DRINK CUP LID

PRIORITY CLAIM

[0001] This application claims priority under 35 U.S.C. § 119(e) to US Provisional Application Serial No. 61/801,433, filed March 15, 2013, which is expressly incorporated by reference herein.

BACKGROUND

[0002] The present disclosure relates to drink cups, and particularly to lids for drink cups. More particularly, the present disclosure relates to a seal established between a drink cup and a lid mounted on the drink cup.

SUMMARY

[0003] According to the present there is provided a liquid container comprising:

a cup including a brim, a floor, and a side wall extending from the brim toward the floor, the side wall including a frustoconical inner surface cooperating with the floor to form an interior liquid reservoir chamber of the cup, the brim including a curved outer boundary surface mating with an uppermost portion of the frustoconical inner surface of the side wall and extending away from the uppermost portion, the curved outer boundary surface of the brim having a rounded shape in vertical cross section that extends along a generally circular path subtends an angle of at least 180°, the curved outer boundary surface of the brim having an annular inner sealing portion adjacent to the frustoconical inner surface of the side wall, an annular outer sealing portion away from the inner sealing portion, and an annular middle sealing portion interposed between the annular inner and outer sealing portions, and

a lid including a central closure and a brim mount coupled to the central closure and configured to be mounted on the curved outer boundary surface of the brim to retain the central closure in a position closing a mouth opening into the interior liquid reservoir chamber formed in the cup, the brim mount including a first seal ring arranged to engage the uppermost portion of the frustoconical inner surface

of the side wall to establish a first annular liquid flow barrier between the lid and the cup, a second seal ring arranged to engage the annular inner sealing portion of the curved outer boundary surface of the brim to establish a second annular liquid flow barrier between the lid and the cup, a third seal ring arranged to engage the annular middle sealing portion of the curved outer boundary surface of the brim to establish a third annular liquid flow barrier between the lid and the cup, and a fourth seal ring arranged to engage the annular outer sealing portion of the curved outer boundary surface of the brim to establish a fourth annular liquid flow barrier between the lid and the cup, wherein each seal ring is tapered to define a sloped inner surface that mates with a companion surface of the cup to establish one of the first, second, third, and fourth annular liquid flow barriers between the lid and the cup when the lid is mounted on the cup; wherein the sloped inner surface of each of the first, second, and fourth seal ring has a generally positive slope and the sloped inner surface of the third seal ring has a generally negative slope in a selected cross-sectional profile of the brim mount; wherein the slope of the second seal ring is steeper than the slope of the fourth seal ring and the slope of the first seal ring is steeper than the slope of each of the second and fourth seal rings; and wherein each of the first, second, and third seal rings has a frustoconical shape and the fourth seal ring has a curved shape.

[0003A] The present disclosure also provides, a liquid container comprises a lid adapted to mate with the brim of a cup. The cup also includes a floor and a side wall extending from the brim toward the floor.

[0004] In illustrative embodiments, the lid includes a central closure formed to include the liquid-discharge outlet and a ring-shaped brim mount arranged to surround the central closure. The brim mount of the lid is configured to mate with the brim of the cup to hold the central closure in a stationary position closing a cup mouth opening into an interior liquid reservoir chamber formed in the cup and placing the liquid-discharge outlet in fluid communication with any liquid stored in the interior liquid reservoir chamber of the cup.

[0005] In illustrative embodiments, the brim mount includes four seal rings. Three of the seal rings are configured to mate with the brim of the cup to establish three annular liquid flow barriers between the cup and the lid. Another of the seal rings on the brim mount is configured to mate with an upper portion of an interior

surface of the side wall to establish another liquid flow barrier between the cup and the lid. Two of the four seal rings can be viewed as interior seal rings since they mate with interior portions of the side wall and the cup brim. Another two of the four seal rings can be viewed as exterior seal rings since they mate with exterior portions of the

CLAIMS

1. A liquid container comprising

a cup including a brim, a floor, and a side wall extending from the brim toward the floor, the side wall including a frustoconical inner surface cooperating with the floor to form an interior liquid reservoir chamber of the cup, the brim including a curved outer boundary surface mating with an uppermost portion of the frustoconical inner surface of the side wall and extending away from the uppermost portion, the curved outer boundary surface of the brim having a rounded shape in vertical cross section that extends along a generally circular path subtends an angle of at least 180°, the curved outer boundary surface of the brim having an annular inner sealing portion adjacent to the frustoconical inner surface of the side wall, an annular outer sealing portion away from the inner sealing portion, and an annular middle sealing portion interposed between the annular inner and outer sealing portions, and

a lid including a central closure and a brim mount coupled to the central closure and configured to be mounted on the curved outer boundary surface of the brim to retain the central closure in a position closing a mouth opening into the interior liquid reservoir chamber formed in the cup, the brim mount including a first seal ring arranged to engage the uppermost portion of the frustoconical inner surface of the side wall to establish a first annular liquid flow barrier between the lid and the cup, a second seal ring arranged to engage the annular inner sealing portion of the curved outer boundary surface of the brim to establish a second annular liquid flow barrier between the lid and the cup, a third seal ring arranged to engage the annular middle sealing portion of the curved outer boundary surface of the brim to establish a third annular liquid flow barrier between the lid and the cup, and a fourth seal ring arranged to engage the annular outer sealing portion of the curved outer boundary surface of the brim to establish a fourth annular liquid flow barrier between the lid and the cup:

wherein each seal ring is tapered to define a sloped inner surface that mates with a companion surface of the cup to establish one of the first, second, third,

and fourth annular liquid flow barriers between the lid and the cup when the lid is mounted on the cup;

wherein the sloped inner surface of each of the first, second, and fourth seal ring has a generally positive slope and the sloped inner surface of the third seal ring has a generally negative slope in a selected cross-sectional profile of the brim mount;

wherein the slope of the second seal ring is steeper than the slope of the fourth seal ring and the slope of the first seal ring is steeper than the slope of each of the second and fourth seal rings; and

wherein each of the first, second, and third seal rings has a frustoconical shape and the fourth seal ring has a curved shape.

2. The liquid container of claim 1, wherein the fourth seal ring has a concave shape and the generally positive slope of the fourth seal ring is established by a plane tangent to the fourth seal ring.

3. The liquid container of claim 2, wherein the fourth seal ring is arranged to face toward each of the first, second, and third seal rings, the first seal ring is arranged to face toward the fourth seal ring and away from the second and third seal rings, the second seal ring is arranged to face toward the third and fourth seal rings and away from the first seal ring, and the third seal ring is arranged to face toward the first and second seal rings and away from the fourth seal ring.

4. The liquid container of claim 1, wherein each of the first, second, and third seal rings has a frustoconical shape and the fourth seal ring has a curved shape to present a concave surface in mating engagement with the annular outer sealing portion of the curved exterior surface of the brim of the cup.

5. The liquid container of claim 4, wherein the lid is made of an elastic plastics material, each of the first, second, third, and fourth seal rings has an undeflected shape preparatory to mating engagement of the brim mount of the lid and the cup, and each of the first, second, third, and fourth seal rings has a different deflected shape once the brim mount of the lid is engaged with the cup to assume a mounted position on the cup, and a variation of about 0.010 inch between the undeflected and deflected shapes of each of the first, second, third, and fourth seal

rings defines an interference fit established between the brim mount of the lid and the brim of the cup when the lid is mounted on the cup.

6. The liquid container of claim 5, wherein the sloped inner surface of each of the first, second, and fourth seal rings has a generally positive slope and the sloped inner surface of the third seal ring has a generally negative slope in a selected cross-sectional profile of the brim mount.

7. The liquid container of claim 1, wherein the fourth seal ring is arranged to face toward each of the first, second, and third seal rings, the first seal ring is arranged to face toward the fourth seal ring and away from the second and third seal rings, the second seal ring is arranged to face toward the third and fourth seal rings and away from the first seal ring, and the third seal ring is arranged to face toward the first and second seal rings and away from the fourth seal ring.

8. The liquid container of claim 1, wherein each of the first, second, and third seal rings has a frustoconical shape and the fourth seal ring has a curved shape to present a concave surface in mating engagement with the annular outer sealing portion of the curved exterior surface of the brim of the cup.

9. The liquid container of claim 1, wherein the brim of the cup includes, in series, a first brim segment coupled to the uppermost portion of the side wall, a second brim segment coupled to the first brim segment, and a third brim segment coupled to the second brim segment, the third brim segment surrounds the uppermost portion of the side wall and lies in spaced-apart relation to an exterior surface of the uppermost portion of the side wall, the second brim segment interconnects the first and third brim segments, the curved outer boundary surface is defined by, in series, a first convex curved outer surface of the first brim segment, a second convex curved outer surface of the second brim segment, and a third convex curved outer surface of the third brim segment, the annular inner sealing surface is provided on the first convex curved surface, the annular middle sealing surface is provided on the second convex curved surface, and the annular outer sealing surface is provided on the third convex curved surface.

10. The liquid container of claim 9, wherein the brim further includes a fourth brim segment coupled to a free end of the third brim segment and

formed to include an annular distal tip arranged to lie in spaced-apart relation to the exterior surface of the uppermost portion of the side wall.

11. The liquid container of claim 9, wherein the first, second, and third convex curved outer surfaces have a common center of curvature.