Nov. 4, 1952 V. H. HASSELQUIST 2,616,096

COLLAPSIBLE POND

Filed Jan. 17, 1948 2 SHEETS—SHEET 1

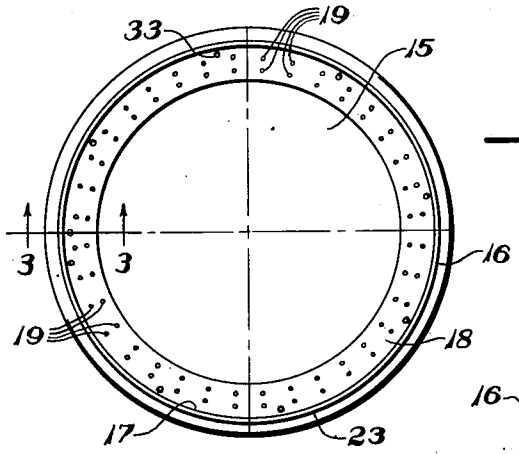

Fig - 1

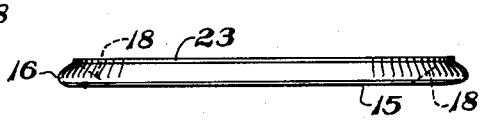

Fig - 2

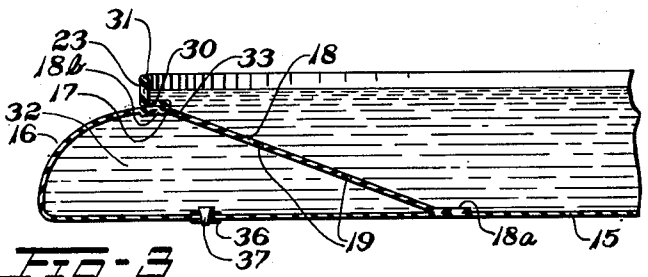

Fig - 3

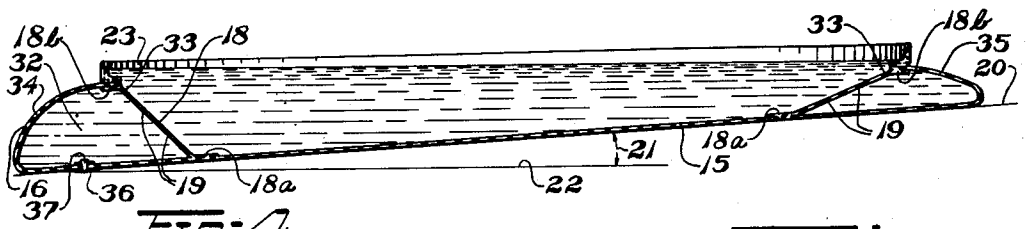

Fig - 4

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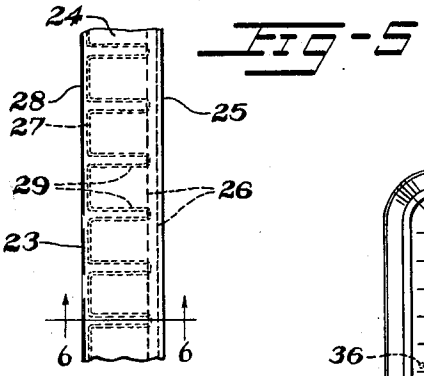

Fig-5

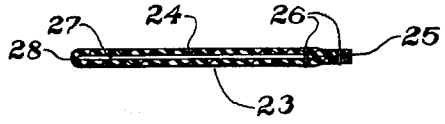

Fig-6

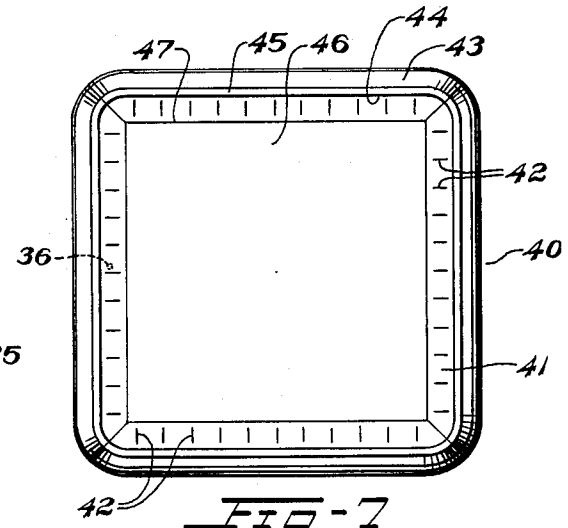

Fig-7

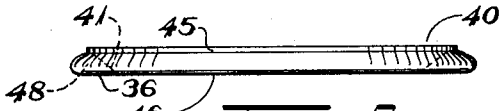

Fig-8

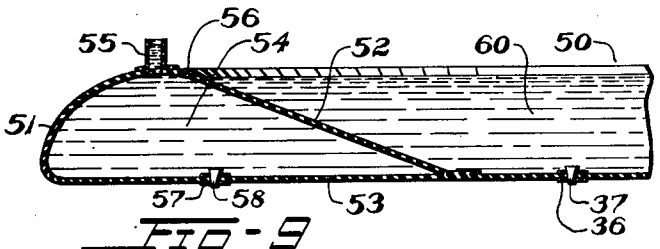

Fig-9

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Patented Nov. 4, 1952 2,616,096

UNITED STATES PATENT OFFICE

2,616,096

COLLAPSIBLE POND

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Application January 17, 1948, Serial No. 2,931

7 Claims. (Cl. 4—177)

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This invention relates to collapsible containers for liquid or other flowable material, and especially to portable wading or swimming pools, skating ponds, portable storage tanks for water and other liquids.

Objects of the invention are to provide an improved collapsible container of rectangular, circular or otherwise curved, or other desired form having a flexible peripheral wall lifted to the position for use and supported in an upright condition solely by a hydrostatic head of contained liquid; to provide for restraining the wall against outward rolling; to provide in a rectangular container for resisting localized outward bowing of the flexible wall intermediate the corners thereof; to provide for foldability of a relatively stiff, peripheral collar or upstanding dam at the upper margin of the wall or inner rim of the container; to provide for water-tightness; to provide for convenience of emptying the container; and to provide for simplicity of construction, convenience of manufacture and storage, portability, and light weight, and attractive appearance.

These and other objects and advantages of the invention will be apparent from the following description.

In the accompanying drawings, which form a part of this specification and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a plan view from above of a collapsible container of circular form, constructed in accordance with and embodying the invention,

Fig. 2 is a side elevation of the container,

Fig. 3 is a sectional view on an enlarged scale taken along line 3—3 of Fig. 1, parts being broken away,

Fig. 4 is a sectional side elevation on an enlarged scale of the container disposed on an inclined or tilted supporting surface,

Fig. 5 is a plan view of a collar or dam before attachment to the inner rim of the container, parts being broken away,

Fig. 6 is a sectional view on an enlarged scale taken along line 6—6 of Fig. 5,

Fig. 7 is a plan view of a modified construction of the embodiment of Fig. 1 and being of square form with rounded corners,

Fig. 8 is a side elevation of Fig. 7, and

Fig. 9 is a sectional side elevation on an enlarged scale of a further modification having the marginal wall hydraulically maintained in the upright condition independent of the main body of liquid in the container, parts being broken away.

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In the illustrative embodiment of the invention shown in Figs. 1 to 6 inclusive, the container includes a base or bottom 15 which may be of circular form of the desired dimensions, and is of flexible fluid-tight sheet material, preferably rubber-like water-proof material, the base being made of one or more thicknesses of the material. The rubber-like material may be rubber, natural or synthetic, or it may be plasticized polyvinyl chloride or other polymer of a rubber-like nature. The sheet material may be reinforced, if desired, as by suitable woven or knitted fabric or other distensible reinforcing material united therewith.

The joinder of the parts of the container may be effected in a sealed manner as by the application of heat and pressure whereby the abutting surfaces of the joints are fused together.

At its periphery, the container has a circumferentially continuous marginal wall or peripheral sidewall 16 of suitable flexible fluid-tight material with or without fabric reinforcement and in one or more thicknesses united in sealing relation with the base 15, desirably in radially unbroken continuation of the material of the base. The wall 16 has a fullness so that the wall is outwardly and upwardly bulged relative to the base to a flatly arched contour at all positions, when under a hydrostatic head or pressure of contained liquid, as shown in the drawings. The wall 16 terminates in an upper margin 17 of gradually decreasing curvature which margin floats on the water by the action of the upwardly-directed pressure of the liquid upon the wall. This construction provides an open-topped arrangement having a peripheral, flatly arched rim of substantial lateral extent, as shown in the drawings, which construction permits local rise and fall of the upper margin 17 with the surge of the liquid in floating relation therewith while presenting resistance to circumferential distortion.

The margin 17 having annular stiffening means 23 for effecting a hooplike stiffening action, is spaced apart from the base 15 the desired extent, and has secured thereto restraining means 18 to prevent bowing and rolling of the wall. The stiffening means 23 may be a flexible, continuous collar or annular dam 23 which may be formed of a flexible strip 24 having its end joined together as shown in Fig. 1 so as to completely encircle the margin 17, the ring-like strip 24 being made of heavy, woven textile fabric having some give such, for example, as canvas impregnated or coated with suitable rubberlike material. The strip 24 is folded with its overlapping side margins positioned together at 25 and secured together as by a

double-row of stitches 26, 26 of filamentary material, or a suitable rubber cement, or both, as shown especially in Figs. 5 and 6. A flexible, reinforcing wire 27 of copper, brass, steel or other suitable metal material is disposed longitudinally between the folds of the strip 24 with longitudinally spaced-apart, open-looped reaches 29, 29 arranged transversely of the strip substantially from margin 28 to margin 25. The closed end portions of the looped reaches of the wire 27 may be engaged by the stitches 26, 26. The folds of the strip 24 intermediate the margins 25, 28 are adhered together for holding the wire 27 in position. The ends of the strip 24 are secured to one another as by stitches, or an adhesive, or both. The construction produces a foldable, closed, collar structure.

The collar 23 is bent intermediate the margins 25, 28 to an L-shape in section, as shown especially in Fig. 3, providing a seating portion 30 and an upright leg portion 31, the flexibility and give of the canvas and the distortability of the looped-wire arrangement facilitating the bending. The collar may be attached at its seating portion 30 to the outer face of the upper margin 17 as by stitches, or a suitable adhesive, or both. The leg portion 31 projects upwardly from the outer face of the wall 16.

The collar 23, in addition to its hoop-stiffening action, thus provides for holding the contained water at the desired level. The flexible construction of the strip also facilitates bending the latter to and from a substantially flat, annular form for storage and packaging purposes.

The invention provides flexible restraining means 18 extending between the upper margin 17 and the base 15, and, in the filled condition of the container, the means 18 is positionable diagonally inward and downward from such margin to the base. The restraining means functions in the manner of a stay to restrain outward rolling of the marginal wall 16 under the hydrostatic pressure and to restrain outward bowing at local regions along the wall 16, all of which facilitates maintaining the desired form of the container. At the same time, the stay permits the rising and falling of the upper margin of the wall to accommodate the water level and surges of the water.

In the embodiment of Figs. 1 to 5 inclusive, the restraining means 18 may be a circumferentially continuous stay member. The stay 18 may be made of one or more thicknesses of flexible, substantially inextensible, sheet material such, for example, as woven textile fabric coated or impregnated with rubber or other rubber-like material, and may have a plurality of spaced-apart apertures 19, 19 to facilitate the passage of contained liquid such as water through the stay. The stay is suitably attached at 18*a* to the base 15 inwardly of the periphery of the upper margin 17, and at 18*b* to the upper margin 17 providing with the base and the wall an annular peripheral chamber 32 in communication with the main body of water of the container. The stay is dimensioned so that it is desirably in a taut condition and in diagonal relation to the base, when the wall 16 is positioned in the flatly arched condition for use, as shown in the drawings.

The attachment of the flexible stay 18 to the upper margin 17 and to the base 15 together with the diagonal disposition and the peripheral continuity of the stay assures effectively restraining outward rolling and resisting localized distortion or outward bowing of the wall, whether the container be positioned on a horizontal supporting surface, as shown in Figs. 1 to 3 inclusive, or on a supporting surface 20 tilted or inclined at an angle 21 with respect to a horizontal plane at 22, as shown in Fig. 4. The restraining action of the stay 18 in cooperation with the hoop-stiffening action of the dam 23 facilitates maintaining the desired shape of the container and the outwardly and upwardly arched form of the marginal wall, especially when the container is positioned on an inclined supporting surface 20.

In the operation of the container which is adapted for packaging and storing in a compact, folded disposition, the same may be unfolded and spread out in the collapsed condition. Water or other liquid is admitted through the top opening defined by the dam 23 and wall margin 17 into the space of the container, which water builds up in depth and flows through the apertures 19, 19 in the stay 18 into the space of the peripheral chamber 32. Any air in the chamber 32 may be vented to the atmosphere through a plurality of spaced-apart vents 33, 33 in the stay immediately adjacent the upper margin 17.

The pressure head of water produces hydrostatic forces acting on the inner surface of the marginal wall to lift the wall 16 away from the base to the upright position, while the wall by virtue of its fullness and flexibility tends to assume a flatly arched form, and at the same time the base 15 becomes taut and is pressed against the ground. The stay 18 swings upwardly about its attachment at 18*a* to the base with the elevation of the wall 16. When the limit of upward movement of the wall 16 is reached, the stay is in a taut condition between its margins in diagonal or angular relation to the base, as shown especially in Fig. 3.

Entrapped air may be vented from the peripheral space at 32 through the vents 33, 33 high in the stay 18.

Upon complete filling of the container with water, the level of the main body of water is maintained adjacent the top of the dam 23 to provide a liquid pressure head effecting a lifting action on the margin 17 beneath the dam. This assures continuity of support by hydrostatic forces acting upwardly and peripherally on the wall 16, particularly at the margin 17, to hold wall upright at the desired height, while the upper margin of the wall floats upon the contained liquid.

When the container is positioned on sloping ground and filled with water, as shown in Fig. 4, the hydrostatic forces of the wall 16 of the lower half at 34 are relatively greater than those of the higher half at 35 of the container due to the greater liquid lead. These greater forces tend to roll the bulged wall at the lower half at 34 outwardly toward and upon the ground and tend to distort the circular shape of the container despite the hoop-stiffening action of the dam 23 and the resistance of the upper margin 17 to distortion.

The circumferential stay 18 overcomes effectively the objectionable outward rolling action downside of the wall; since the diagonal stay, being of finite extent between its margins 18*a* and 18*b*, assumes a taut condition.

When it is desired to restore the container to the collapsed condition as for storage purposes, the water may be drained conveniently from the container through a suitable outlet fitting 36 closed by a removable plug 37. The plug is retained in the space 32 and may be worked into the fitting for closing purposes, the flexible ma-

terial of the construction permitting this. The dam 23 may then be bent from its L-shape to a substantially flat ring shape for facilitating folding and storing the container.

The modified construction 40 of Figs. 7 and 8 is like that of the container of Fig. 1 except that it is of square or other rectangular form with straight sides. Rounded corners may be provided. The flexible restraining means 41 or inner peripheral stay of suitable flexible, substantially inextensible, water-tight material has a plurality of spaced-apart openings which may be in the form of transverse slits 42, 42 for the passage of water or other liquid therethrough. The slits may terminate closely adjacent the upper margin 44 of the wall 43 to vent air from the peripheral space at 48 between the wall 43 and the stay 41, although additional vents may be provided, if desired, as in the embodiment of Fig. 1. The stay extends diagonally from the upper margin 44 adjacent the stiffening dam 45 to the base 46 at a position at 47 inwardly of the margin 44.

The flexible stay 41 functions as described hereinabove for the stay 18, when the container is filled with water, and cooperates with the base 46 and the dam 45 to restrain outward rolling of the marginal wall 43.

Although the liquid head acting uniformly along the wall 43 at each straight side, ordinarily would tend to bow or curve outwardly the sides and distort the container to a generally rounded form, the stay uniformly restrains and counteracts this bowing tendency, thereby facilitating the maintenance of the square form and preventing subsidence of the wall.

The water may be drained from the container by a suitable outlet fitting 36 and plug 37 in the base 46. The dam 45 may be folded for storage purposes as discussed hereinabove for the dam 23.

In another modification shown especially in Fig. 9, the container 50 may be of the desired form in plan and may be constructed in some aspects like the containers of Figs. 1 to 8, inclusive, but differs therefrom in several features. The marginal wall 51 is lifted to and supported in the position for use by hydrostatic pressure means independent of the main body of liquid of the container itself, whereby an accessory stiffening collar or dam is not required for obtaining the desired liquid pressure head.

The restraining means or stay 52 of suitable flexible, fluid-tight material is made without openings so that the stay provides a substantially impervious, inner wall of the container 50 for holding the main body of liquid in the latter, and in cooperation with the marginal wall 51 and base 53 provides a closed, annular chamber 54 extending peripherally about the container.

The chamber is filled with water and maintained under liquid pressure head by a hollow stack or standpipe 55 at the upper margin 56 in communication with the chamber 54 through the wall 51. The stack 55 projects upwardly from the marginal wall 51. The stack has self-supporting walls of suitable flexible fluid-tight material, and is dimensioned to provide a substantial pressure head of contained liquid acting upwardly for effectively maintaining the wall 51 upright in flatly arched condition for use. Closing or sealing the open-end of the stack is not required. The water in the chamber may be drained through the base 53 by a suitable outlet fitting 57 and plug 58.

In the operation of the container 50, the latter, in a collapsed condition, is spread out on the ground. Water is admitted through the hollow stack 55 to the annular peripheral chamber 54 until the chamber is filled and water stands in the stack at the desired height of pressure head, most or all the entrapped air within the chamber escaping through the stack during the filling operation. The marginal wall 51 is thus hydraulically elevated to the flatly arched position for use, as shown in Fig. 9. The flexible stay 52 becomes taut and pivots upwardly about its attachment to the base 53 under the action of the hydrostatic forces as the water builds up in depth in the chamber 54 and restrains outward rolling and bowing of the wall 51. The interior at 60 of the container may be filled with water to the desired depth and may be filled coincidentally with the chamber.

The construction of the container 50 thus prevents subsidence of the wall and loss of contained liquid and assures continuity of hydrostatic lifting forces on the wall independently of the level of contained liquid in the interior at 60 of the container. The main body of liquid at 60 may be conveniently drained through the outlet fitting 36 and plug 37.

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

I claim:

1. A collapsible container for liquid, said container comprising a base and a sidewall of flexible liquid-tight material around said base, said sidewall having normally an upwardly and inwardly arched disposition relative to the base when the container is filled with liquid and said sidewall having an upper peripheral margin overlying said base inwardly of the periphery of said base and elevated above said base at various heights above said base under the pressure of contained liquid against said sidewall in accordance with the height of the contained liquid above said base, and a restraining stay element attached to said base inward of said upper peripheral margin and extending diagonally upward away from said base and outward to an attachment to said sidewall at said upper peripheral margin for vertical swinging movement of said stay element to accommodate changes in the height of said upper peripheral margin above said base, whereby shifting of said upper peripheral margin in the direction laterally outward of the container is restrained by said stay element under conditions of greater height of liquid above the base in the restrained region of the container as compared with other regions of the container.

2. A collapsible container as defined in claim 1 in which said upper peripheral margin comprises an annular collar of deformable fluid-tight material relatively stiff as compared to said sidewall for effecting a hoop-stiffening action in said upper peripheral margin and projecting upwardly from said sidewall at said upper peripheral margin for holding in the space defined by said collar liquid at a level providing a hydrostatic head above said upper peripheral margin for exerting lifting pressure on said sidewall, and in which said stay element is attached to said sidewall at said upper peripheral margin below the uppermost edge of the annular collar for resisting distortion of said collar and said sidewall laterally outward of the container.

3. A collapsible container for liquid, said container comprising a base of flexible liquid-tight material and a sidewall of said material in con-

tinuation of said base around its periphery and said sidewall having normally an upwardly and inwardly arched disposition relative to said base when the container is filled with liquid and said sidewall having an upper peripheral margin overlying said base inwardly of the periphery of said base and elevated above said base at various heights above said base under the pressure of contained liquid against said sidewall in accordance with the height of the contained liquid above said base, in combination with a flexible stay of sheet material extending about the periphery of said upper peripheral margin and attached to said base inward of said upper peripheral margin and extending diagonally upward away from said base and outward to an attachment to said sidewall at said upper peripheral margin for vertical swinging movement of said stay to accommodate changes in the height of said upper peripheral margin above said base, whereby shifting of said upper peripheral margin in the direction laterally outward of the container is restrained by said stay under conditions of greater height of liquid above said base in the restrained region of the container as compared with other regions of the container.

4. A collapsible container as defined in claim 3 in which said flexible stay is peripherally continuous and substantially inextensible and impervious throughout its peripheral extent providing with said sidewall and said base a closed annular chamber entirely about the periphery of the container for containing liquid independent of the main body of liquid in the container, and in which said container includes a tubular stack projecting upwardly from said sidewall at said upper peripheral margin in communication with said chamber for maintaining a hydrostatic head on the contained liquid in said chamber.

5. A collapsible container as defined in claim 3 in which said base is rectangular, and said sidewall forms straight sidewalls and round corners of the container, and in which said flexible stay has elongated slits spaced-apart in the direction peripherally of said base and extending from a position in said stay adjacent said base to a position in said stay adjacent said upper margin for passage of liquid through said slits.

6. A collapsible container for liquid, said container comprising a base and a sidewall of flexible liquid-tight material around said base, said sidewall having normally an upwardly and inwardly arched disposition relative to the base when the container is filled with liquid and said sidewall having an upper peripheral margin overlying said base inwardly of the periphery of said base and elevated above said base at various heights above said base under the pressure of contained liquid against said sidewall in accordance with the height of the contained liquid

above said base, means for maintaining a hydrostatic head of contained liquid for exerting lifting pressure on said sidewall to support the sidewall in its elevated condition above said base, and a flexible stay of sheet material extending about the periphery of said upper peripheral margin and attached to said base inward of said upper peripheral margin and extending diagonally upward away from said base and outward to an attachment to said sidewall at said upper peripheral margin for vertical swinging movement of said stay to accommodate changes in the height of said upper peripheral margin above said base, whereby shifting of said upper peripheral margin in the direction laterally outward of the container is restrained by said stay under conditions of greater height of liquid above said base in the restrained region of the container as compared with other regions of the container.

7. A collapsible container for liquid, said container comprising a base of flexible liquid-tight material, a collapsible wall of flexible liquid-tight material extending about said base and overlying said base and having an upper margin inward of the periphery of said base, said wall having normally an upwardly and inwardly arched disposition relative to said base when the container is filled with liquid, means for maintaining a hydrostatic head of contained liquid for exerting lifting pressure on said wall to support the latter in upright disposition, and a flexible stay of sheet material extending about the periphery of said upper margin and diagonally from a position at said upper margin to a position on said base inwardly of said upper margin and providing with said base and said wall an annular chamber for liquid, said stay being attached to said wall and said base only at said positions and being spaced from said wall between said positions for swinging movement relative to said base, and said stay being in a taut condition under the upright disposition of said wall for restraining localized outward rolling and bowing of said wall under the hydrostatic pressure and having openings therein for admitting the main body of liquid of the container to the space of said annular chamber for exerting said lifting pressure on said wall.

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