United States Patent

Barker et al.

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[54] VESSEL WITH STABILIZER

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[52] **U.S. Cl.** **220/69**

[51] **Int. Cl.** **B65d 25/20**

[58] **Field of Search** ..... 220/69, 85 K

[56] **References Cited**

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[57] **ABSTRACT**

A vessel with a convex bottom having adhered to said convex bottom a stabilizing member of a low-density rigid plastic foam.

6 Claims, 2 Drawing Figures

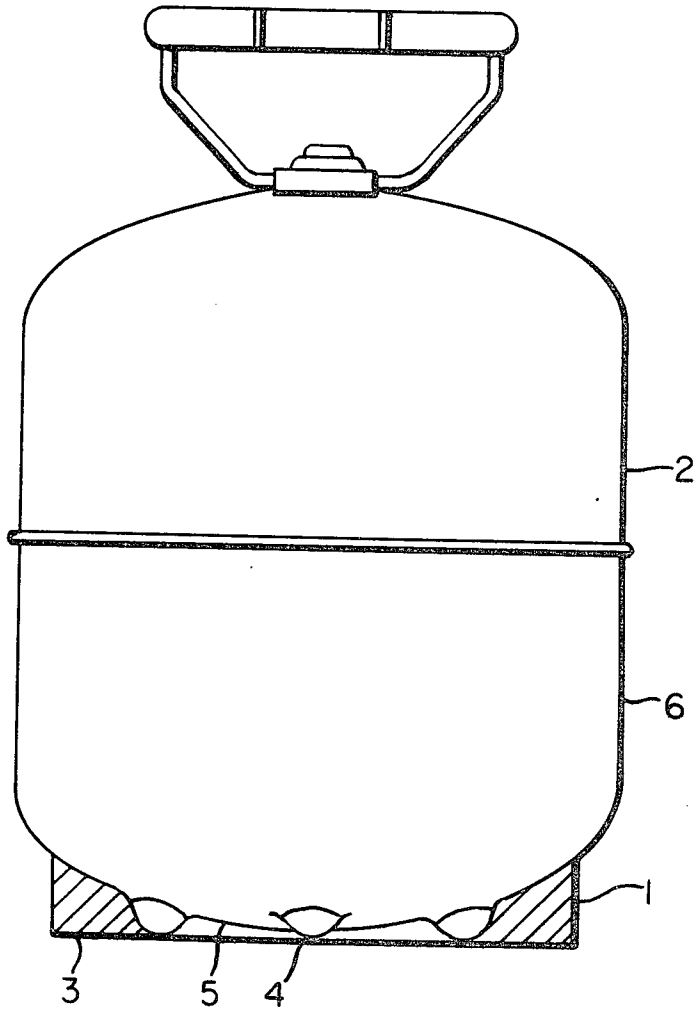


FIG. 1

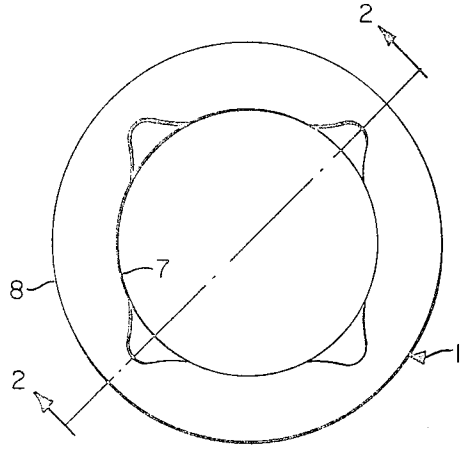
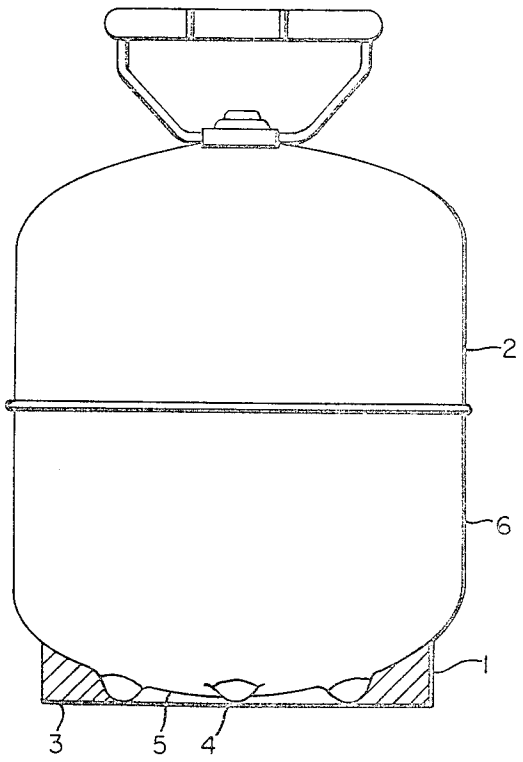


FIG. 2



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VESSEL WITH STABILIZER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an apparatus comprising in combination a vessel and a low-density rigid plastic foam bottom stabilizing member. More particularly, the stabilizing member has a center aperture, an upper surface which conforms with and is adhered to the bottom of the vessel and a lower planar surface which is perpendicular to the longitudinal axis of the vessel. This apparatus may be used as a container for such things as liquefied gases which are used as fuels or refrigerants.

2. Description of the Prior Art

Vessels for containing liquefied gases and the like are constructed of various materials in diverse shapes and sizes chosen to retain the product as a liquid safely at the maximum anticipated temperature. The vessel must withstand handling during shipping, storage, and field use and be convenient to handle by the tradesman utilizing the product. Cylindrical and spherical vessels have long been used because these shapes make possible efficient use of the chosen material of construction. To prevent the vessels from tipping or rolling, base structures of the vessel material or other materials have been attached by suitable methods. Some vessels have themselves been formed with integral protrusions or sharp corners in an attempt to provide the necessary stability.

Now the widespread adoption of lightweight portable nonrefillable vessels for refrigerants and other gases for single trip use has made it uneconomical to continue to use the heavy walled cylindrical vessels used in the past for various products. These nonrefillable vessels are normally formed from two generally similar deep-drawn cylindrical steel shells which are welded or brazed together. The vessels are satisfactorily light in weight but not usually sufficiently stable to be acceptable to the trade when the only support is provided by protrusions formed in the deep-drawn base shell because such protrusions cannot be spaced widely enough apart for proper support without employing additional heat treatment and drawing steps.

The need to lower the cost of the vessels sufficiently to permit single trip use has in general made the provision of previously used support bases unattractive. At the same time, separately formed bases welded or brazed to the vessel may require an additional heat treatment step to relieve stresses in the vessel wall. Resilient or rigid elastomeric or plastic bases used on vessels designed for multiple trip uses may possibly provide sufficient stability but at an unacceptable cost for single trip use vessels. A stabilized vessel of low cost, lightweight, and sufficient durability for the single use period is therefore what is required.

SUMMARY OF THE INVENTION

The present invention is directed to an apparatus comprising in combination a vessel having an outwardly convex bottom and a bottom stabilizing member of a low-density rigid plastic foam. This bottom stabilizing member has a periphery whose length approximates the length of the periphery whose length approximates the length of the periphery of the vessel. The upper surface of the stabilizing member is concave and generally conforms with and is adhered to the convex bottom of the vessel. The lower surface of the stabilizing member is planar and its plane is generally perpendicular to the longitudinal axis of the vessel with the center of the plane intersecting said axis. The center of the stabilizer has an aperture.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view of a vessel bottom stabilizer.

FIG. 2 is a side elevation of a vessel having adhered thereto the stabilizer of FIG. 1 with said stabilizer being shown in a cross-sectional view along line 2—2 of FIG. 1.

DESCRIPTION OF THE INVENTION

The particular vessel to be utilized in specific embodiments of this invention is not critical as will be readily determined by those skilled in the art and will vary according to the purposes for which it is to be used. For example, lightweight portable nonrefillable vessels are often used to contain and transport refrigerants and other gases for single trip use. These nonrefillable vessels, as stated previously, are normally formed from two generally similar deep-drawn cylindrical steel shells which are welded or brazed together.

The bottom stabilizing member or stabilizer which is adhered to the vessel may be made of any of a variety of rigid foamed plastics such as polystyrene or polyurethane. A suitable material is polystyrene foam having a density of 1½ to 2 lbs. per cubic foot (24 to 32 g. per liter). The stabilizer may be adhered to the vessel after finish painting by the use of a suitable adhesive such as the modern hot-melt adhesives.

An embodiment of the apparatus of the present invention can best be described by reference to FIGS. 1 and 2.

A top view of a stabilizer for a portable nonrefillable cylindrical vessel for compressed refrigerant gases is shown in FIG. 1. A cross-sectional view of stabilizer 1 in FIG. 2 shows that the upper surface of the stabilizer conforms to the curvature and any support protrusions of the convex bottom of vessel 2. FIG. 2 shows that the lower surface 3 of the stabilizer is in the plane defined by support protrusions 4 which may be formed in the convex bottom 5 of vessel 2 and outside the vessel as defined by the convex bottom surface itself. Protrusions 4 have been found incapable of providing acceptable stability of the vessels and may be omitted if the stabilizer is used. When the protrusions are present, they facilitate the placing of the stabilizer in the desired position on the vessel. When protrusions are not used, the lower surface of the stabilizer is at the level of the lowest metal portion of the vessel when the vessel is upright.

The ring-shaped stabilizing member shown in FIGS. 1 and 2 is circular in the top view as are the majority of nonrefillable portable vessels used for containing and transporting compressed gases. If a vessel were of another shape in the top view, the stabilizer top view would be changed accordingly to a conforming shape. The length of the periphery of the stabilizer approximates the length of the periphery of the vessel, however, because the vessels normally have an outwardly convex bottom with a large radius between the bottom 5 and the vertical side 6 of the vessel, the length of the periphery of the stabilizer will actually normally be less than the length of the periphery of the vessel to avoid the presence of thin fragile edges on the stabilizer. It has been determined that adequate stability of refrigerant vessels is provided by a stabilizer having peripheral length of 80–90 percent of the peripheral length of the vessel. Vessels with such stabilizers do not readily overturn during transportation in service trucks or when they are suddenly moved about by the user in contrast with vessels having only bottom protrusions which easily overturn during such use. The stabilizer does not cover the entire bottom of the vessel because the presence of a thin fragile center portion contributes little to the effectiveness of the stabilizer, rather, the stabilizer has a center aperture. The periphery of the center aperture of the stabilizer is not critical but rather is dependent upon the compressive strength of the material of the stabilizer.

The stabilizer inner wall 7 and outer wall 8 may be normal to the lower surface 3 or the walls may be tapered at an angle up to 15° to facilitate removal of the stabilizer from the mold used to form it. The upper surface of the stabilizer is concave, generally conforming with the convex bottom of the vessel to which it is adhered. The lower surface of the stabilizer is planar and the plane of this surface is generally perpendicular to the longitudinal axis of the vessel and said axis is in fact intersected by the center of the plane of the lower surface of the stabilizer.

To prevent rocking of the vessel on flat surfaces, the lower surfaces of the stabilizer should be as near to the vessel bottom surface as possible but because the stabilizer is not made of a material having high compressive strength, it does not necessarily project below the lowest metal portion of the vessel. If, however, the stabilizer does in fact project below the lowest metal portion of the vessel, then the center of the plane of the lower surface of the stabilizer will intersect the longitudinal axis of the vessel at a point outside of the vessel.

In addition to sustaining the vessel in a stable upright position, the stabilizer provides shock-absorbing protection during use. Because the vessels normally have two handles but are often lifted by only one handle, one side of the stabilizer often contacts any supporting surface first. The deformation of the stabilizer protects the vessel against shock and reduces noise.

The foregoing detailed description has been given for clearness of understanding only and no unnecessary limitations are to be understood therefrom. The invention is not limited to the exact details shown and described, for obvious modifications will occur to those skilled in the art.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. An apparatus comprising in combination a cylindrical metal vessel having an outwardly convex bottom and a bottom stabilizing member of a low-density rigid plastic foam the length of the periphery of said stabilizer being from 80 to 90 percent of the length of the periphery of the vessel said stabilizer having a concave upper surface generally conforming with and adhered to the convex bottom of said vessel and a planar lower surface the plane of which is generally perpendicular to the longitudinal axis of said vessel and the center of which plane intersects said axis at the level of the lowest metal portion of the vessel when the vessel is upright, said stabilizer having also a center aperture.

2. An apparatus according to claim 1 wherein the bottom stabilizing member is polystyrene.

3. An apparatus according to claim 1 wherein the bottom stabilizing member is polyurethane.

4. An apparatus according to claim 1 wherein the convex bottom of the vessel has support protrusions and the lower surface of the stabilizer is in a plane defined by said support protrusions.

5. An apparatus according to claim 4 wherein the bottom stabilizing member is polystyrene.

6. An apparatus according to claim 4 wherein the bottom stabilizing member is polyurethane.

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