May 8, 1951 V. H. HASSELQUIST 2,551,673

COLLAPSIBLE CONTAINER

Filed Nov. 29, 1947

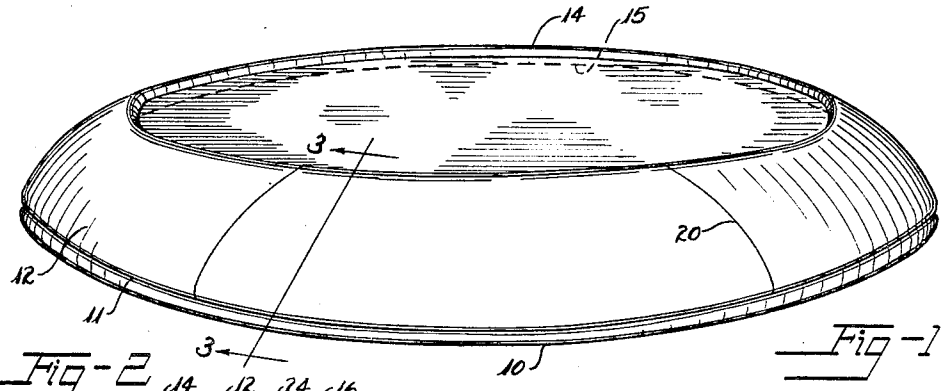


Fig-1

Fig-2

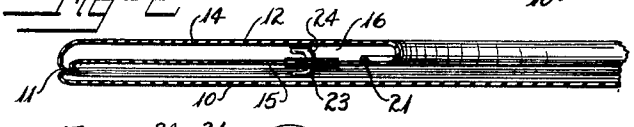
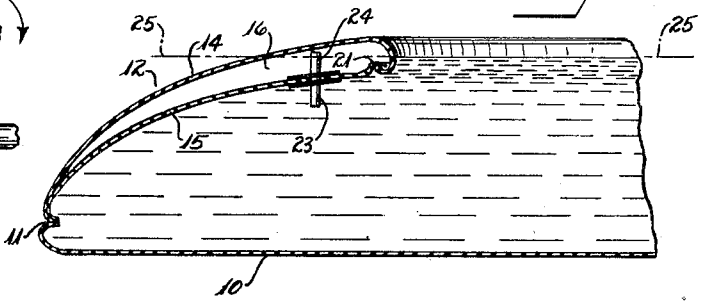


Fig-3



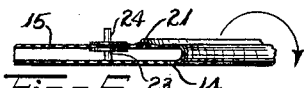


Fig-6

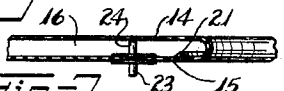


Fig-7

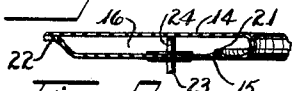


Fig-8

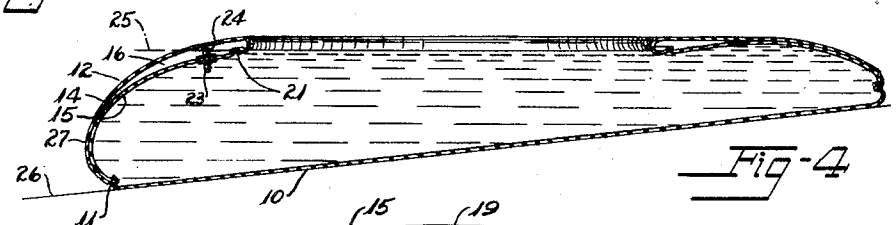


Fig-4

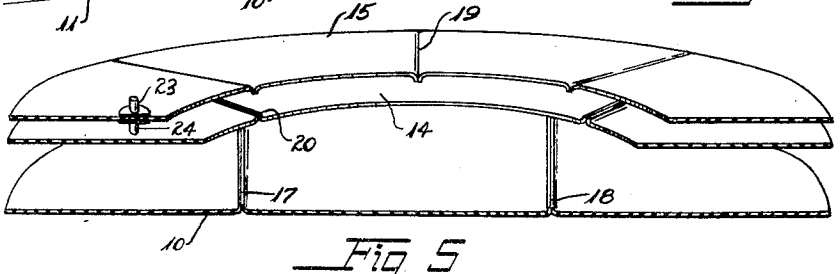


Fig 5

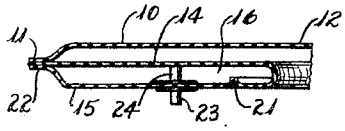


Fig-9

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COLLAPSIBLE CONTAINER

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Application November 29, 1947, Serial No. 788,913

14 Claims. (Cl. 4—177)

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This invention relates to collapsible containers for liquid and is especially useful in the construction of portable wading pools, although the invention is also useful for portable storage tanks for liquid, baths, wash-tubs, stock-watering tanks and containers for other similar purposes.

This invention pertains to improvements in collapsible containers of the type, and the building procedure thereof, which forms the subject of my co-pending application Serial No. 613,994, filed September 1, 1945, now Patent No. 2,529,872, dated November 14, 1950.

Objects of the invention are to provide automatic control of degree of inflation of the side walls, to provide a container in which the side walls retain a flatly arched contour at all positions when the container has liquid therein, to provide for maintaining marginal portions of the side walls in a substantially horizontal disposition, to provide a double-walled structure in which the inner wall sustains a greater tension than the outer wall, to provide a container which is stable when placed on sloping surfaces, to provide effectively for maintaining a head of liquid above the inner side wall, and especially to provide this by maintaining a convex margin of suitable depth, to provide for access of fluid to the space between the inner and outer side walls while nevertheless preventing objectionable entry of liquid, to provide for maintaining slight increase over atmospheric pressure in the buoyant chamber, to provide improved facility of inflation and to provide for convenience of manufacture.

These and other objects will appear from the following description and the accompanying drawings,

Of the drawings,

Fig. 1 is a perspective view of a container corresponding to and embodying the invention, the container being shown as filled with liquid.

Fig. 2 is a radial cross-section thereof with the container empty, parts being broken away.

Fig. 3 is a cross-sectional view thereof taken on line 3—3 of Fig. 1 showing the construction in the filled condition, parts being broken away.

Fig. 4 is a diametrical cross-sectional view of the filled container resting upon an inclined surface.

Fig. 5 is an exploded view showing in superimposed and spaced-apart relation one-half of each of the three sheets of material comprising the container before assembly thereof.

Fig. 6 is a radial sectional view of the side wall sheets seamed together at their inner margins,

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illustrating a step in the manufacture of the container, parts being broken away.

Fig. 7 is a similar view showing the same seamed in reversed position and ready for seaming their outer margins together.

Fig. 8 is a similar view showing the outer margins of the sheets seamed to each other.

Fig. 9 is a similar view showing the outer margins of the side wall sheets seamed to the margin of the bottom sheet.

In accordance with the invention, a container of flexible sheet material is provided in which a bottom of flat sheet material is seamed to a pair of annular flat rings of flexible sheet material to provide a double walled side wall which lies flat upon the bottom sheet in the unfilled condition of the container. Provision is made for an inflatable space between the double walls and for prevention of undesirable over-inflation or undesirable entrance of liquid into the wall space. In the filled condition of the container, the doubled side wall overlies the bottom from which it springs at all positions thereabout in a gradually decreasing curvature with its upper marginal portion substantially parallel to the surface of the liquid, and of substantial thickness providing a standing head of liquid above the margin of the inner wall acting to float its margin by upwardly-directed pressure of the liquid upon the inner wall. The depth of the marginal portion of the wall is increased by joining the wall members to each other at their inner margins by a seam directed inwardly of the inflatable space so that the wall members are stressed at the inner margin of the wall in a manner to provide a margin of convex cross-section in the uninflated condition of the space. The radially inward directed and flatly curved side wall permits local rise and fall of the upper margin with the surge of the liquid in floating relation therewith while presenting stiff resistance to circumferential distortion.

Referring to the drawings, the numeral 10 designates a round flat bottom of flexible sheet material, preferably having some elasticity and of rubber-like physical properties. While soft vulcanized sheet rubber may be employed for all the parts of the container, it is preferred to employ a polymerized vinyl chloride composition or similar material having the property of good resistance to sunlight and adapted to be seamed by heat and pressure. If desired a suitable fabric or other reinforcement may be included in the sheet material, although it has been found that good results are obtained without such reinforcement,

the polymerized vinyl chloride providing good strength for the purpose.

Joined to the bottom by a circumferential seam 11 is an annular side wall 12 of double-walled construction and comprising two annular flat sheets 14 and 15 providing an annular space 16 therebetween. As seen in Fig. 5, the bottom sheet 10 and the annular side wall sheet 14, 15 are all of substantially the same outside diameter, whereas the inside diameter of the side wall sheet 15 is considerably greater than the inside diameter of the side wall sheet 14. This is for the purpose of placing the inner wall 15 under greater tension than the outer wall 14 when the container is in use. While the bottom sheet and the side wall sheets have been mentioned as single sheets, in large containers these may each be made up of smaller pieces seamed together, as for economy of material. When so formed of pieces, the bottom is preferably made up of two or more sheets seamed, as at 17, 18, chordwise of the bottom, while the side wall sheets are preferably made up of segments joined by radial seams 19, 20, as such seams do not detract from the appearance and do not interfere with uniform bowing of the side walls under load, while at the same time, such seams reinforce the side walls radially.

The inner and outer wall sheets are joined at the inner peripheries by a seam 21, preferably turned inwardly of the space 16, as such a seam induces rounding and increased thickness at the inner margin of the side wall, a feature desirable in providing a well extending above the level of the liquid for providing a hydraulic head of liquid.

The inner and outer walls 14, 15 are also seamed together about their outer margins, as at 22 (see Fig. 8) and these margins are united to the bottom by the seam 11 which for desirable appearance is an inwardly directed seam.

The space 16 is provided with a tubular flanged inflating nipple 23 sealed at its flanged base to the sheet 15 about an aperture therethrough near the inner margin of the sheet whereby the space may be slightly inflated by mouth or otherwise to provide buoyancy. The tube is of such length as to provide a head of liquid from the elevation of the submerged opening of the nipple to the elevation of the surface of the liquid in the container, equal to the desired air pressure in the space 16, any excess pressure being compensated for by escape of air from such opening. To prevent flow of liquid from the container into the space 16 by way of the nipple 23, a stack 24 in the form of a similar tube is affixed about the same aperture of the sheet 15 at the opposite side of the sheet, or within the space 16, and is of such length as to stand, in the filled condition of the container, above the line 25 of liquid level. In filling the container, the stack 24 will always be above the level of the liquid, as within the capacity of the container the side walls rise, in filling, from a position resting upon the bottom to a floating position upon the liquid.

Where such a container is placed upon an inclined surface 26, as in Fig. 4, a horizontal component of the downwardly-acting weight of the liquid will tend to bulge the side wall, as at 27 at the downhill side of the container. This, however, will be balanced by the horizontal stiffness toward circumferential distortion provided by the normally flat shape of the side wall sheets and their substantially flat disposition upon the liquid.

In the manufacture of the container, the outer wall sheet 14 is stretched until its central opening is equal to that of the inner wall sheet 15. The inner margins of the two sheets are then seamed to each other at 21 (see Fig. 6), the nipple 23 and stack 24 having perviously been secured to the sheet 15 about the inflation aperture therein. Upon release of tension, the seam 21 will assume a position outwardly of the fold as shown. The sheet 15 is then grasped and turned in the direction of the arrow and passed through the central aperture of the joined sheets to reverse the article and turn the seam 21 inwardly as shown in Fig. 7.

The sheets 14, 15 are then seamed to each other about their outer margins, as at 22 in Fig. 8. The bottom 10 is now laid over the assembled side wall adjacent the sheet 14, as in Fig. 9, and seamed to the seamed margin 22, as at 11, the combined seams extending outwardly of the article. The article is then turned inside out to bring the seam 11 to the inside of the article, as seen in Fig. 2. When the article has been made of polymerized vinyl chloride composition or similar thermoplastic sheet material in which the seams are made by applying heat and pressure, the article is complete. When such articles are made of rubber or other thermosetting materials, they may be vulcanized or otherwise suitably heat-treated in order to complete them.

The finished article lies flat and may be rolled or folded for packing and shipment. In using the container, it is spread out preferably upon a flat surface, a slight amount of air is blown into the nipple 23 to open the space 16. Water or other liquid is then poured upon the bottom and the side walls rise automatically as the container is filled. If too much air has been blown into the space 16, the excess will automatically escape and bubble out.

Due to the fact that the inner wall 15 is normally narrower than the wall 14, it is subjected to tension and assumes the load of the liquid. The air between the adjacent inner and outer side walls holds the outer wall under less tension while inflating it sufficiently to provide a smooth unwrinkled rounded appearance, pressure of the air being low and dependent upon the elevation of liquid above the lower end of the nipple 23. Due to the low pressure within the cavity 16, puncture of the outer wall is difficult and the presence of porosity is not fatal.

The tendency of the material at the juncture of the inner and outer side wall sheets about their inner peripheries, due to the inwardly turned seam provides a degree of natural inflation of the space 16 at atmospheric pressure, and while the pressure so provided in space 16 is low, there is considerable volume of space so that often artificial inflation is unnecessary. The entrapped air is necessarily compressed as the container is filled by movement outwardly of the inner wall.

Variations may be made without departing from the scope of the invention as it is defined by the following claims.

I claim:

1. A collapsible liquid container comprising a bottom member, a marginal wall of flexible material secured thereto and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double walled pocket of said wall, and said wall members being joined to each other at their inner margins by a seam directed inwardly

of said pocket and holding said members adjacent said seam in spaced apart relation to provide depth to the inner margin.

2. A collapsible liquid container comprising a bottom member, a marginal wall of flexible material secured thereto and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double walled pocket of said wall having in the unfilled condition of the container an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere by virtue of the liquid within the container, and said wall members being joined to each other at their inner margins by a seam directed inwardly of said pocket and holding said members adjacent said seam in spaced-apart relation to provide depth to the inner margin.

3. A collapsible liquid container comprising a bottom member, a marginal wall of flexible material secured thereto and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double-walled pocket of said wall having in the unfilled condition of the container an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere by virtue of the liquid within the container, and means within said pocket at said aperture in communication therewith and extending above the level of the liquid in the filled condition of the container for preventing flow of liquid into said pocket.

4. A collapsible liquid container comprising a bottom member, a marginal wall of flexible material secured thereto and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double-walled pocket of said wall having in the unfilled condition of the container an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere by virtue of the liquid within the container and a tubular body communicating with said aperture and extending above the same in said pocket to a height to prevent flow of liquid into said pocket from said container.

5. A container as defined in claim 4 in which said tubular body comprises a tube of material having self-supporting stiffness mounted on said inner wall member at said aperture.

6. A collapsible liquid container comprising a bottom member, a marginal wall of flexible material secured thereto and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising

inner and outer wall members providing therebetween a double-walled pocket of said wall having in the unfilled condition of the container an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere by virtue of the liquid within the container, a tubular body communicating with said aperture and extending above the same in said pocket to a height to prevent flow of liquid into said pocket from said container, and a tubular stem extending downward from said aperture at the lower side of said inner member.

7. A collapsible liquid container comprising a round flat bottom member, a normally flat marginal wall of flexible material secured thereto about its periphery and overlying the bottom member, said wall including means at the inner margin thereof for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double walled pocket of said wall having in the unfilled condition of the container, an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere by virtue of the liquid within the container, and said wall members being joined to each other at their inner margins by a seam directed inwardly of said pocket and holding said members adjacent said seam in spaced-apart relation to provide depth to the inner margin.

8. A collapsible liquid container comprising a round flat bottom member, a normally flat marginal wall of flexible material secured thereto about its periphery and overlying the bottom member, said wall including a deep flexible inner margin, and means at the margin for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double walled pocket of said wall having in the unfilled condition of the container an inflation aperture in the inner wall member in communication with the atmosphere at a position below the upper margin of the container and in the filled condition of the container in closed relation to the atmosphere sealed by virtue of the liquid within the container, and means within said pocket at said aperture in communication therewith and extending above the level of the liquid in the filled condition of the container for preventing flow of liquid into said pocket.

9. A collapsible liquid container open substantially across its top comprising a bottom member, a marginal side-wall of flexible material secured thereto and overlying the bottom member, said side-wall having a deep flexible inner margin, and means included in said side-wall margin for buoyantly supporting the side-wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer side-wall members providing therebetween a double walled pocket of said side-wall, said inner wall member being of less width than said outer wall member and thereby sustaining substantially the entire hydrostatic load on said side-wall in the filled condition of the container.

10. A collapsible container comprising a round flat bottom member, a normally flat marginal wall of flexible material secured thereto about its periphery and overlying the bottom member, said wall having a deep flexible inner margin, and means included in said wall margin for buoyantly supporting the wall above the bottom member in the presence of liquid within the container, said means comprising inner and outer wall members providing therebetween a double walled pocket of said wall, said inner member being of less radial width than said outer wall member and thereby sustaining substantially the entire hydrostatic load on said wall in the filled condition of the container.

11. A collapsible container comprising a bottom member, a marginal wall member of flexible sheet material extending thereabout, said wall member comprising two layers of flexible sheet material united to each other and to said bottom and having their inner peripheries united to each other by a seam directed inwardly between them to provide a double wall having a smaller upper perimeter than said bottom and defining an air space between said layers, and means below the top of said wall providing communication between the interior of the container and said space below the level of fluid in the filled condition of said container.

12. A collapsible container comprising a bottom member, a marginal wall member of flexible sheet material, said wall member comprising two layers of flexible sheet material of flat annular shape united to each other and to said bottom and having their inner peripheries united to each other by a seam directed inwardly between them to provide a double wall having a smaller upper perimeter than said bottom and defining an air space between said layers, means below the top of said wall providing communication between the interior of the container and said space below the level of fluid in the filled condition of said container, and means between said layers in communication with the last said means and extending above the level of liquid in the filled container for preventing flow of liquid into said space.

13. A collapsible container comprising a bottom member, a marginal wall member of flexible sheet material extending thereabout, said wall member comprising two layers of flexible sheet material of flat annular shape united to each other and to said bottom thereabout by a seam directed inwardly of said container and having their inner peripheries united to each other by a seam directed inwardly between them to provide a double wall having a smaller upper perimeter than said bottom and defining a space between said layers, the layer adjacent said bottom member being of less radial width than the other of said layers and thereby sustaining substantially the entire hydrostatic load on said wall member in the filled condition of the container.

14. An open-top collapsible container for liquid comprising an impervious base and a peripheral wall of flexible material secured thereto, said wall comprising inner and outer wall members of impervious material joined to each other along their outer peripheries and to said base, and joined together along their inner peripheries above said base to provide an air-pocketing chamber between them, the inner peripheries of said wall members being smaller than the enclosed area of said base so that the center of buoyancy of any cross-section of said air-pocketing chamber is within and above the wall-enclosed area of said base for support of the peripheral wall on a liquid in the container by buoyancy of said chamber, and said inner wall member being of less width than the width of said outer wall member and thereby sustaining substantially the entire hydrostatic load on said wall in the filled condition of said container.

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