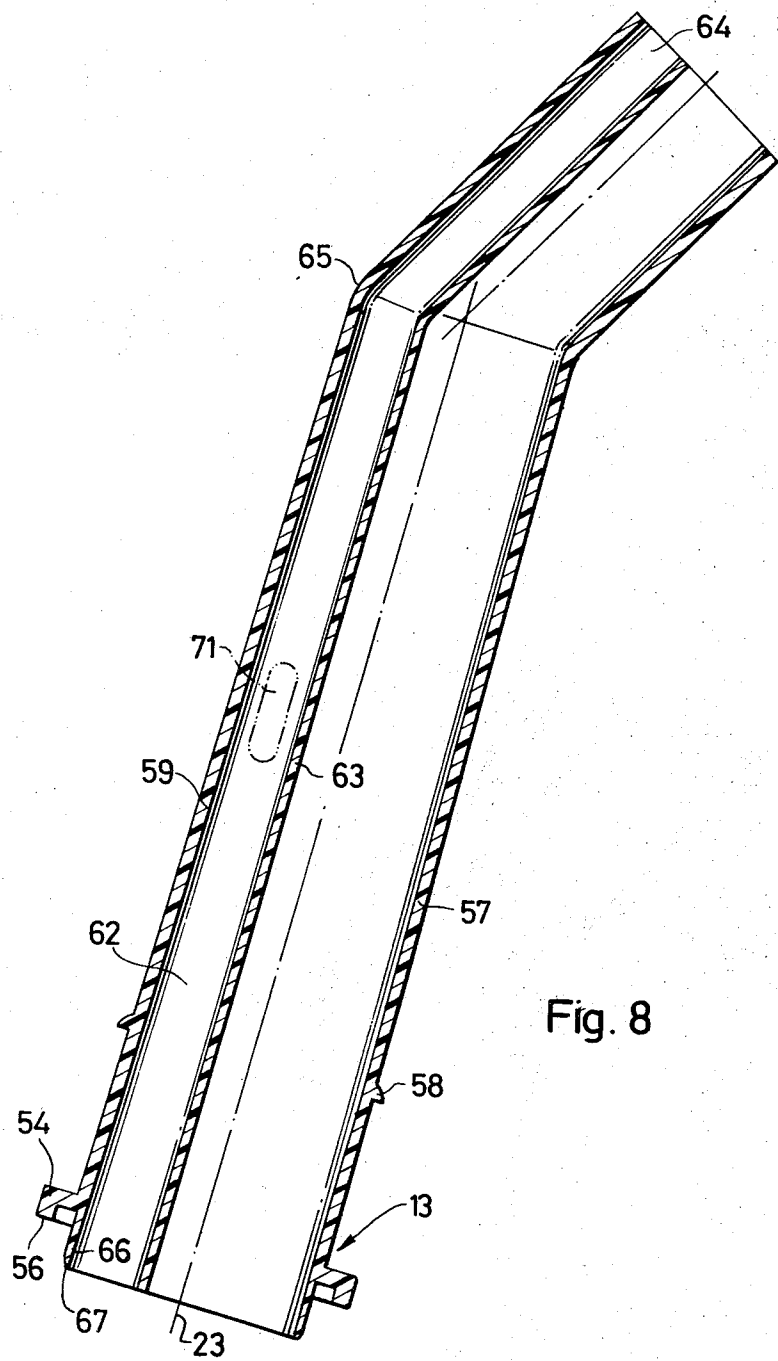


Fig. 8

DEVICE FOR THE VENTING OF JERRY CANS

The invention relates to a device for the venting of jerry cans by means of a tube which is attached to the inner perimeter of the spout and is bent and extends freely into the interior of the can towards the upper part of the rear wall of the can.

The emptying of a jerry can should be executed as quickly as possible. If many or even hundreds of cans are to be emptied, a saving of time of several percent or even 10–20 percent becomes exceedingly important. Even when only a single can has to be emptied, a quicker pouring means that the can, which on occasion can be quite heavy, has to be held for a shorter time period with the spout pointing down. A faster pouring not only entails a saving in time. Moreover, significantly more liquid can often be poured into the tank to be filled if the emptying of the can proceeds quickly. This is especially true if one has to transfer liquid from a can to a tank on a moving vehicle, e.g., a rolling and pounding boat. Experience shows that spilling is minimized by a quick emptying of the can.

A quick emptying of the can automatically solves the problem of bubbling and splashing during this operation. If, in effect, the can is not sufficiently vented by the tube, the air bubble in the can on top of the liquid sucks air through the spout, and the counterflow of air bubbles and liquid induce turbulence and limit the space available for the flow of liquid. For some liquids it is also detrimental to be mixed with air.

According to German Pat. No. 1,003,123 attempts have been for a long time to find a solution for this problem in the case of metal containers. According to this patent, the discharge time can be significantly decreased by means of a specially shaped deep drawn metal dish which is welded in a certain way to the upper part of the metal can. An attempt is made to avoid the disadvantages of the known solution by means of a tube, which extends to the rear wall by one-fourth less than the handle length approximately. Because of the complicated welding process, the price of this solution is high and it is well known that it has not succeeded. This solution is especially not applicable to plastic cans which are formed in one piece so that such metal pieces cannot be welded in, since this operation requires welding first one half with the metal piece and then subsequently attaching the other half to the first half.

Surprisingly, it appears now that significantly better results can still be achieved by a suitable modification of the old solution based on a tube.

It is the object of the invention to provide a device for the venting of jerry cans that can be applied to plastic jerry cans, is exceedingly inexpensive and permits the achievement of significantly shorter discharge times than presently known devices.

This problem is solved, according to the invention, by supporting an extruded plastic ring insert in the spout of plastic cans which cannot be rotated or axially translated, by providing a nipple which forms one piece with the ring insert and has a first part which runs approximately parallel to the geometrical major axis of the spout and a second part which is bent pointing towards the upper part of the rear wall, by providing a tube which is telescopically and tightly joined to this second part, at least by a press fit; this tube being considerably longer than the second part of the nipple with its free end terminating close to the rear wall.

With a tube which has been modified in this manner, short discharge times are achieved, amounting for example to 11–15 seconds for a 20 litre (5 gallon) can. Often it is desirable to provide an extended spout in order to be able to reach tank openings which are not easily accessible. However, this should have no significant effect on the discharge speed.

In order to extend the spout, a discharge pipe is used which is in most cases provided with a vent tube. The vent tube reaches then from the outside air, e.g., from the spout of the discharge pipe, up to close to the end of the discharge pipe facing the can wall. By proper design the liquid must be prevented from entering the vent tube while pouring liquid from the spout. This is accomplished by establishing a certain ratio for the flow cross sections of air and liquid, with due consideration for the length of the vent tube. In the solution used until now, the cross section available for the flow of air is very small, without effectively preventing the penetration of liquid into the vent tube. This design has the disadvantage of a slow and gurgling discharge of the can. This is so because the discharge speed is not determined by the cross section available to the flow of liquid but rather by the flow cross section or flow resistance, respectively, of the air.

In order to provide the can with a discharge pipe without a substantial increase in the discharge time while effectively preventing the penetration of liquid into the vent tube, a preferred embodiment of the invention provides a vent tube which extends at least partially within the discharge pipe and which has the same cross section as the nipple insert, so that both are butted together when the discharge pipe is attached to the spout.

This device is suitable for all kinds of cans whether provided with a screw cap or a clasp lock, because the discharge pipe is accordingly provided either with a cap which can be screwed onto the spout or with a clasp adapter.

A preferred design of the invention comprises a vent tube with at least one aperture open to the outside air. By this means the liquid which possibly has penetrated into the vent tube is more quickly discharged back into the can. Moreover, it also acts as an additional vent opening reducing the discharge time. As a further specific advantage, the discharge pipe including the vent tube can be simply fabricated by injection molding. Since the vent tube is relatively thin and long, the core used for injection molding is also relatively thin and long. In the region of the aperture an additional sliding core can be employed, which keeps the core for the vent tube in its proper position.

The aperture is located at approximately half the height of the discharge pipe. It is therefore located at a sufficient height to prevent the liquid which might have entered the vent tube from flowing out through this aperture. The preferred shape of this aperture is an elongated ellipse.

In a further embodiment of the invention, the discharge pipe is slightly tapered towards its spout so that smaller tank openings are also accessible. The vent tube is likewise tapered towards the spout.

The preferred shape of the cross section of the vent tube and the nipple insert is elliptical. This leads to a ratio of approximately 1 : 3 for the cross section area of vent tube and discharge pipe. It has been shown that

this ratio optimizes the outflow or discharge time for a can.

In order to prevent the vent tube from disengaging from the nipple insert or even from falling out, the vent tube is provided with an annular groove and the nipple insert with an annular enlargement or torus.

Further details and characteristics of the invention are obtained from the following description of a preferred design. We find in:

FIG. 1 — the side view of a partially broken-away can

FIG. 2 — a part of the can in FIG. 1 with discharge pipe, insert ring and nipple according to a first embodiment.

FIG. 3 — the front view of insert ring and nipple according to the first embodiment. FIG. 4 — a cross-section taken along section line 4—4 in FIG. 3.

FIG. 5 — a top view of insert ring and nipple.

FIG. 6 — a cross-section through the spout in scale 1 : 1 of another embodiment.

FIG. 7 — a front view of insert ring and nipple.

FIG. 8 — a discharge pipe in 1:1 scale.

A 20 litre (5 gallon) army can 11 made of polyethylene is provided with handles 12. A spout 13 with a trap-ezoidal outer thread 15 is attached to the inclined plane 16 on the left side, which can be closed by a screw cap not shown in the figure. The mentioned inclined plane 16 is on the top side 14 of can 11 and is inclined towards the upper left side where it passes over into horizontal plane 17, from which handles 12 protrude. With radius 18, horizontal plane 17 passes into the lower horizontal plane 19 which rises again to a horizontal plane 22 through incline 21. Plane 22 lies above the upper part of spout 13. Although it is of course possible to fill the can to different heights, the upper level is approximately determined by plane 19. Below plane 22 there remains an air space which also provides for expansion of the liquid if the temperature increases, preventing an increase of the pressure in can 11.

Insert ring 24 with exterior toothing 26 is located in spout 13 coaxially with its longitudinal axis 23. The exterior threads can be sawtooth-shaped, for instance. In the design shown in the illustration, outer thread 26, which also runs coaxially to longitudinal axis 23, comprises an annular ridge 25 with a sawtooth-shaped cross section and an annular protrusion 30 separated from ridge 25. The female portion of thread 26 matches male thread 27 on the inside of the upper part of spout 13. After insert ring 24, which is molded as a single piece, is press-fitted into spout 13, it can only be removed with considerable deformation by exerting a strong force which is not experienced in practical use. When inserting ring 24, a stop is provided by annular flange 28 of insert ring 24, whose annular surface 29 faces front plane 31 of spout 13 which is also annular shaped. For sealing purposes, a groove for O-ring 32 is provided on the inner part of annular surface 29. To prevent the rotation of insert ring 24, which could occur for instance when a screw cap is used, two notches 34 are cut into it in the range of the female thread 26, which engage two matching lugs in spout 13 (not shown in the illustrations). It is of course also possible to provide the spout with notches and the insert ring with lugs. By this means an abrasion of male and female 27, 26 and of O-ring 32 are prevented, but mainly a rotation of insert nipple 36 — provided for venting — is prevented. This is necessary since end 37

of insert nipple 36 has to point towards the air bubble formed by discharging can 11. Therefore, insert nipple 36, which starts parallel to the longitudinal axis 23, is provided with bend 38 after which it runs almost horizontally towards the inside. The upper surface 39 of insert ring 24 acts as a seal.

As shown in the illustrations, insert nipple 36 has an elliptical cross section in its first part 41 which gradually changes into a circular cross section at about the middle of its second part 42. In the second part 42, the front end of an extruded plastic tube 43 is inserted which closely fits second part 42 and follows its inner outline. An annular groove 48 is cut into the front end of tube 43, whereas the second part 42 of insert nipple 36 is provided with an annular protrusion 49 at its end which has a slightly larger diameter. Annular protrusion 49 fits annular groove 48 exactly, leading to a press fit between tube 43 and insert nipple 36.

Tube 43 is not quite horizontal. Its free end 44 terminates close before rear wall 46 of can 11. A separation of 1 cm (three-eighths inch) is quite sufficient. The separation must only be large enough to avoid substantial blocking of the air passage by rear wall 46. Tube 43 is sufficiently light to follow the movements of can 11, even when these are jerky, without a loosening of the sleeve joint with part 42. The tube has a smooth inner surface to ensure a laminar flow of air. An inclined cut-out can be provided at free end 44 in order to enlarge the exit area for the air.

By means of the indicated dimensioning, free end 44 is practically always within an air bubble when the can is discharged by pouring in the usual manner, so that the air streaming through end 44 does not have to bubble through the liquid in order to reach the large air bubble. This considerably enhances the quality of the discharge.

The cost of tube 43 is, of course, very small. A complicated extrusion die is avoided through the solution with tube 43. If tube 43 would form one piece with part 42, i.e., simply extend this piece, an extrusion die would be required with a core as long as tube 43 and the second part 42. The full length of the core amounting to almost 30 cm (1 foot) would be without a lateral guide, and since it would have to be quite thin it would not be rigid enough to withstand the injection pressure. Besides the bulkiness of the required extrusion, difficulties would arise because of the long straight channels for such an injection core; the injection speed would have to be reduced and the incidence of rejects would still be high.

However, it is quite simple to extrude insert ring 24 and nipple 36 in one piece. It is advantageous, for instance, to make the separation plane of the extrusion halves coincident with the plane of the drawing of FIG. 4. Thus only very short cores are required to fabricate the cavities in the first and second parts 41, 42. It is also possible to slide tube 43 onto second part 42 but then the inner diameter of tube 43 must be increased. It appears, however, that the diameter as shown in the illustration, is sufficient. Furthermore, the narrow tube is less expensive than a wider one and weighs less, so that the joint is subject to less stress.

The elliptical cross section of the first part 41 of the insert nipple 36 has proved advantageous and, as shown in FIG. 5, only reduces insignificantly the discharge area available to the liquid in the spout. The joint area with respect to insert ring 24 can be made

large, so that the common wall 47 of nipple 36 and insert ring 24 is relatively large. This design provides for a stiffer construction while saving material. As shown in the figure, nipple 36 terminates below the upper surface 39 of insert ring 24; it extends through approximately two-thirds of insert ring 24.

The first part 41 of nipple 36 has a larger cross section than the second part 42. It acts thus like a nozzle and the air velocity increases in the second part 42 and in tube 43. In this manner, any liquid which has penetrated into tube 43 or nipple 36 is rather sucked back.

The embodiment represented in FIGS. 6 and 7 differs from the first embodiment with respect to the female thread 26 on insert ring 24 which has a sawtooth-shaped cross section over its full height. Insert ring 24 is further provided with a lug 33 which engages a matching notch 35 in spout 13. Finally, no latching joint is provided between nipple 36 and tube 43.

A screw cap 50 is screwed on the trapezoidal outer thread 15. The cap has a matching inner thread 51 and its central opening 52 is coaxial with the longitudinal geometrical axis 23 of spout 13, but its diameter is smaller than the inner diameter of the spout. The inner rim 53 of central opening 52 presses against a circular angular flange 54, one step of which presses with its downward pointing annular, front surface 56 against front surface 39. The angular flange 54 pertains to discharge pipe 57 which is provided with an annular rib 58 of a wider outer diameter than the diameter of central opening 52, so that screw cap 50 cannot be lost. The distance between annular rib 58 and angular flange 54 is larger than the length of central opening 52. The outside of screw cap 50 is star shaped.

The exterior wall 59 of the discharge pipe 57 begins below the front surface 56 of the circular angular flange 54, where its diameter is slightly less than the inner diameter of ring insert 24, and therefore extends for a certain length into insert ring 24, i.e., up to the height of nipple 36. In this manner a certain guidance is provided for the discharge pipe 57.

Discharge pipe 57 is provided with a vent tube 62, formed in part by a crescent-shaped wall 63 which projects towards the inside of discharge pipe 57, with which it is molded as one piece. Vent tube 62 also shares a substantial part of the exterior wall 59. This results in an approximately elliptical cross section of vent tube 62. This also holds for the length after bend 65 of approximately 30°, experienced by the discharge pipe 57 as well as the vent tube 62. As shown in the representation to scale 1:1 in FIG. 2, the cross section of vent tube 62 is unusually large in proportion to the cross sectional area available to the liquid in discharge pipe 57. The ratio of the cross sectional areas of vent tube 62 and discharge pipe 57 is 1:3, approximately. The outer opening 64 of vent tube 62 is level with the spout of discharge pipe 57.

End 66 of the crescent-shaped wall 63 facing can 11 also reaches below front surface 56 of angular flange 54. End 66 also protrudes into insert ring 24. The distance between front surface 56 of angular flange 54 and face 67 of end 66 of vent tube 62 is slightly larger than the distance between face 68 of nipple 36 and the upper front surface 39 of insert ring 24. When the screw cap 50 is tightened, face 67 of vent tube 62 is pressed against nipple 36. The walls of nipple 36 and vent tube 62 are thus tightly butted in the part of the

spout accessible to the liquid. This makes an additional rubber seal unnecessary. No liquid can penetrate through the joint into vent tube 62 or nipple 36. The elliptical cross sections of both tubes 36 and 62 have approximately the same dimensions.

The discharge pipe 57 can also be easily fabricated by injection molding of thermoplastic materials. Vent tube 62, as well as the discharge pipe 57, are tapered towards bend 65. Beyond the bend, the walls are approximately parallel. Discharge pipe 57 can therefore be injection molded by means of four cores, butted at the approximate location of bend 65, using two mold parts.

The common wall of discharge pipe 57 and vent tube 62 is provided with a slot 71 which connects vent tube 62 with the outside air. Slot 71 is located at approximately half the height of discharge pipe 57 or vent tube 62. Thus slot 71 is at a sufficient distance above end 44 of tube 43 to prevent the liquid from reaching slot 71 or discharging therefrom. By providing slot 71 it is furthermore possible to use a support core during injection molding. This support core maintains the position of the core for vent tube 62, which is thin and long.

The device according to the invention results in a discharge time of approximately 18 seconds for a 20 litre (5 gallon) can.

The device according to the invention can be applied to all kinds of jerry cans, and is therefore not limited to cans with a screw cap, for instance. Accordingly, it is also applicable to cans with a clasp lock. In this case the screw cap 50 has simply to be replaced by an equivalent cap. Swivelling and known clasps are attached to this cap which engage appropriate protrusions on the spout. A substantial modification is not required. It is, of course, also possible to apply the device according to the invention to cans of smaller capacity than 20 litres (5 gallons) and also to cans which only have one center handle, for instance.

For 20 litre cans, the preferred diameter of tube 43 would be at least 8 mm and preferably 10 mm, approximately. The length of tube 43 would be about 23 cm. The length of the second portion 42 of the nipple 36 would be about 55 mm and the overlap between them would be about 25 mm. Tube 43 would weigh about 15 grams. The elliptical cross-section has an area of approximately 300 mm². The first portion 41 of discharge pipe has a length of approximately 175 mm and following the 30° bend, a second portion 42 of approximately 55 mm. Its inner diameter at its end facing the spout 13 is about 41 mm, about 37 mm in the region of the bend and about 32 mm at its discharge end.

What is claimed is:

1. A device for the venting of a plastic can having a spout comprising injection molded plastic insert ring means retained in the spout so that it cannot be rotated or axially displaced, and rigid, venting tube means formed of two parts, the first part of the venting tube means comprising an injection molded, bent nipple means formed integrally with the insert ring means and the second part of the venting tube means comprising commercially available tube means rigidly secured to said bent nipple means and substantially longer than said bent nipple means, said nipple means having first and second portions,

the first portion of said nipple means extending from the vicinity of the inner perimeter of the spout and being substantially parallel to the geometrical longitudinal axis of spout and the second portion of said nipple means being bent and pointing towards the upper portion of the rear wall of the can, said tube means being tightly jointed in a telescopic manner, at least by a press fit, to the second portion of said nipple means, the free end of said tube means terminating close to the rear wall of the can, a discharge pipe attached to the spout, a vent tube at least partially located within said discharge pipe, the cross-sections of the vent tube and said nipple means being substantially equal, said vent tube and said nipple means being butted together.

2. A device in accordance with claim 1, in which the discharge pipe and the vent tube share a portion of their wall,

the insert ring means and the nipple means share a portion of their wall,

the nipple means extends through approximately 2/3 of the insert ring means,

the wall common to the discharge pipe and the vent tube rests against the inside of the wall common to the insert ring and the nipple means and the front faces of the walls of the vent tube and the nipple means are tightly abutted.

3. A device for venting a plastic can having a spout comprising

an injection molded plastic insert ring rigidly retained in the spout,

an injection molded plastic nipple formed integrally with the plastic insert ring and having a bend therein,

said nipple means having first and second portions, the first portion of said nipple means comprising a first portion of a vent tube extending from the vicinity of the inner perimeter of the spout and being substantially parallel to the geometrical longitudinal axis of the spout and the second portion of said nipple means being bent and forming a continuation of the vent tube pointing towards the upper portion of the rear of the can,

tube means joined to the second portion of said nip-

ple means forming a further continuation of the vent tube and extending towards the rear wall of the can,

a discharge pipe attached to the spout,

a second portion of the vent tube being located within the discharge pipe,

the first and second portions of the vent tube being butted together at their ends, the cross-sections of the two portions of the vent tube substantially equal.

4. A device in accordance with claim 3 for a can with a threaded cap in which the discharge pipe has a screw cap which can be screwed onto the spout.

5. A device in accordance with claim 3 for a can with a clasp lock in which the discharge pipe is provided with a clasp cap.

6. A device in accordance with claim 3 in which the vent tube has at least one aperture open to the outside air.

7. A device in accordance with claim 6 in which the aperture has an elongated ellipse.

8. A device in accordance with claim 6 in which the aperture is located approximately at half the height of the discharge pipe.

9. A device in accordance with claim 3 in which the discharge pipe is slightly tapered towards its discharge end.

10. A device in accordance with claim 3 in which the vent tube narrows slightly towards the discharge end of the discharge pipe.

11. A device in accordance with claim 3 in which the cross sectional areas of vent tube and discharge pipe are in the approximate ratio of 1 : 3.

12. A device in accordance with claim 3 in which the discharge pipe is fabricated by injection molding.

13. A device in accordance with claim 3 in which the discharge pipe is circular and comprises a first portion which is approximately 175 mm long, followed by a bend at an angle of approximately 30° and a second portion which is approximately 55 mm long and has an inner diameter of approximately 41 mm at its end facing the can spout, of approximately 37 mm in the region of the bend, and of approximately 32 mm at its discharge end, and in which the can has the dimensions of a 20 litre jerry can.

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