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Inventor(s)	MARTINO; John M.

APPARATUS FOR PIERCING A SEAL OF A LIQUID-FILLED CONTAINER

Abstract

Embodiments of adapters for emptying liquid-filled containers are provided herein. In some embodiments, an adapter for emptying a liquid-filled container includes: an annular ring configured to at least partially be disposed in an opening of the liquid-filled container; one or more spokes extending at least partially across a central opening of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of the liquid-filled container.

Inventors: **MARTINO; John M. (Glen Gardner, NJ)**

Applicant: **J-Sons Equipment Overhaul Inc.** (Kearny, NJ)

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Background/Summary

FIELD

[0001] Embodiments of the present disclosure generally relate to an apparatus for piercing a seal of

a liquid-filled container.

BACKGROUND

[0002] Fluids for use in various applications such as for automotive, agricultural, and industrial applications are often packaged in sealed containers to prevent tampering and leakage or evaporation. The seal of the sealed containers may include a protective film that covers an opening of the container. During use, a user needs to remove or pierce the protective film in order to empty the fluid in the container. However, some protective films are difficult to remove. The user also needs to hold the container and aim the fluids into an opening or spout of a receiving storage vessel. However, such a process requires a user to continuously hold the container and often leads to spillage or splashing of the fluids outside of the storage vessel.

[0003] Accordingly, the inventors have provided herein embodiments of improved adapters for emptying liquid-filled containers.

SUMMARY

[0004] Embodiments of adapters for emptying liquid-filled containers are provided herein. In some embodiments, an adapter for emptying a liquid-filled container includes: an annular ring configured to at least partially be disposed in an opening of the liquid-filled container; one or more spokes extending at least partially across a central opening of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of the liquid-filled container.

[0005] In some embodiments, an adapter for emptying a liquid-filled container includes: an annular ring configured to at least partially be disposed in an opening of the liquid-filled container; one or more spokes extending across a central opening of the annular ring from a first location of the annular ring diametrically opposed to a second location of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of the liquid-filled container, wherein a lower surface of the one or more spokes is substantially flush with a lower surface of the annular ring.

[0006] In some embodiments, a storage vessel includes: a vessel body configured for storing a liquid and having an opening for receiving the liquid; and an adapter at least partially disposed in the opening, the adapter comprising: an annular ring; one or more spokes extending at least partially across a central opening of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of a liquid-filled container.

[0007] Other and further embodiments of the present disclosure are described below.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Embodiments of the present disclosure, briefly summarized above and discussed in greater detail below, can be understood by reference to the illustrative embodiments of the disclosure depicted in the appended drawings. However, the appended drawings illustrate only typical embodiments of the disclosure and are therefore not to be considered limiting of scope, for the disclosure may admit to other equally effective embodiments.

[0009] FIG. **1** depicts an isometric view of an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure.

[0010] FIG. **2** depicts a top view of an adapter disposed in a storage vessel in accordance with at least some embodiments of the present disclosure.

[0011] FIG. **3** depicts a schematic side view of a storage vessel with an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure.

[0012] FIG. **4** depicts a side view of an adapter for emptying a liquid-filled container in accordance

with at least some embodiments of the present disclosure.
[0013] FIG. **5** depicts a side view of an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure.
[0014] To facilitate understanding, identical reference numerals have been used, where possible, to designate identical elements that are common to the figures. The figures are not drawn to scale and may be simplified for clarity. Elements and features of one embodiment may be beneficially incorporated in other embodiments without further recitation.
DETAILED DESCRIPTION
[0015] Embodiments of adapters for emptying a liquid-filled container are provided herein. The adapters are generally configured to be removably disposed in an opening of a storage vessel or integrated with the storage vessel. The adapter generally includes a protrusion configured for piercing a seal of the liquid-filled container. Once the seal is pierced, the liquid from the liquid-filled container begins to flow into the storage vessel. The adapter advantageously facilitates piecing or puncturing the seal. The adapter may also advantageously aid in supporting the liquid-filled container over the storage vessel to facilitate ease of flowing liquid from the liquid-filled container to the storage vessel and reduced handling for a user. With the support provided by the adapter or adapter in combination with the storage vessel, the adapter may advantageously promote one handed emptying of the liquid-filled container. With the support provided by the adapter or adapter in combination with the storage vessel, the liquid-filled container may advantageously be emptied without user support.
[0016] FIG. **1** depicts an isometric view of an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure. FIG. **2** depicts a top view of an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure. The adapter **100** includes an annular ring **102** configured to at least partially be disposed in an opening of the liquid-filled container (see FIG. **2**). The annular ring **102** may include rounded edges at an interface between an upper surface **130** of the annular ring **102** and an outer sidewall **134** of the annular ring **102**. In some embodiments, the annular ring **102** has an outer diameter of about 1 to about 3 inches.
[0017] The adapter **100** includes one or more spokes **106** extending from the annular ring **102** and at least partially across a central opening **110** of the annular ring **102**. In some embodiments, the one or more spokes **106** comprise two spokes that are diametrically opposed to each other and connect such that together, the two spokes extend across the central opening **110** from a first location **112** of the annular ring **102** diametrically opposed to a second location **114** of the annular ring **102**. In some embodiments, the one or more spokes **106** comprise an even number of spokes (e.g., four spokes) that connect in the central opening **110**. In some embodiments, the one or more spokes **106** comprise an odd number of spokes (e.g., three spokes) that connect in the central opening **110**, where the spokes extend from locations along the annular ring **102** that are not diametrically opposed.
[0018] In some embodiments, the one or more spokes **106** and the annular ring **102** define at least two openings **115** through the adapter **100**. In some embodiments, a lower surface **136** of the one or more spokes **106** is substantially flush with a lower surface **142** of the annular ring **102**. In some embodiments, the lower surface **136** of the one or more spokes **106** is disposed above or substantially flush with the lower surface **142** of the annular ring **102** (e.g., the lower surface **136** does not extend beyond the lower surface **142**).
[0019] The adapter **100** includes a protrusion **120** extending from the one or more spokes **106** to a location vertically above the annular ring **102** and configured for piercing a seal of the liquid-filled container. In some embodiments, the protrusion **120** is disposed at a center of the annular ring (i.e., centrally located in the central opening **110**). In some embodiments, the protrusion **120** is offset from the center of the annular ring. In some embodiments, the protrusion **120** has a sharp edge **154** to facilitate puncturing a seal of a liquid-filled container. The adapter **100** is made of a material

such as polymer, metal, wood, or the like.
[0020] In some embodiments, a width **150** of the one or more spokes **106** varies across the central opening **110**. In some embodiments, the one or more spokes **106** decrease in width from the first location **112** to the protrusion **120** and increase in width from the protrusion **120** to the second location **114**. In some embodiments, a height **160** of the one or more spokes **106** varies across the central opening **110**. In some embodiments, the lower surface **136** of the one or more spokes is substantially flat. In some embodiments, an upper surface **144** of the one or more spokes **106** extends upwards so that the one or more spokes **106** increase in height from the first location **112** to the protrusion **120** and the second location **114** to the protrusion **120**. In some embodiments, the upper surface **144** of the one or more spokes **106** at the first location **112** and the second location **114** is disposed below an upper surface **130** of the annular ring **102**. In some embodiments, the upper surface **144** of the one or more spokes **106** at the first location **112** and the second location **114** is disposed sufficiently below an upper surface **130** of the annular ring **102** to facilitate supporting a mouth of a container having a diameter smaller than the inner diameter of the annular ring **102** such that the container can be maintained in position by resting against the inner sidewall of the annular ring **102**.
[0021] FIG. **3** depicts a schematic isometric view of an adapter disposed in a storage vessel in accordance with at least some embodiments of the present disclosure. A storage vessel **300** includes a vessel body **310** configured for storing a liquid **304** and having an opening **302** for receiving the liquid **304**. The vessel body **310** may have any suitable size or shape for storing the liquid **304**. For example, the storage vessel **300** may be a windshield fluid reservoir that may be attached to a vehicle such as a car or truck.
[0022] In some embodiments, the vessel body **310** includes a mouth **330** adjacent to the opening **302**. In some embodiments, the mouth **330** includes a ledge **308** so that the adapter may rest on the ledge **308**. In some embodiments, the storage vessel **300** includes a cap **306** configured to close the opening **302**. The cap **306** may be press fit, screwed onto, or removably attached to the vessel body **210** via any suitable manner. In some embodiments, the adapter **100** is entirely disposed in the vessel body **210**. In some embodiments, the adapter **100** may be integrally formed or coupled to the vessel body **210**. In some embodiments, the lower surface **142** of the adapter **100** or the outer sidewall **134** of the adapter **100** includes an adhesive to aid in attaching the adapter **100** to the vessel body **310**.
[0023] In use, a user can flip a liquid-filled container **312** (e.g., windshield wiper fluid, a cleaning fluid, motor oil, antifreeze, or the like) onto the adapter **100** at least partially disposed in the storage vessel **300**. The protrusion **120** of the adapter **100** is configured to puncture a seal of the liquid-filled container **312**, which automatically begins the flow of the liquid from the liquid-filled container **312** into the storage vessel **300**. In some embodiments, the user can simply help balance the liquid-filled container **312** with one hand while the storage vessel **300** is being filled, instead of conventional manners in filling such a storage vessel **300**, which comprises manually puncturing the seal and then aiming the fluid into the mouth **330** of the storage vessel **300**. In some embodiments, once placed on the adapter **100**, the sidewalls of the adapter **100** and/or the sidewalls of the mouth **330** can support the liquid-filled container **312** entirely so that the liquid-filled container **312** may be emptied into the vessel body **310** without support by the user. The adapter **100** advantageously allows for easier refilling of storage vessels **300** with reduced spillage.
[0024] FIGS. **4** and **5** depict a side view of an adapter for emptying a liquid-filled container in accordance with at least some embodiments of the present disclosure. The one or more spokes **106** generally extend vertically above a horizontal plane **410** along an upper surface **130** of the annular ring **102**. For example, the protrusion **120** of the one or more spokes **106** extends vertically above the horizontal plane **410**. In some embodiments, the one or more spokes **106** extend vertically to or above a horizontal plane **420** extending along the lower surface **142** of the annular ring **102**. In other words, the one or more spokes **106** may entirely be disposed vertically above the horizontal

plane **420**. In some embodiments, the one or more spokes **106** are entirely disposed between the horizontal plane **410** and the horizontal plane **420** except for the protrusion **120**.
[0025] In some embodiments, as depicted in FIG. **4**, the protrusion **120** includes a blunt portion **404**. The blunt potion **404** may include a blunt edge or a rounded edge that interfaces with the liquid-filled container **312** when disposed thereon. In some embodiments, an upper surface **412** of the protrusion **120** is substantially flat. In some embodiments, as depicted in FIG. **5**, the upper surface **412** of the protrusion **120** includes the sharp edge **154**. In some embodiments, the protrusion **120** includes a triangular cross-sectional shape. In some embodiments, the protrusion **120** is pyramidal in shape.
[0026] While the foregoing is directed to embodiments of the present disclosure, other and further embodiments of the disclosure may be devised without departing from the basic scope thereof.

Claims

1. An adapter for emptying a liquid-filled container, comprising: an annular ring configured to at least partially be disposed in an opening of the liquid-filled container; one or more spokes extending at least partially across a central opening of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of the liquid-filled container.
2. The adapter of claim 1, wherein the one or more spokes extend vertically to or above a horizontal plane extending along a lower surface of the annular ring.
3. The adapter of claim 1, wherein a width of at least one of the one or more spokes varies across the central opening.
4. The adapter of claim 1, wherein a height of at least one of the one or more spokes varies across the central opening.
5. The adapter of claim 1, wherein the adapter is made of a polymer, metal, or wood.
6. The adapter of claim 1, wherein the annular ring has an outer diameter of about 1 to about 3 inches.
7. The adapter of claim 1, wherein the protrusion is disposed at a center of the annular ring.
8. The adapter of claim 1, wherein the protrusion includes a sharp edge or rounded edge.
9. The adapter of claim 1, wherein the one or more spokes include a plurality of spokes that connect in the central opening.
10. An adapter for emptying a liquid-filled container, comprising: an annular ring configured to at least partially be disposed in an opening of the liquid-filled container; one or more spokes extending across a central opening of the annular ring from a first location of the annular ring diametrically opposed to a second location of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of the liquid-filled container, wherein a lower surface of the one or more spokes is substantially flush with a lower surface of the annular ring.
11. The adapter of claim 10, wherein each of the one or more spokes decrease in width from the first location to the protrusion and increase in width from the protrusion to the second location.
12. The adapter of claim 10, wherein the lower surface of the one or more spokes is substantially flat, and an upper surface extends upwards so that the one or more spokes increase in height from the first location to the protrusion.
13. The adapter of claim 10, wherein an upper surface of the one or more spokes at the first location and the second location is disposed below an upper surface of the annular ring.
14. The adapter of claim 10, wherein the one or more spokes and the annular ring define at least two openings through the adapter.
15. A storage vessel, comprising: a vessel body configured for storing a liquid and having an opening for receiving the liquid; and an adapter at least partially disposed in the opening, the

adapter comprising: an annular ring; one or more spokes extending at least partially across a central opening of the annular ring; and a protrusion extending from the one or more spokes to a location vertically above the annular ring and configured for piercing a seal of a liquid-filled container.

16. The storage vessel of claim 15, wherein a width of each of the one or more spokes varies across the central opening, and wherein a height of each of the one or more spokes varies across the central opening.

17. The storage vessel of claim 15, wherein the storage vessel is a windshield fluid reservoir.

18. The storage vessel of claim 15, further comprising a cap configured to close the opening, and wherein the adapter is entirely disposed in the vessel body.

19. The storage vessel of claim 15, wherein the vessel body include a mouth adjacent to the opening and the mouth includes a ledge, wherein the adapter is configured to rest on the ledge.

20. The storage vessel of claim 15, wherein a lower surface of the one or more spokes is substantially flat, and an upper surface of the one or more spokes extends upwards so that the one or more spokes increase in height from the annular ring to the protrusion.