United States Patent

[11] **3,574,870**

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[54] **TANK STRUCTURE**
12 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **4/172.19**
[51] **Int. Cl.** **E04h 3/18**
[50] **Field of Search** 4/172.19, 172

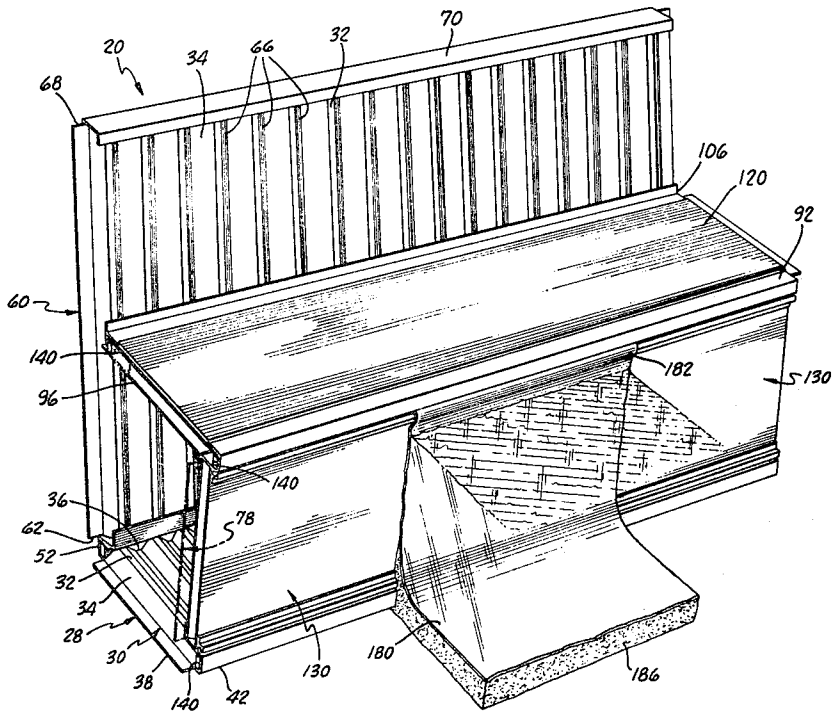
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ABSTRACT: A lightweight, strong tank structure, primarily suited for use as an aboveground swimming pool, wherein the wall surrounding the liquid-containing area is made principally of a light metal and has a box-shaped cross section formed by corrugated panels joined by extrusions and with the corrugations of the panels disposed transversely of the panels.



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5 Sheets-Sheet 1

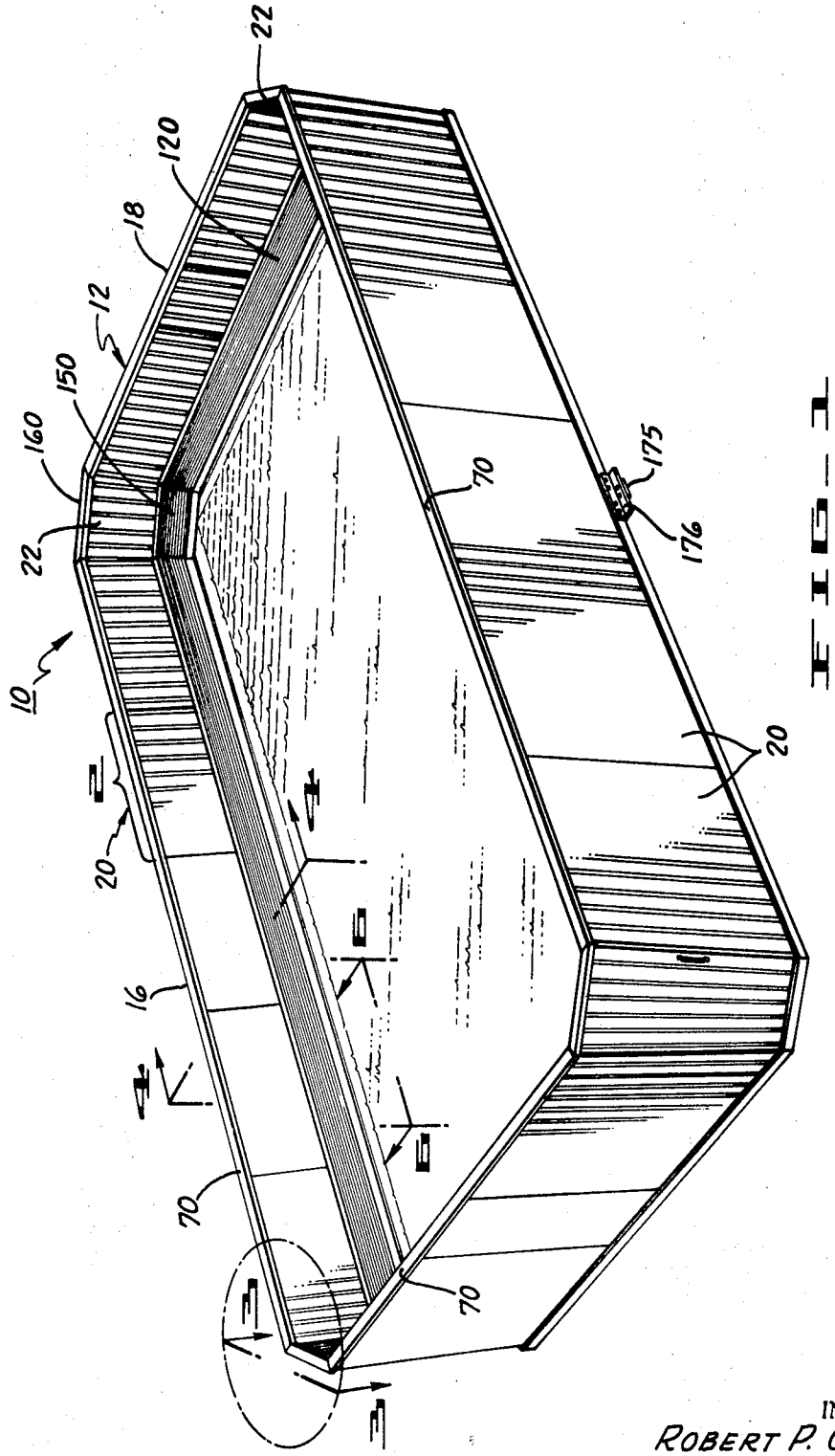


FIG. 1

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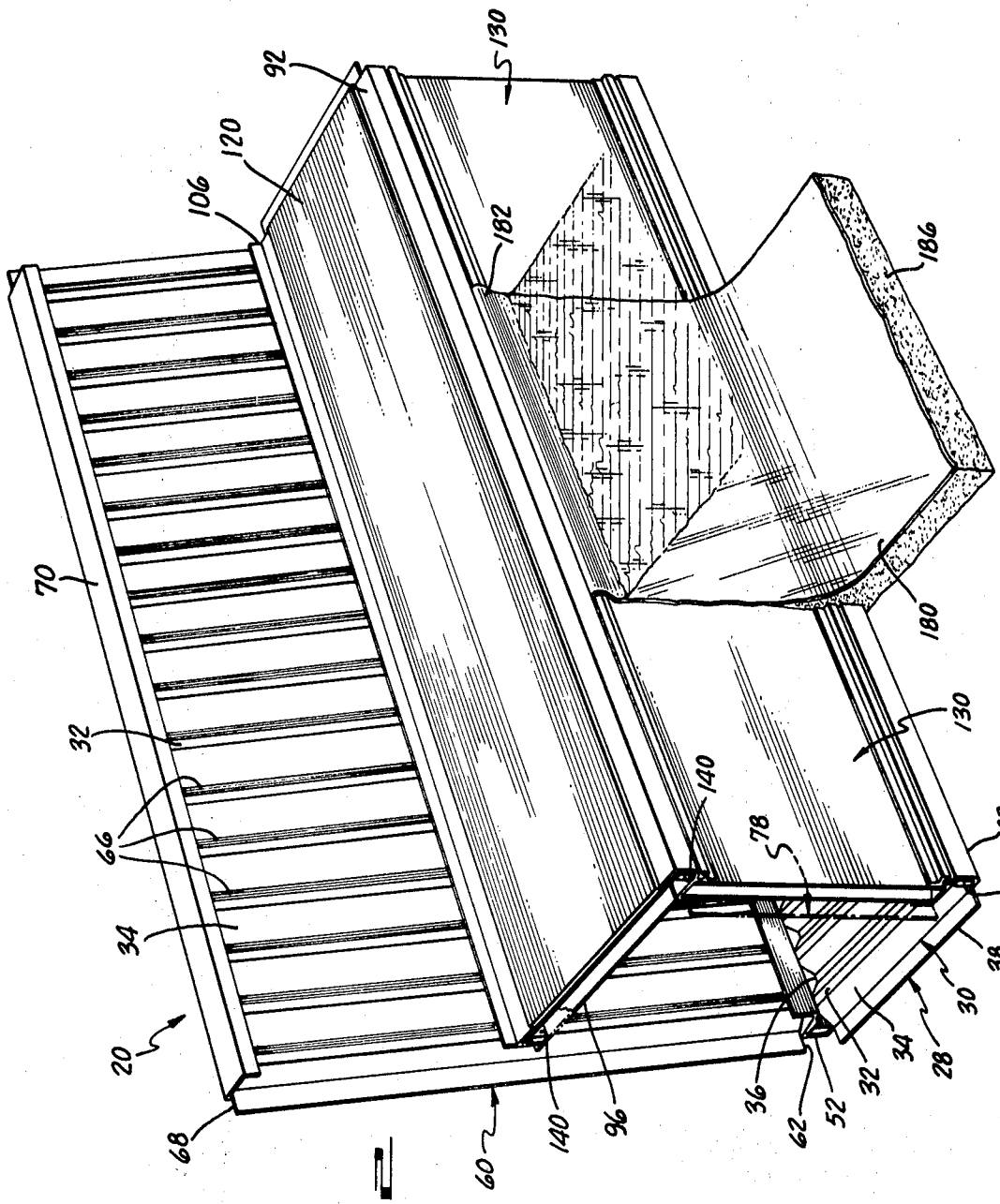


FIG. 2

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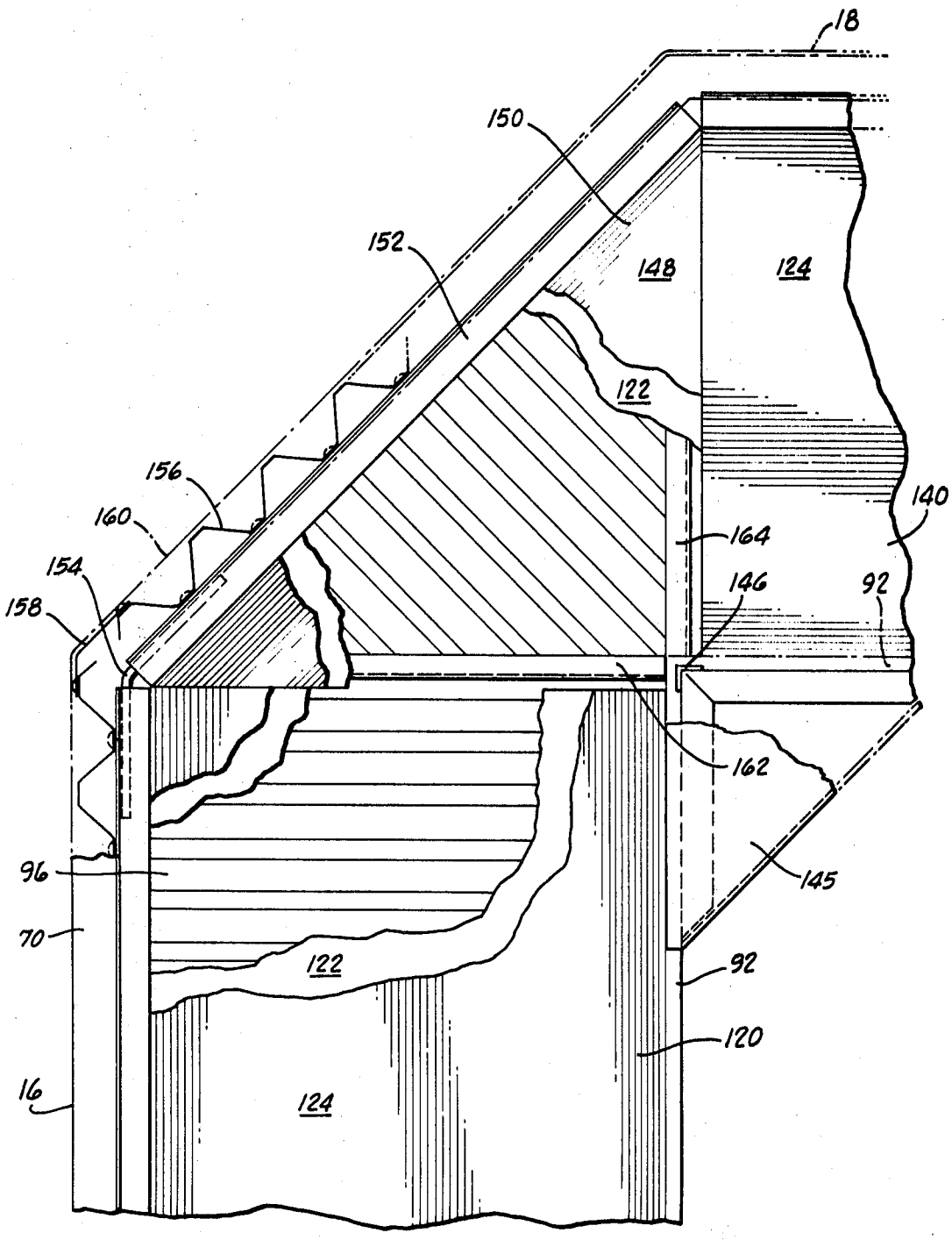


FIG. 3

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FIG. 5

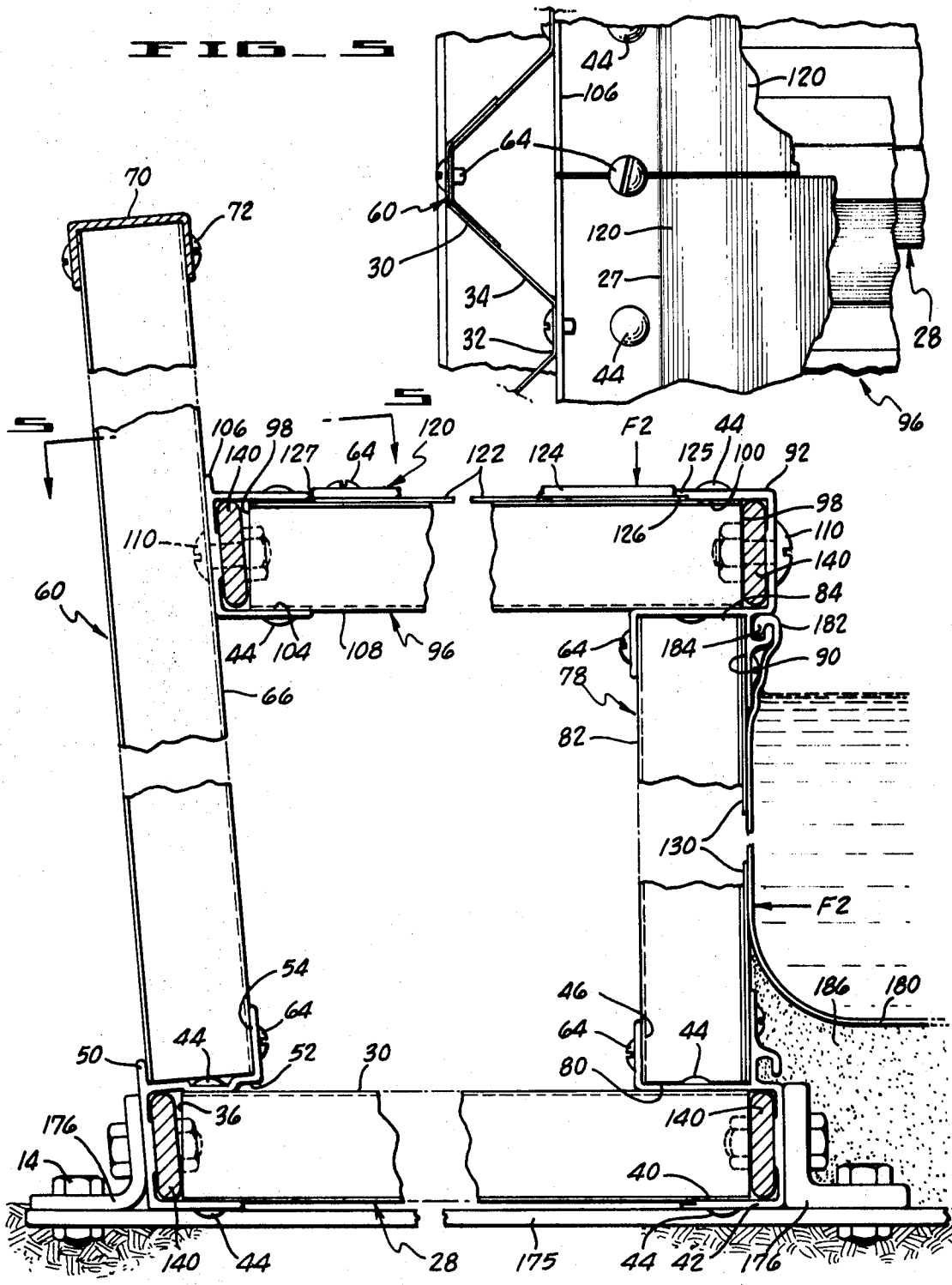


FIG. 4

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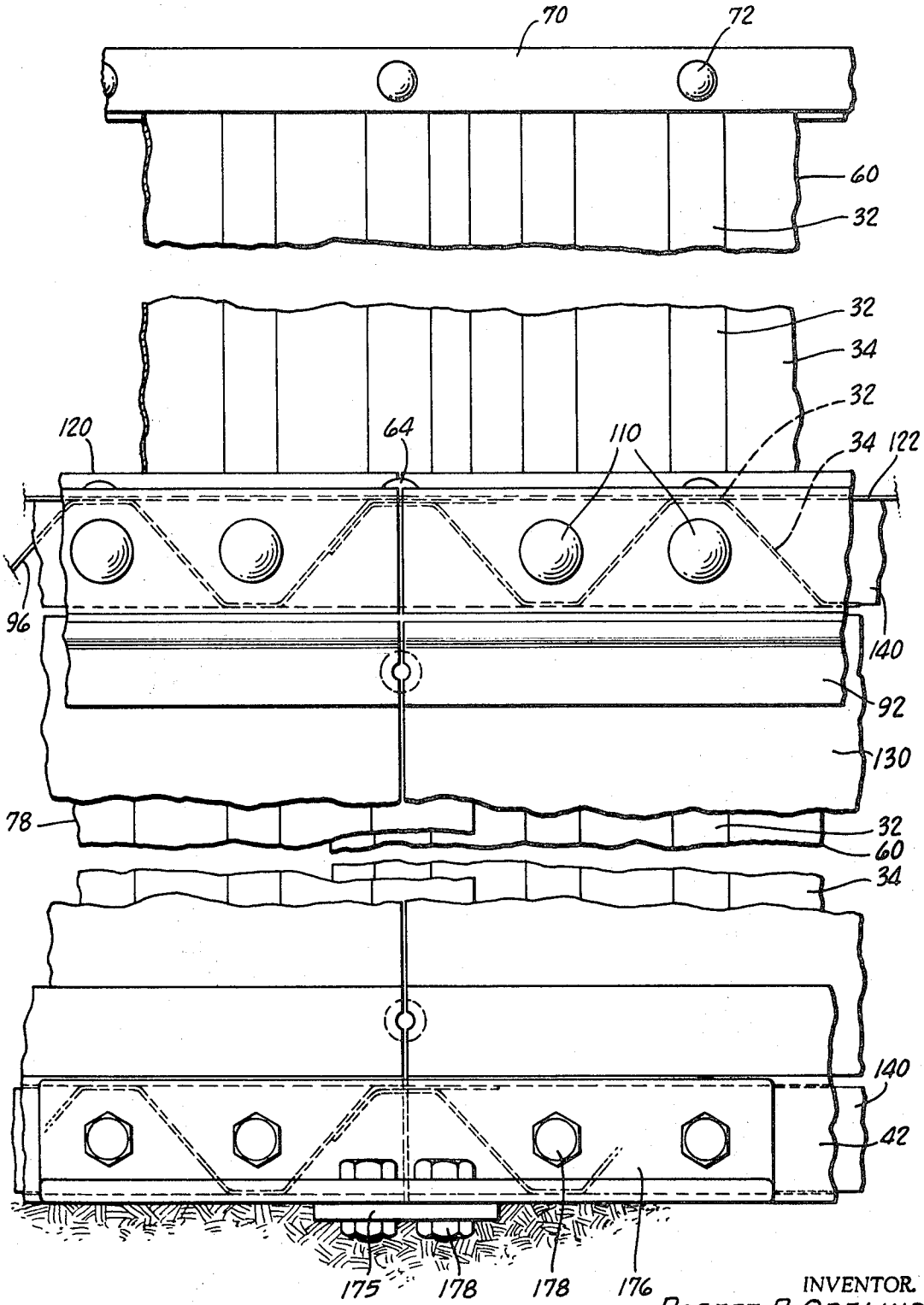


FIG_6

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TANK STRUCTURE

BACKGROUND OF THE INVENTION

The present invention pertains to a tank structure and more particularly to a lightweight and strong wall construction for an aboveground liquid-containing tank wherein the wall is generally box-shaped in cross section and is formed by interconnected corrugated panels.

Although aboveground portable swimming pools have been commercially available for many years, there has been a desire to increase the size of such pools so that they might be more comparable to pools installed in the ground. In order to contain the high water pressure of such a larger pool of 16 feet by 24 feet by 4 feet for example, it has been necessary to use a relatively heavy steel construction, as typified by the pool disclosed in U.S. Pat. No. 3,256,532 and by other recently patented art. As a result, such pools have been expensive and time consuming to assemble. Also, they have been too heavy and have required too much maintenance.

SUMMARY OF THE INVENTION

In contrast, the tank of the present invention can be made almost entirely of a very lightweight metal, such as aluminum, because of its unique sidewall construction which is capable of withstanding the forces involved. This sidewall has a box-shaped cross section and is formed of corrugated panels, preferably joined by extruded brackets, with the corrugations of the panels disposed so as to impart a high strength to the wall of the tank.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a swimming pool which has a wall construction incorporating the principles of the present invention.

FIG. 2 is a somewhat enlarged perspective view of one of the modules which form the wall construction of the pool of FIG. 1, and a portion of a liquid-containing liner attached to the wall construction.

FIG. 3 is an enlarged fragmentary plan of a corner of the pool of FIG. 1 with portions being broken away to show internal construction.

FIG. 4 is an enlarged section taken on line 4–4 in FIG. 1 with portions being broken away for illustrative convenience and showing in particular the box-beam shape of the sidewall of the pool.

FIG. 5 is a fragmentary section taken on a plane at a position indicated by line 5–5 of FIG. 4.

FIG. 6 is an enlarged elevation as seen from a position indicated by line 6–6 in FIG. 1 with portions being broken away.

DETAILED DESCRIPTION

The subject tank construction is conveniently shown and described with reference to a swimming pool which is generally identified by numeral 10. The pool has a wall structure 12 resting on the ground 14 and including sides 16 and 18, each of which is formed of a plurality of wall sections or modules 20, and corners 22 joining adjacent sides and ends.

Each wall modules 20 (FIGS. 2, 4 and 6) includes a corrugated bottom panel 28 of sheet material, such as aluminum sheet, with the corrugations 30 thereof being defined by parallel flanges 32 and diagonal webs 34, with the panel having opposite inner and outer side edges 36 and opposite end edges 38, and with the corrugations disposed transversely of the length of the panel. The inner side edge of the panel is fitted in a lower socket 40 of a lower inner bracket 42, which is preferably an extrusion of a light metal such as aluminum. The panel is connected to the brackets by rivets 44 which extend through flanges 32.

A lower outer bracket 50 has a lower socket 52, in which the outer side edge 36 of bottom panel 28 is fitted, and an upper socket 54. The outer bracket is connected to the bottom panel preferably by rivets 44 in a manner similar to the inner bracket 42. In the preferred method of constructing the pool, the bottom panel and the lower brackets 42 and 50 are prefabricated or preassembled at a factory by riveting the brackets to the panel as described. Of course, the brackets and the panel could be connected by any suitable fastening means at the factory, at the site of the pool, or elsewhere.

The module 20 also includes a corrugated outer panel 60 having a lower side edge 62 fitted in the upper socket 54 of the lower outer bracket 50 and preferably connected thereto by screws 64. The corrugations 64 of the outer panel 66 are formed in the same manner as the corrugation 30 and are disposed transversely of the outer panel. The outer panel also has an upper side edge 68 over which is placed a railing 70, preferably an extruded channel of a light material such as aluminum, that is connected to the outer panel as by screws 72.

An inner corrugated panel 78 of the same construction as the bottom and outer panels 28 and 60, and with the corrugations disposed transversely thereof, has a lower side edge 80 fitted in the upper socket 46 of the lower bracket 42 and connected thereto, such as by screws 64. The inner panel has an upper side edge 84 which is fitted in a lower socket 90 of an upper inner bracket 92 and is secured thereto, as by screws 64.

The wall module 20 also has a corrugated top panel 96 having opposite side edges 98 respectively fitted in an upper socket 100 of the upper inner bracket 92 and in a socket 104 of an upper outer bracket 106, being connected thereto by rivets 44. As before, the corrugations 108 of the top panel are disposed transversely thereof. As with the bottom panel 28, the top panel and the upper brackets are preferably prefabricated at a factory and delivered to the pool site as a subassembly. The outer panel 60 is also connected to the upper outer bracket 106 by fasteners 110 which are preferably nuts and bolts. It is to be noted that the upper outer brackets connect to the outer panel intermediate the upper and lower edges thereof.

From the foregoing, it is evident that the bottom, outer, inner and top panels 28, 60, 78 and 96, respectively, are interconnected by the brackets 42, 50, 92 and 106 in box formation so that the cross-sectional shape of the module of 20 as viewed in FIG. 4, is box shaped. In essence, therefore, the interconnected panels and brackets provide a box-beam structure for the module 20. All of the corrugations 30, 66, 82 and 102 of the panels are disposed transversely of the panels as well as of the modules. Both the top and bottom panels are substantially horizontal, the inner panel is substantially vertical, and the outer panel preferably extends upward and outward at a slight acute angle to the vertical.

A walkway 120 is provided on the top panel 96 of each module 20 and includes a relatively rigid top sheet 122, such as aluminum sheet, and a strip 124 of outdoor carpeting bonded to the top sheet. The top sheet has an inner edge 125 fitted in a notch 126 in the inner upper bracket 92 and an opposite side edge 127 abutting the outer upper bracket 106. The walkway is fastened by screws 64 along the edge 127 to the top flanges of The corrugations 108 of the top panel. Each module also has an inner sheet 130 placed against the inside surface of the inner panel 78 and held thereto under flanges of the lower and upper inner brackets 42 and 92.

The modules 20 are attached end-to-end to form the sides 16 and ends 18 of the pool 10, as best seen in FIGS. 1, 5 and 6. The ends of adjacent pairs of modules are interconnected by overlapping the endmost flat flanges 32 of the corrugations 30, 66, 82 and 108 joining the same together by screws 64. Also, connecting bars 140 (FIGS. 4 and 6) bridge adjacent modules, are fitted in the sockets 40, 52, 100 and 104 and are connected to their associated brackets 42, 50, 92 and 106 by fasteners 110.

The corners 22 (FIGS. 1 and 3) of the pool 10, which join adjacent sides 16 and ends 18, include upper triangular gussets 145 connected in perpendicular relation to the upper

inner brackets **92** of adjacent sides and ends and lower gussets, not shown, joining the lower inner brackets **42**. A vertical angle member **146** (FIG. 3) is disposed between the side and end and connected thereto. Each corner also includes a corrugated top panel **148** covered by a walkway **150**, a corner bracket **152** connected to the top panel **148**, angular corner bars **154** joining the corner bracket with the adjacent upper outer brackets **106** of the adjacent side and end, an outer panel **156** connected to the outer panels **60** of the side and end by angular sheet connectors **158** and to the corner bracket, and a corner railing **160** connected to the upper edge of the outer panel **156** and abutting the railings **70** for the end and side. Side and end brackets **162** and **164** are also connected to the top panel **148** and to the top panels of the side and end. Although not shown, each corner also includes a bottom panel and brackets connected in a manner now believed to be understood.

Substantially the entire pool as described above can be made of a light metal such as aluminum. Thus, the panels **28**, **60**, **78**, **96**, **148** and **156** and the sheets **122** and **130** as well as the gussets **145** can be made of aluminum sheet. Furthermore, all of the brackets **42**, **50**, **92**, **106**, **152**, **162** and **164** and the railings **70** and **176** as well as the bars **140** can be made of aluminum extrusions. Even the rivets **44**, the screws **64** and the fasteners **110** can be made of aluminum. Insofar as the wall structure **12** is concerned, only the outdoor carpet **124** is of nonaluminum in the preferred form of this wall structure. Of course, the principles of the present invention, involving the interconnection of the corrugated panels into a box beam, are not dependent upon the use of aluminum although the high strength afforded by this construction makes possible the use of a light metal such as aluminum. As an example of the light weight of a pool constructed according to the present invention, with pools ranging in size from 20 feet by 13½ feet to 40 feet by 20 feet, the weight will range from about 1,244 pounds to about 2,150 pounds.

Moreover, the pools under 20 feet in width are all capable of withstanding the water pressures within the wall structure **12** without any additional reinforcing for the wall structure or connection thereof into the ground. For pools wider than 20 feet, however, it is preferred to employ a tie-bar **175** (FIGS. **1**, **4** and **6**) which extends across the width of the pool **10**, intermediate the length thereof, and is connected to the lower inner and outer brackets **42** and **50** by angle bars **176** and fasteners **178**.

Although not constituting a part of the present invention, the pool **10** employs a plastic liner **180** which has an upper edge **182** fitted in a slot **184** of the inner upper brackets **92**. To separate the liner from the angle bars **176** and the inner lower brackets **42** and to provide a softer surface on which to walk, sand **186** is normally placed between the bottom wall of the liner and the lower inner bracket **42** and the angle bars **176**.

In summary, therefore, the tank structure of the present invention includes a wall **12** completely surrounding the liquid receiving area, the wall being constructed of corrugated panels **28**, **60**, **78** and **96** interconnected in a continuous box beam or monocoque construction. As used herein, a monocoque structure means a boxlike or tubularlike structure formed by a plurality of panels in which stresses and strains imposed on one or more of the panels are shared by other panels in the structure. In the present tank structure, the box-beam wall formed by the panels is strong enough, without the aid of any connections into the ground such as footings, stakes or the like, to take the hydrostatic force F1 (FIG. 4) imposed by the liquid within the tank against the inner panel **78** as well as the deckload force F2 imposed by people on the walkways **120** and **150**; the structure is self-supporting, merely resting on the ground or other support surface. Bending forces which result from the imposition of the hydrostatic force F1 on the inner panels **78** are shared by the top and bottom panels **96** and **28**, whereas the torsional forces caused by the application of the resultant force F1 closer to the bottom than to the top of the inner panel **78** are taken by the inner and outer panels **78** and **60**; in this sense, the structure is similar to a torque tube.

Since the box beam of corrugated panels **28**, **60**, **78** and **96** with the corrugations disposed transversely of the panels are of such high strength, it is unnecessary to attach any bracings, such as extrusions, transversely of the panels; the corrugated panels interconnected in the described manner provide the necessary strength for both column and shear loads.

Another advantage is that difference size pools or tanks can be constructed from various combinations of identical modules **20** and identical corners **22**. And, since a portion of each module is preassembled, the amount of onsite fabrication is minimized.

From the foregoing, it will be evident that a tank structure, particularly suitable for use as an aboveground swimming pool, has been provided which features the use of corrugated sheets interconnected by brackets, all of which may be fabricated from a light metal such as aluminum, and in which the corrugations of the panels are disposed transversely to the length thereof thereby to form a wall structure having a generally box-shaped cross section. The resulting construction is light and strong and is ideal for a portable aboveground swimming pool of sizes which correspond to the swimming pools which are installed in the ground.

Although a preferred form of the invention has been shown and described, it will be evident that modifications can be made in the details thereof without departing from the spirit and the scope of the appended claims.

I claim:

1. A tank device provided with upstanding wall means adapted to rest on a support surface and surrounding the liquid-receiving area of the tank device, and liquidtight means in said area for containing a body of liquid, said wall means being generally comprised of interconnecting modules that are box-shaped in vertical cross section and generally monocoque in construction, at least certain of said modules each being provided with a plurality of corrugated panels interconnected to form said generally box-shaped cross section, said panels including an inner panel which faces the liquid-receiving area and against which is imposed the hydrostatic pressure in said area, and a further panel disposed in angular relation to said inner panel, and bracket means disposed between and connected to said inner and further panels for transferring hydrostatic loads from said inner panel to said further panel whereby said further panel absorbs a portion of the bending forces which are transferred thereto by said inner panel and which result from said hydrostatic pressure.

2. A tank having a wall structure surrounding a liquid-receiving area, said wall structure being generally of monocoque construction and comprised of individual interconnected modules made up of elongated top, bottom, inner and outer corrugated panels, means interconnecting the panels of a given module to each other as well as to panels of another module, the vertical cross-sectional shape of the wall structure of said given module being generally box-shaped with the inner and outer panels of the given module projecting up from the bottom panel thereof and the top panel of the given module being connected to the inner and outer panels and constituting a means for supporting a walkway around the said area, and said inner panel of the given module being directly disposed relative to the liquid-receiving area whereby the hydrostatic pressure of the liquid exerted directly against said inner panel will be transferred to the top and bottom panels and partly resisted by said last-mentioned panels as well as said inner panel.

3. The tank of claim **2** wherein the corrugations of each panel extend transversely of its panel.

4. The tank of claim **2** including outer lower, inner lower and inner upper elongated brackets each having a pair of elongated sockets, said panels having side edges, the adjacent side edges of said outer and bottom panels, of said bottom and inner panels, and of said inner and top panels respectively

fitting into the sockets of said outer lower bracket, said inner lower bracket and said inner upper bracket, means connecting said interfitted panels and brackets together, and a bracket joining said outer and top panels together.

5. The tank of claim **6** wherein said panels are made of light sheet metal and wherein said brackets are made of extrusions of a light metal.

6. The tank of claim **2** wherein said walkway is a flat sheet overlying said top panel.

7. The tank of claim **2** including an inner flat sheet disposed over said inner panel and facing said liquid-receiving area.

8. The tank of claim **2** wherein said outer panel extends above said walkway.

9. In a tank having a wall surrounding an area adapted to contain liquid, said wall including a wall module comprising a corrugated bottom panel, inner and outer corrugated panels connected to and extending upward from said bottom panel so that inner and outer panels are in confronting relation and so that said inner panel is in juxtaposed relation to the liquid-containing area of the tank, and a corrugated top panel interconnecting the inner and outer panels in confronting relation to said bottom panel, said panels thereby forming a tubular structure, the corrugations of each panel running transversely of said module.

10. A swimming pool comprised of a plurality of interconnected modules so arranged as to form a closed monocoque structure, at least certain of said modules being comprised of elongated top, bottom, inner and outer corrugated panels of aluminum sheet, each of said panels having opposite side edges, said bottom panel being supported in a horizontal plane, elongated lower brackets of aluminum extrusions individually connected to the side edges of the bottom panel, the side edges of the inner and outer panels being individually connected to said brackets and extending upward from said bottom panel, elongated upper brackets of aluminum extrusions connected to the outer panel above the lower brackets and to the upwardly disposed side edge of the inner panel, said top panel having its side edges individually connected to said upper brackets in confronting relation to the bottom panel, each of said panels circumscribing the water receiving area of the pool and the corrugations of each of the panels being disposed transversely of the longitudinal axes of their respective panels and watertight means for containing a body of water attached to the inwardly disposed upper brackets and positioned within said inner panel.

11. The pool structure of claim **10** wherein said outer panel extends upward and outward in acute angular relation to the vertical.

12. The pool structure of claim **10** including flat aluminum sheets disposed on the top panel and against the inner side of the inner panel.

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,574,870 Dated April 13, 1971

Inventor(s) Robert P. Orelind

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 51, "Fig. 1 with" should be -- Fig. 1 and with
Column 1, line 60, "and 18" should be -- and ends 18 --
Column 1, line 62, "modules 20" should be -- module 20 --
Column 2, line 15, "light material" should be -- light metal
Column 2, line 59, "The" should be -- the --
Column 2, line 67, "108 joining" should be -- 108 and joinin
Column 5, line 5, "Claim 6" should be -- Claim 4 --

Signed and sealed this 24th day of August 1971.

(SEAL)
Attest:

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WILLIAM E. SCHUYLER, JR.
Commissioner of Patents