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2,907,489

DISPOSABLE VENT PLUG

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FIG. 1

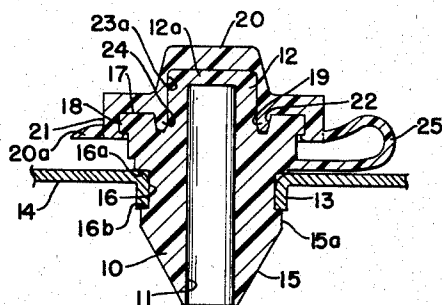


FIG. 2

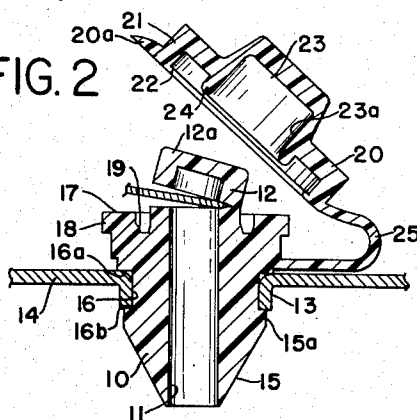


FIG. 3

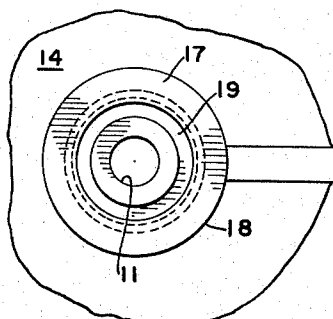


FIG. 4

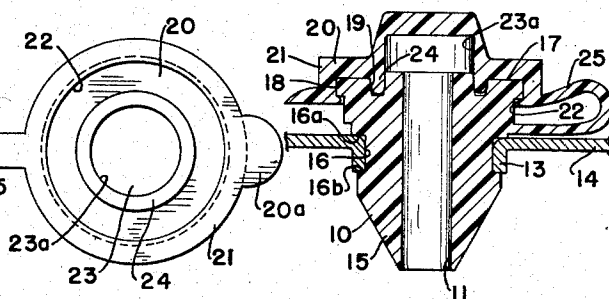


FIG. 5

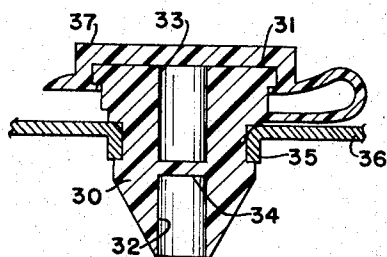


FIG. 6

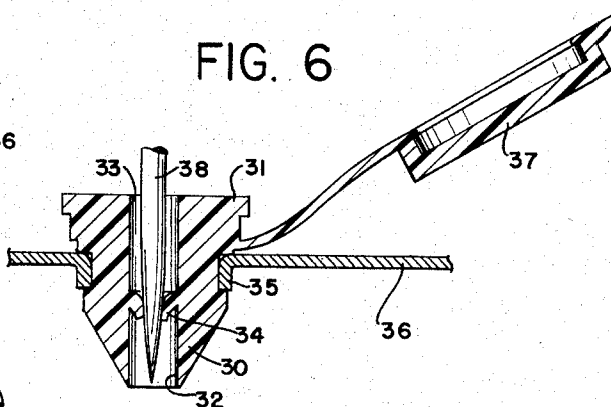
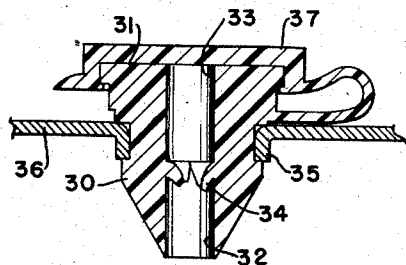


FIG. 7



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1

2,907,489

DISPOSABLE VENT PLUG

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5 Claims. (Cl. 220—27)

The present invention relates to vent closures for liquid containers and the like, and more particularly to a novel and improved disposable plug adapted to be inserted in the vent opening of a liquid container to seal the opening until such time as the contents are drained from the container. Although the article of the invention has a variety of uses, it may be advantageously employed as a closure for the vent openings of large drums, for example.

In connection with the handling of the various liquids in large drums and similar containers, it is conventional to provide separate pouring and vent openings in an end wall of the container, so that air may be admitted into the container as the liquid contents thereof are expelled through the main outlet. It is also conventional to provide suitable closure means for the vent opening which will seal the opening during storage and transportation of the container and which may be opened when desired to provide an air vent. The present invention provides an improved closure device adapted to be quickly and easily placed in the vent opening of a container wall to provide a durable and tamperproof seal. The new closure device is of a disposable type, in that it is opened by rupturing or severing a sealing element, and, in accordance with the invention, novel arrangements are provided to facilitate opening of the vent in this manner.

One of the specific features of the invention resides in the provision of a disposable vent plug which is formed of a semi-resilient plastic material and is adapted to be inserted into the vent opening of a drum or container in a manner such that the opening is sealed and removal of the closure device is not possible without its destruction. The closure device or plug has passage means therein closed and sealed by an integral wall, which must be severed or punctured to permit the passage of air through the vent opening. The new plug also has a cap attached thereto by a flexible element and adapted to be received in sealing relation over the exposed outer end of the plug. Prior to severing or puncturing of the sealing wall, the cap serves to maintain the outer end of the plug free of dirt and other foreign matter, and subsequent to the severing or puncturing of the primary seal to close off the vent opening and provide a temporary seal.

In the preferred form of the invention, the vent plug has a boss which projects from its exposed outer end and forms the sealing wall closing off the vent passage. In this form of the invention, the vent may be opened by severing the boss from the body of the plug, with a knife or similar instrument, or by puncturing the outer end wall of the boss. This is of particular advantage in that the vent may be opened with a variety of instruments, as may be convenient at the time. In a second form of the invention, the sealing wall is recessed in the plug, intermediate the ends of the vent passage, and is opened by inserting a suitable puncturing tool in the vent opening. In either form of the invention, the sealing wall for the vent passage forms an integral part of the plug and must be destroyed in order to open the vent passage. Accordingly it may be readily determined by inspection of the

2

vent plug whether or not the container has been opened.

Another feature of the invention resides in the provision of a novel and improved disposable vent plug having the advantageous features described above which may be manufactured at low cost. In accordance with the invention, the plug and its attached cap constitute a one piece plastic molding of a simplified type, formed of polyethylene or similar material. The low cost of the new plug renders it ideally suited for one-trip or disposable use, wherein the plug is removed and discarded after the contents of the drum or container have been exhausted.

For a better understanding of the invention, reference should be made to the following detailed description and accompanying drawing, in which:

Fig. 1 is a longitudinal cross-sectional view of a preferred form of the new vent plug, with its cap closed, in operative position in the vent opening of a container;

Fig. 2 is a cross-sectional view of the vent plug of Fig. 1, with the vent passage sealing wall severed therefrom and with the cap open;

Fig. 3 is a top plan view of the plug of Fig. 1, with the sealing wall severed therefrom and with the top open flat;

Fig. 4 is a longitudinal cross-sectional view of the plug of Fig. 1, with the sealing wall severed therefrom and with the cap closed;

Fig. 5 is a longitudinal cross-sectional view of a second form of the new plug, with its cap closed, in position in the vent opening of a container;

Fig. 6 is a longitudinal cross-sectional view of the plug of Fig. 5 with the cap open and with a puncturing tool inserted through the vent passage sealing wall; and

Fig. 7 is a longitudinal cross-sectional view of the plug of Fig. 5, with the sealing wall punctured and the cap closed.

Referring now to the drawing, and initially to Figs. 1—4 thereof, the numeral 10 designates generally the body portion of the new vent plug, which is preferably formed of polyethylene or similar plastic material. Opening at the lower end of the body 10 is an axially disposed recess 11 which extends throughout the entire length of the body member 10 and into a circular boss 12 formed integrally at the upper or outer end of the body. The upper end of the recess 11 is defined by the side wall of the boss 12 and is closed off or sealed by the top wall 12a of the boss.

It is contemplated that the new vent plug will be inserted into a vent opening 13 in a wall 14 of a liquid drum or container, not shown. To this end, the lower or inner end of the body 10 is provided with a frusto-conical or pointed end portion 15. The extreme lower end of the pointed portion 15 is of smaller diameter than the vent opening, while the upper end 15a of the pointed portion is of slightly greater diameter than the vent opening.

Directly above the pointed end portion 15 of the plug is an annular recess 16, the upper and lower edges of which define oppositely facing shoulders 16a, 16b. As will be observed in Fig. 1, for example, the upper shoulder 16b is advantageously somewhat larger than the lower shoulder 16a. The arrangement is such that the pointed end portion of the plug may be inserted in the vent opening 13 of the container by applying sufficient axial pressure to the plug to compress the plug radially and allow the shoulder 16b to pass through the opening. In this respect, the material of which the plug is formed is of a semi-resilient nature, so that after the shoulder 16b has passed through the opening 13 the compressed portion of the plug expands to lockingly engage the shoulder 16 with the wall 14 of the container and to provide a tight seal between the plug and the vent opening. Since the upper shoulder 16a is considerably larger than the lower shoulder 16b the former acts as a positive

stop to limit the extent to which the plug may be inserted into the vent opening 13.

At its upper end, the body portion 10 of the vent plug has a relatively flat upper surface 17, which is a substantial distance below or inwardly of the outer end 12a of the boss 12. Advantageously, an outwardly facing annular groove or recess 19 is formed in the upper end of the body 10 immediately adjacent the side wall of the boss 12. The inner wall of the recess 19 defines the base portion of the boss 12, while the outer wall of the recess 19 defines the inner edge of the end surface 17. Also at the upper end of the body 10 is a radial flange or bead 18 which projects outwardly of the general outlines of the body.

When the plug as thus described is inserted in the vent opening 13, the opening is completely sealed off, since there are no passages through the plug 10. In accordance with the invention, a vent passage may be provided by severing the outwardly projecting boss 12 with a knife, for example, or by puncturing the outer end wall 12a of the boss. This opens the upper end of the axial recess 11, so that the latter produces the desired vent passage.

As one of its advantageous features, the new vent plug includes a cap 20 which is adapted to be received over the outer end of the plug to maintain the exposed end surface free of dirt and other foreign matter and to provide a temporary seal after the boss 12 has been severed or punctured. As shown best in Fig. 2, the cap 20 has a depending side wall 21 adapted to be closely received about the flange 18 at the upper end of the plug. At the lower edge of the side wall 21 is a circumferential bead 22 which is adapted when the cap is in position on the end of the plug to engage the lower surface of the flange 18 and lock the cap 20 in place. In its central portion, cap 20 has a recess 23 having cylindrical side walls 23a adapted to be received tightly about the cylindrical walls of the boss 12. At the lower or outer edge of the recess 23 is an axially projecting annular bead 24 which is complementary to the upwardly facing recess 19 in the plug body and is adapted to be received in this recess when the cap is applied to the end of the plug. Advantageously the recess 19 and annular bead 24 are of such relative dimensions that the bead 24 fits tightly into the recess 19, forming a seal between the cap and plug body 10.

To facilitate removal or opening of the cap 20, an integral tab 20a is provided at one side thereof. The tab 20a projects radially from the cap and is adapted to be manually engaged when the cap is lifted from the plug.

In the preferred form of the invention the cap 20 is molded of polyethylene or similar material, and is formed as an integral part of the plug body 10. In this respect, it will be observed that an elongated flexible element 25 connects integrally at its opposite ends with the plug body 10 and cap 20. This is desirable in that the cap 20 cannot be lost or misplaced when temporarily removed from the plug.

In using the vent plug of Figs. 1-4, it is contemplated that the plug will be inserted in the vent opening prior to or at the time of the filling of the container. The cap 20 is kept in place over the exposed outer end of the plug during times when the container is in storage and transit, so that the boss 12 is kept clean and free of foreign matter. When it is desired to withdraw the contents of the container the vent plug may be opened by either severing the boss 12 with a knife, as shown in Fig. 2, or by puncturing the end wall 12a of the boss.

After the boss 12 has been punctured or severed from the plug body 10, the primary seal of the plug is permanently destroyed. However, to provide a temporary seal, so that the vent may be closed after only part of the contents of the container have been withdrawn, the cap 20 may be placed over the end of the plug body, as shown in Fig. 4. In this respect, the recess 19 in the plug body

and cooperating annular bead 24 on the cap form a first seal since it is practically impossible to sever the boss without leaving at least a small base portion thereof, substantially as indicated in Figs. 2 and 4. Accordingly, when the cap 20 is replaced on the exposed end of the plug the annular bead 24 enters the recess 19 and forms therewith an annular seal immediately surrounding the severed boss 12 in the open recess or passage 11.

In addition to the seal provided by the bead 24 and recess 19, an additional seal is afforded between the depending side wall 21 of the cap 20 and the flange 18 at the outer end of the plug. It will be understood in this respect that the cap 20, being formed of a semi-resilient material, may be so dimensioned as to fit tightly about the flange 18.

In the event the vent plug is opened by puncturing the end wall 12a, rather than severing the boss 12 transversely, the sealing ability of the cap 20 is further improved. Thus, the cylindrical side walls 23a of the cap recess 23 are adapted to be received tightly about the outer side wall of the boss 12, forming a seal therewith throughout its entire length.

In the form of the invention shown in Figs. 5-7 the body portion 30 of the plug is generally similar to that of the first described embodiment. However, it will be observed that the upper end 31 of the body 30 is generally flat, whereas in the first described embodiment there is a recess 19 and projecting boss 12. The body 30 also has a pair of axially aligned recesses 32, 33 which open at the inner and outer ends respectively of the body and are separated from each other by a sealing wall 34 which forms an integral part of the plug body.

The plug of Figs. 5-7 is inserted into the vent opening 35 of a container wall 36 in the same manner as the plug of Figs. 1-4, and has a cap 37 for covering the exposed end of the plug during shipping and transit. To open the vent, the cap 37 is removed and a suitable pointed instrument 38 is inserted in the upper recess 33 and forced through the sealing wall or web 34, substantially as shown in Fig. 6.

After the primary sealing web 34 has been broken, a temporary seal may be provided by replacing the cap 37 on the exposed end of the plug 30. The cap 37 tightly engages the flanged outer end of the plug body 30 in such manner as to form a seal therewith.

The advantages of the invention should be readily apparent. The new vent plug is of a highly simplified form and is adapted to be manufactured at low cost. For this reason, the new plug is ideally suited for use as a disposable plug, to be discarded after a single use. The new plug, being formed of semi-resilient plastic material, may be quickly and easily installed in a liquid drum or container by merely pushing the plug into the vent opening of the container. The design of the plug body is such, however, that the plug automatically locks itself in place and cannot be removed without destruction of the plug or other evidence of tampering.

In the form of the invention shown in Figs. 1-4, the provision of a boss 12 projecting from the outer end of the plug body and defining the outer end portion of the vent passage recess 11 is productive of substantial advantages. The construction is advantageous in one respect in that the vent plug may be opened with either a cutting or puncturing tool. The design of the boss is such that if the boss is severed from the plug body, means including an unseverable base portion of the boss are provided for forming a temporary vent seal. This construction is such that, with the cap 20 having a bead 24 adapted to be received about the base of the boss 12 and a depending side wall 21 adapted to be received about the flanged outer edge of the body, a double seal is provided when the cap is replaced on the body member. When the vent plug is opened by puncturing instead of severing the boss an even better seal is provided, since the cap has sealing engagement with the unsevered side

walls of the boss. The form of the invention shown in Figs. 5-7 is a less expensive design, and is desirable for applications where a good temporary seal is not of great importance subsequent to opening of the primary plug seal. In the latter form of the invention the main sealing web 34 is recessed in the interior of the body 30, and is thereby well protected from damage during storage and transportation of the liquid containers.

It should be understood that the forms of the invention herein specifically described are intended to be illustrative only as certain changes may be made therein without departing from the clear teachings of the invention. Reference should therefore be made to the following appended claims in determining the full scope of the invention.

I claim:

1. A vent plug for insertion in the vent opening of a large container, such opening being bordered by a laterally extending collar formed out of the container wall stock, which comprises, a generally tubular body member formed of semi-resilient material formed with an axial bore therein extending for substantially the length of said body and closed off by an integral destructible sealing wall, said bore having a diameter which is a minor fraction of the diameter of said body, said body having a frusto-conical inner end portion for insertion through said container wall opening, the smaller end of said frusto-conical portion being at the inner end of said body, said body adjacent the larger end of said frusto-conical portion being recessed radially inwardly into a cylindrical neck portion formed to tightly engage within said opening bordering collar, radially outwardly extending shoulders formed at the ends of said neck portion to engage the ends of said collar, and said body, at its outer portion being formed into a radially enlarged portion including a radially outwardly extending flange, a hollow cap member integrally secured to said enlarged portion by a flexible strap portion said cap portion being formed to overlie the outer end of said outer portion including said flange, said outer end being formed with a substantial flat surface and said cap being formed with an interior flat surface engaged therewith when said cap is assembled on said flange and inwardly extending lip means carried by said cap formed to underlie said flange to secure said cap in tight sealing relationship thereover when said cap is applied in closing position over said flange.

2. A vent plug as in claim 1 in which said integral

sealing wall is located intermediate the ends of said body.

3. A vent plug as in claim 2 in which said sealing wall is positioned substantially centrally intermediate the ends of said bore.

4. A vent plug for insertion in the vent opening of a large container, such opening being bordered by a laterally extending collar formed out of the container wall stock, which comprises, a generally tubular body member formed of semi-resilient material formed with an axial bore therein extending for substantially the length of said body and closed off by an integral destructible sealing wall, said bore having a diameter which is a minor fraction of the diameter of said body, said body having a frusto-conical inner end portion for insertion through said container wall opening, the smaller end of said frusto-conical portion being at the inner end of said body, said body adjacent the larger end of said frusto-conical portion being recessed radially inwardly into a cylindrical neck portion formed to tightly engage within said opening bordering collar, radially outwardly extending shoulders formed at the ends of said neck portion to engage the ends of said collar, and said body at its outer portion being formed into a radially enlarged portion including a radially outwardly extending flange, a hollow cap member integrally secured to said enlarged portion by a flexible strap portion, said cap portion being formed to overlie the outer end of said outer portion, including said flange, said outer end being provided with an annular recess therein surrounding the adjacent end of said bore and said cap being formed with an axially extending annular bead adapted to be received in said recess to form a seal therewith.

5. A vent plug as in claim 4 in which said destructible wall includes a boss projecting axially outwardly above said body and being severable therefrom, said cap being recessed to receive said boss.

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