Sept. 27, 1966 J. DIEMOND ETAL 3,274,621

WATER-RETAINING RECREATIONAL STRUCTURE
FOR SWIMMING POOLS AND THE LIKE

Filed Dec. 27, 1965 8 Sheets-Sheet 1

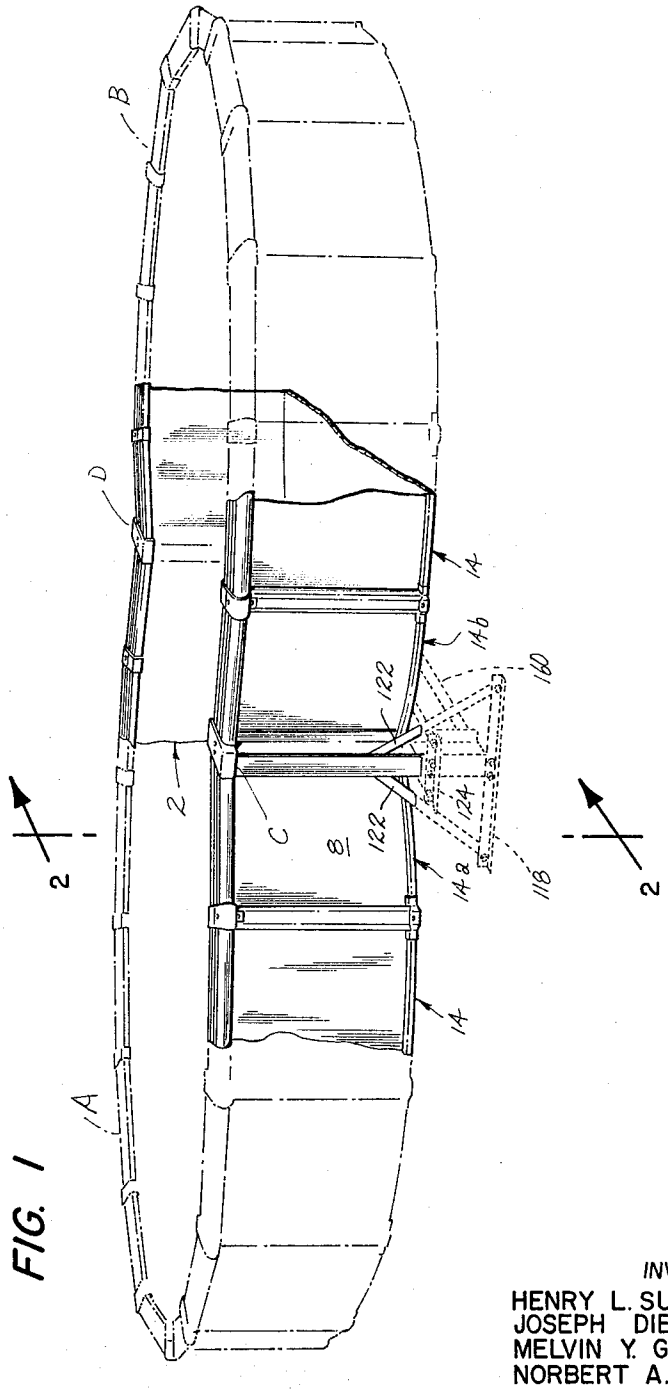


FIG. 1

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FIG. 2

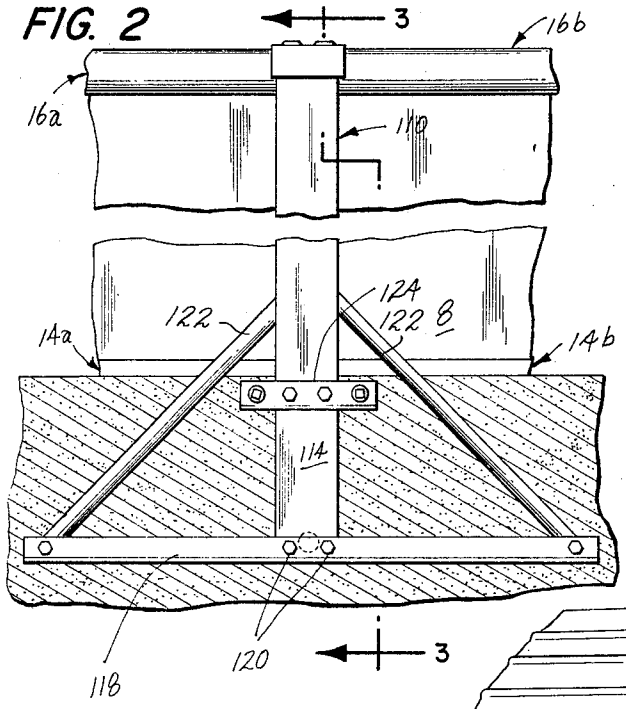


FIG. 4

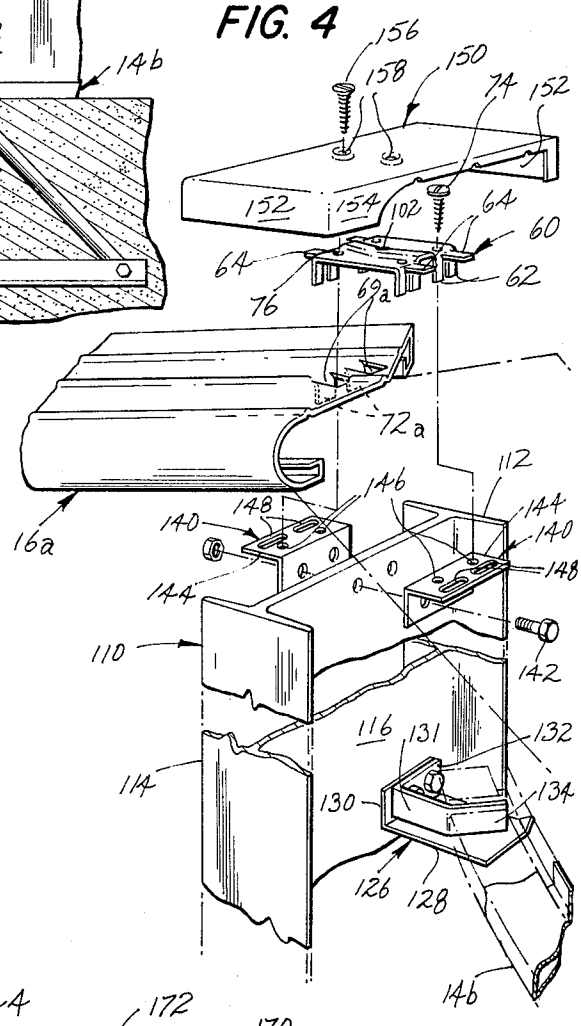
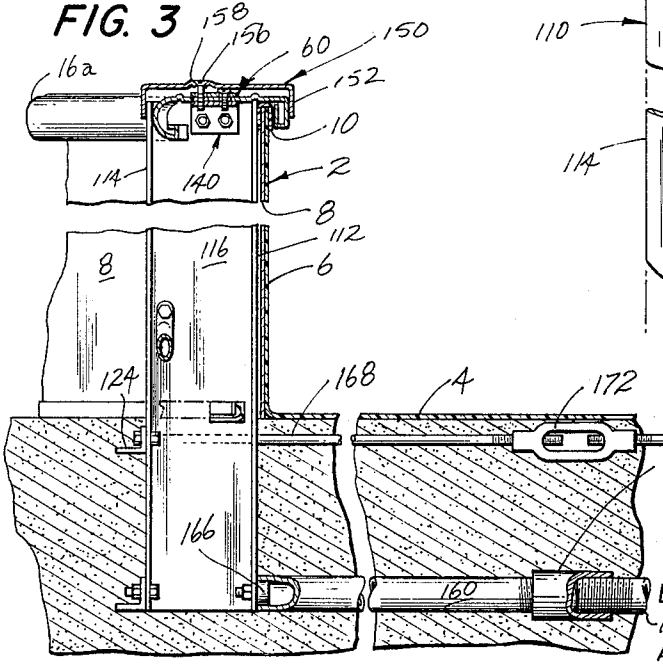


FIG. 3



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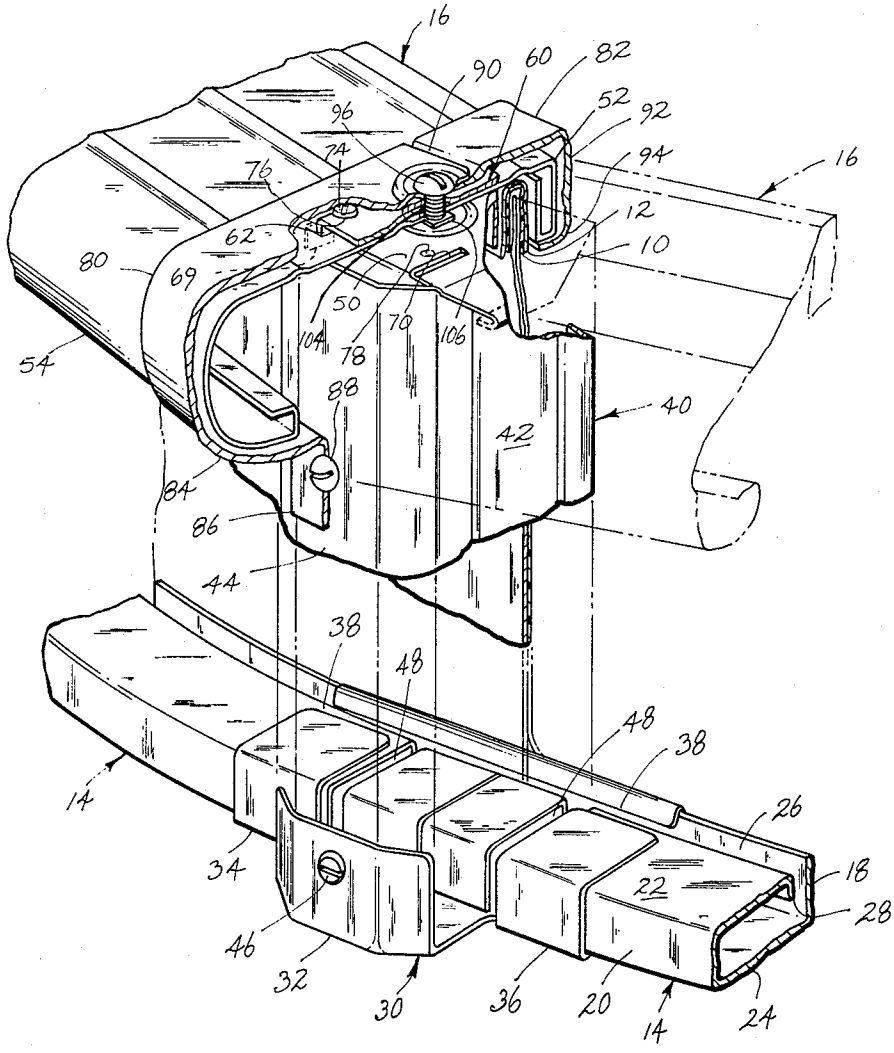
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WATER-RETAINING RECREATIONAL STRUCTURE
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FIG. 4a



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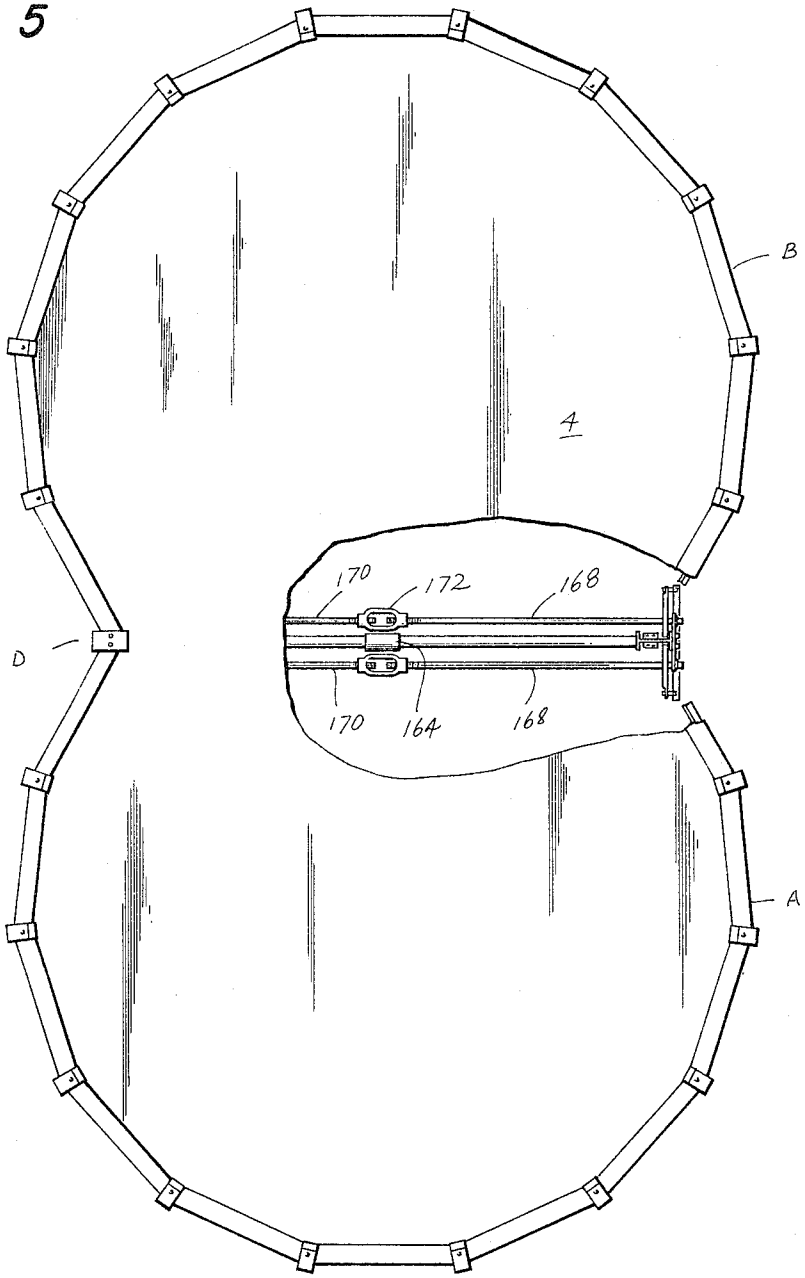
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FIG. 5



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FIG. 6

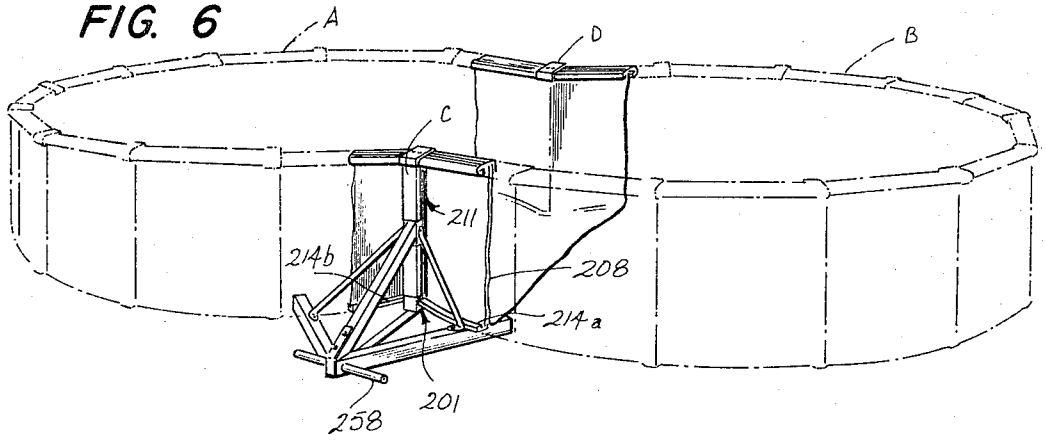
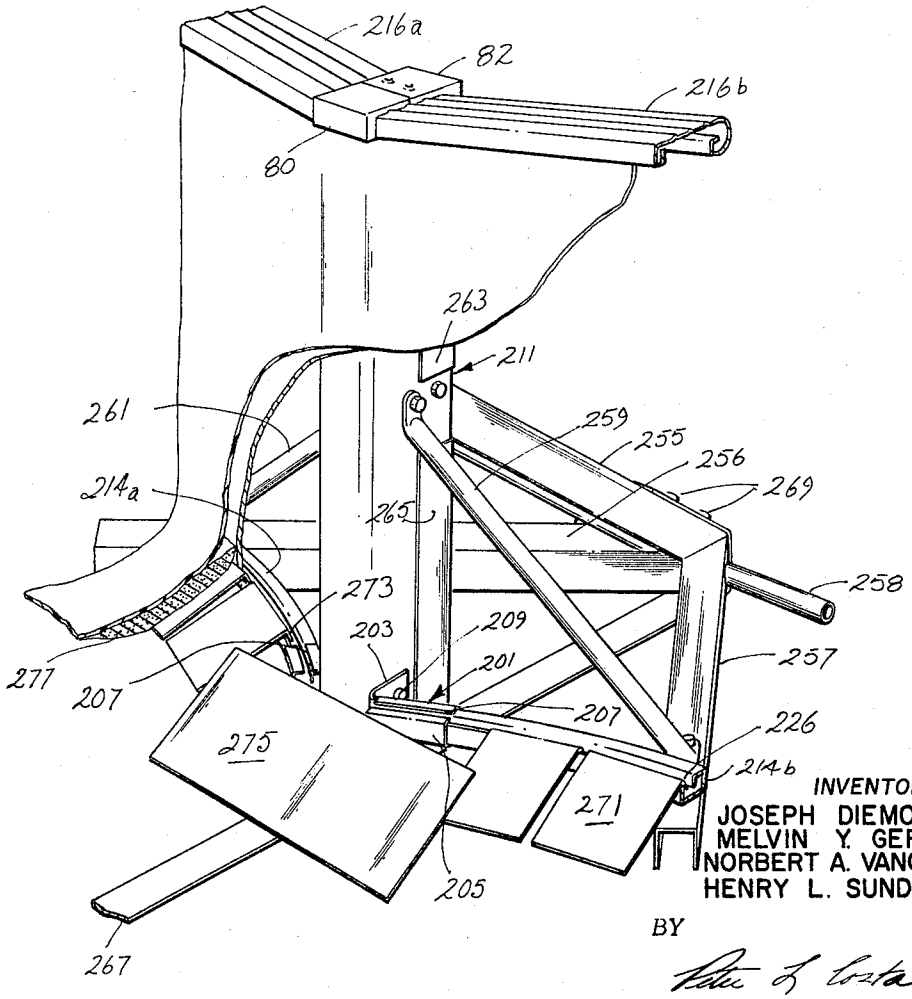


FIG. 7



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FIG. 8

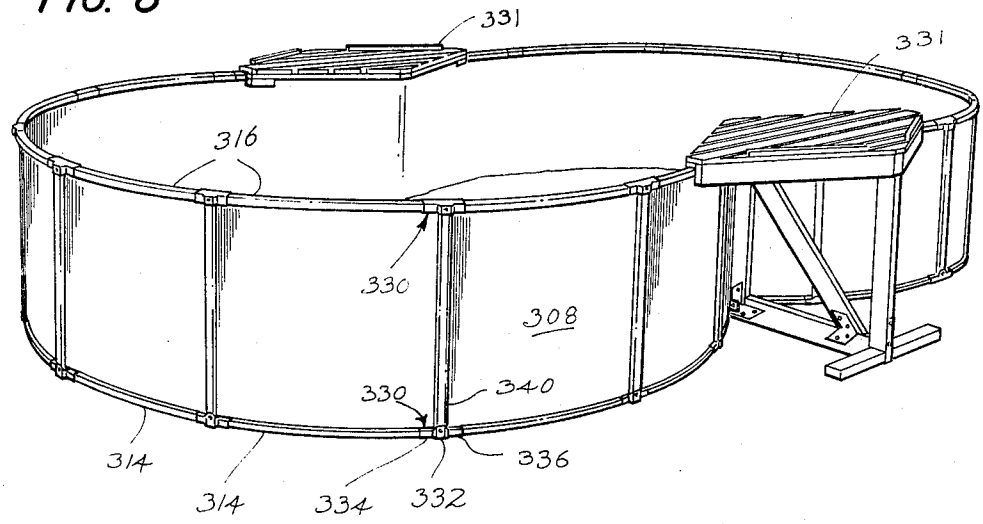
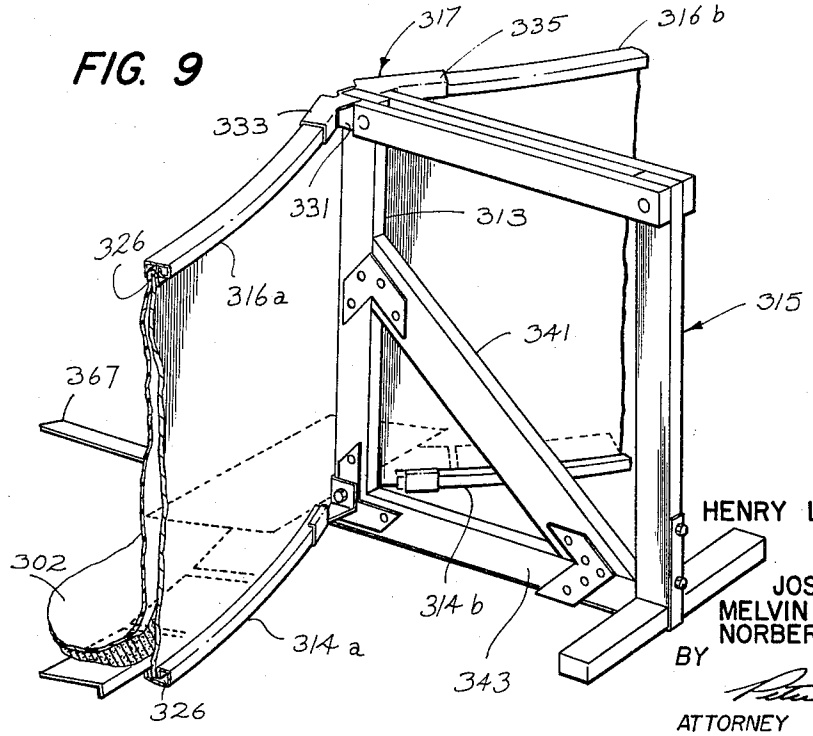


FIG. 9



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FOR SWIMMING POOLS AND THE LIKE
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FIG. 10

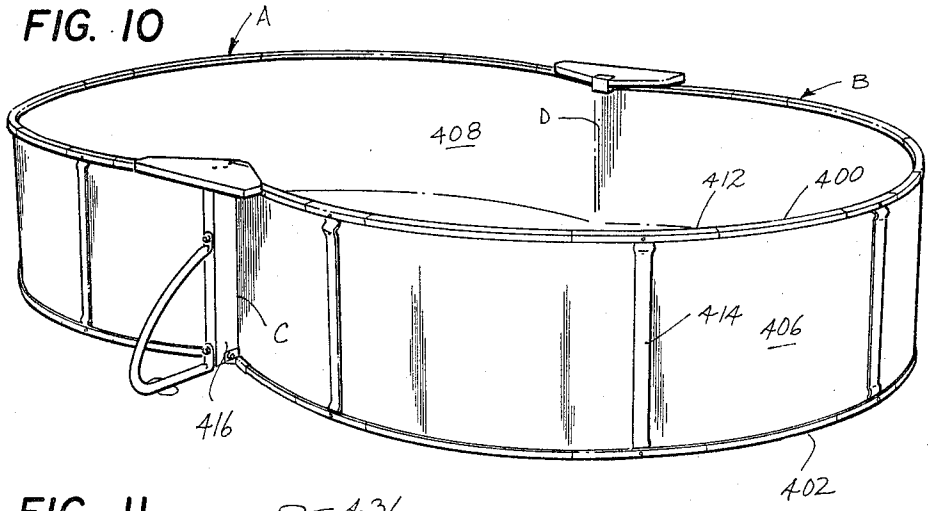
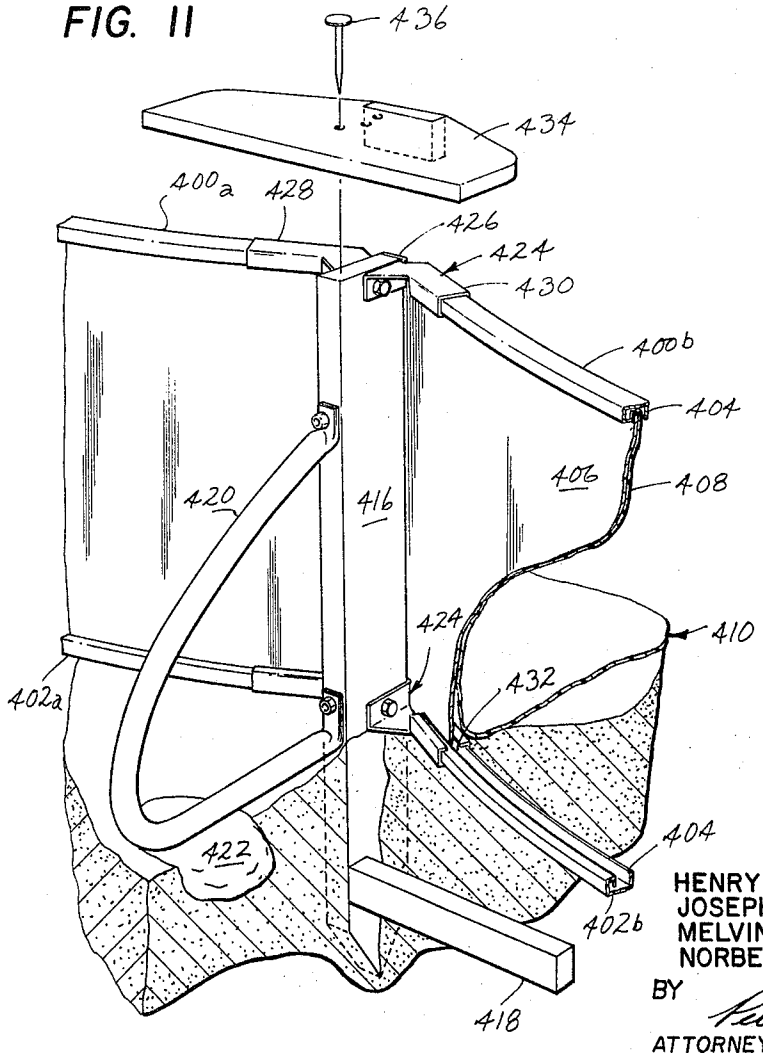


FIG. 11



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FIG. 12

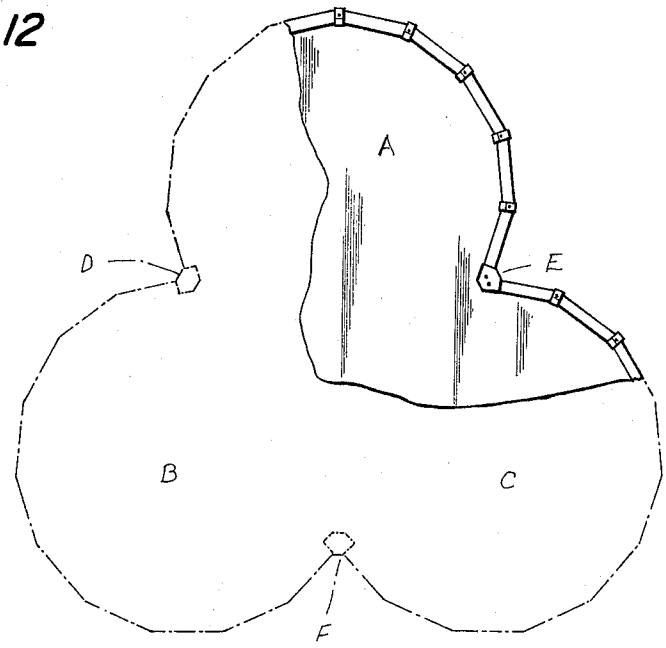
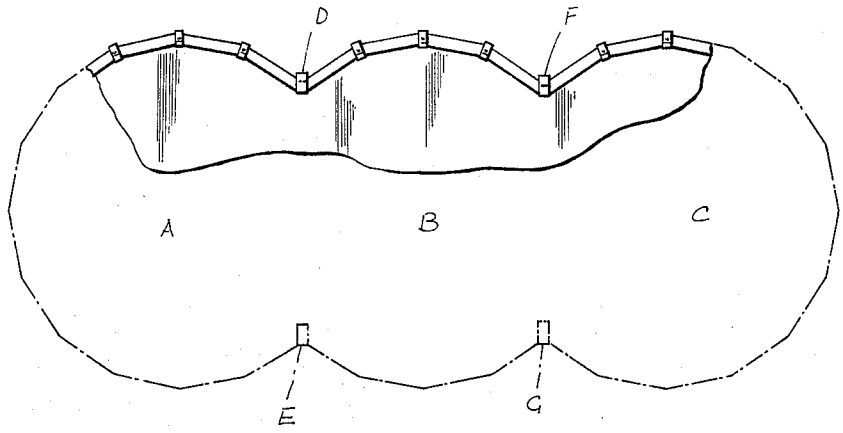


FIG. 13



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United States Patent Office 3,274,621 Patented Sept. 27, 1966

3,274,621

WATER-RETAINING RECREATIONAL STRUCTURE FOR SWIMMING POOLS AND THE LIKE

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Filed Dec. 27, 1965, Ser. No. 516,287
21 Claims. (Cl. 4—172)

The present invention relates to water-retaining recreational structures and, more particularly, to a novel assembly of the type having a flexible liner supported by a peripheral frame adapted to provide a swimming pool, hockey rink and the like.

Prefabricated pools of the type employing a flexible liner and a relatively rigid metal frame have enjoyed substantial acceptance in producing above-ground pools for use by families and organizations at considerably lower cost and with considerably greater ease than possible with concrete or other masonry pools which generally extend substantially below ground. Such pools have the advantages of being readily disassembled and of being portable to new locations and are also readily maintained and repaired.

Generally, such pools have assumed a rectangular configuration such as illustrated in Hooper United States Patents No. 1,740,305 and No. 1,742,313 and Phillips United States Patent No. 1,753,427; or a circular configuration such as illustrated in Arnold United States Patent No. 2,939,153 and Friedlander et al. United States Patent No. 2,989,757. It has also been proposed to use an oval configuration as illustrated by Hooper United States Patent No. 1,786,613. Of the various designs, the circular configuration has enjoyed extremely widespread application because of the fact the pressures of the water upon the frame may be more readily withstood by avoiding points of excess stress, thus facilitating construction and minimizing cost and problems in erection. As a result, circular pools of relatively large diameter have become more prevalent in an effort to provide larger family pools.

To achieve a longer swimming length, the width of such a circular pool is also necessarily increased, which may be undesirable both in terms of cost and in terms of the overall area required for the pool. Although an oval pool configuration would permit such elongation without increase in width, it is generally required that extensive reinforcing be provided at spaced points along the sides to resist the pressures upon the framework as illustrated in the aforementioned Hooper United States Patent No. 1,786,613.

It is an object of the present invention to provide a novel water-retaining recreational structure of elongated configuration which is easily assembled and highly rugged in construction.

It is also an object to provide such a water-retaining recreational structure which is readily adaptable to variation in design to provide cross sections of various curvilinear patterns, thus enabling separate diving wells, wading areas, etc.

Another object is to provide such a water-retaining recreational structure having a rugged frame assembly of great strength capable of withstanding pressures upon the peripheral wall exerted by volumes of water of relatively great height.

Still another object is to provide a frame assembly for a water-retaining recreational structure which may be readily assembled, which is relatively economical and simple to manufacture and which will ensure relatively long life and low maintenance.

Other objects and advantages will be readily apparent from the following detailed specification and claims and the attached drawings wherein:

FIGURE 1 is a perspective view of a water-retaining recreational structure embodying the present invention with portions thereof illustrated in phantom line and other portions below ground level indicated in dotted line;

FIGURE 2 is a fragmentary sectional view to an enlarged scale along the line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary sectional view along the line 3—3 of FIGURE 2;

FIGURE 4 is a fragmentary exploded view of the vertical support, horizontal suport, locking and cover members at the top portion of one of the intersections of the two circular components;

FIGURE 4*a* is a fragmentary perspective view to an enlarged scale of the frame assembly at a point other than the intersection of the two vertical components;

FIGURE 5 is a plan view of the water-retaining recreational structure of FIGURE 1 with a portion of the frame, liner and ground broken away to reveal the constructure of the rods and connectors, which are exaggerated in size for purposes of illustration;

FIGURE 6 is a perspective view of another water-retaining recreational structure embodying the present invention with portions thereof illustrated in phantom line;

FIGURE 7 is a fragmentary perspective view to an enlarged scale of the elements at the intersection of the circular components with portions thereof broken away for clarity of illustration;

FIGURE 8 is a perspective view of still another water-retaining recreational structure embodying the present invention;

FIGURE 9 is a fragmentary perspective view to an enlarged scale of the elements at the intersection of the circular components with the deck member removed and portions thereof broken away for clarity of illustration;

FIGURE 10 is a perspective view of yet another embodiment of a water-retaining recreational structure embodying the present invention;

FIGURE 11 is a fragmentary perspective view to an enlarged scale of the elements at the intersection of the circular components with portions thereof broken away or in section for clarity of illustration and with the cover exploded therefrom;

FIGURE 12 is a plan view of a further pool embodying the present invention with portions thereof illustrated in phantom line; and

FIGURE 13 is a plan view of a still further water-retaining recreational structure embodying the present invention with positions thereof illustrated in phantom line.

It has now been found that the foregoing and related objects can be readily attained in a water-retaining recreational structure having a curvilinear peripheral configuration defined by a plurality of generally circular components intersecting at apices where the chords extending between the apices defined by the points of intersection are of lesser length than the diameter of the intersecting circular components. The recreational structure has a liner member of flexible relatively waterproof sheet material providing a bottom wall portion and a side wall portion extending about the periphery of the bottom wall portion, and a relatively rigid, generally vertical support panel extends about the periphery of the liner side wall portion closely adjacent thereto so as to provide a relatively rigid horizontal support therefor on the curvilinear peripheral configuration. A plurality of elongated horizontal support members extend in end-to-end relationship about the liner member in the curvilinear configuration, and vertical support members at the intersections of the circular components extend vertically along the outer surface of the

support panel. Engaging the adjacent ends of the horizontal support members and the vertical support members at the intersections to provide a firm assembly thereof are coupling means or elements and the horizontal support members diverge outwardly from the vertical support members to form the walls of the circular components. Means are provided at the vertical support members at the intersections to compensate against the pressures thereon.

The coupling means for engaging the adjacent ends of the horizontal support members and the vertical support members conveniently may take the form of an element with a body portion engaged with the vertical post and a pair of diverging arm portions which telescopically receive the end portions of the horizontal support members. It can be seen that the connectors for the horizontal support members may, however, comprise elements permanently or releasably affixed to the vertical support members at the intersections. Various structural arrangements may be employed either individually or collectively to effect the desired coupling of the horizontal support members and the vertical support members at the intersections so that the horizontal support members are firmly engaged therewith and diverge outwardly therefrom.

The compensating means provided at the vertical support members at the intersections to compensate against the pressure thereon which would tend to produce deformation or warping thereof may take a number of forms. In its preferred aspect, an extremely rugged assembly is provided by utilizing vertical support members of relatively great strength, which extend below the bottom horizontal support members of the structure and into the ground therebelow. At or adjacent the lower end thereof, a compression coupling is provided between the vertical support members at the opposed points of intersection and tension coupling means are provided therebetween at a point spaced upwardly therefrom but also below the base horizontal support members. In other embodiments, the compensating means may be provided by a single member extending between the vertical support members at the intersections, or by utilizing a bracing or buttressing arrangement extending outwardly from the vertical support members at the intersections to support the vertical support member intermediate the height thereof or along the entire length thereof, or by the combination thereof. Straps, chains, rods, tubes and various metal members such as I-beams, or combinations thereof, may be used to tie the vertical support members at the opposed points of intersection so as to allow them to function as a unit in resisting the pressures upon the structure. Such members used to tie the vertical support members at the opposed points of intersection, whether functioning in compression or in tension, are referred to herein as "tie means," and such tie means includes tension and compression members whether used singly or jointly. In still another embodiment the vertical support members at the intersections may simply comprise posts of relatively greater length which extend below the base horizontal support members into the ground so as to derive support therefrom in resisting deformation and such members are most desirably coupled with external bracing or buttressing extending outwardly therefrom.

In accordance with the present invention the curvilinear configuration for the structure may be provided by two, three, four or even more generally circular components which intersect in the manner heretofore described. For example, when utilizing two circular components, they are arranged in a generally Figure-8 pattern. Three circular components may be arranged with their centers aligned or in a trilobal pattern wherein a line drawn between the centers forms a triangle. Four circular components may be arranged in a tetralobal configuration or arranged with their centers in alignment for an elongated configuration or in a generally trilobal arrangement with

one of the lobes elongated through use of two intersecting circular components. In this manner, one of the circular components may be used as a deep diving well, another as a shallow wading area and still others to provide general swimming areas of intermediate depth. It will be appreciated that the liner member must be appropriately configured and dimensioned so as to conform reasonably closely to the configuration of the frame assembly.

Referring now in detail to the attached drawings, FIGURES 1–5 illustrate an embodiment of the present invention particularly adapted to retaining a relatively deep and wide body of water. As can be seen in FIGURE 5, the peripheral configuration is curvilinear and defined by two generally circular components A, B which intersect at the points or apices C, D to provide a Figure 8 outline. The chords extending between the apices C, D defined by the points of intersection are smaller than the diameters of the circular components A, B, and the overall length of the structure is about 1⅔ times the diameter of the circular components.

In accordance with conventional construction, the pool utilizes a liner member generally designated by the numeral **2** and fabricated from flexible, waterproof synthetic plastic sheet material to provide a bottom wall portion **4** and a side wall portion **6** extending about the periphery thereof. Extending about the outer periphery of the side wall portion **6** of the liner member **2** is a side wall panel **8** which is closely adjacent thereto to provide relatively rigid horizontal support against the pressure of the water in the structure and pressures occurring during use. The side wall panel **8** is illustrated as a single length of coilable corrugated sheet metal providing substantial rigidity and has its ends joined by a connecting member (not shown). However, a plurality of panels may be employed if so desired. The upper edge of the liner side wall portion **6** is folded over the upper edge of the side wall panel **8** and secured thereon by the channel-shaping coping **10** of semi-rigid synthetic plastic material which is preattached thereto and dimensioned to frictionally bear upon the surfaces of the side wall panel **8** through the material of the liner **2**. A channel-shaped steel coping strip **12** fits snugly over the coping strip **10** to secure it in place and stiffens the upper edge of the side wall panel **8**.

The side wall panel **8** is aligned and secured against movement by a plurality of lower horizontal support members or base rails extending in end-to-end relationship about the base thereof and generally designated by the numeral **14** and wider upper horizontal support members or top rails extending in end-to-end relationship about the upper end thereof and generally designated by the numeral **16**. The base rails **14** are of generally arcuate shape so as to conform the circular components A, B, and have inner and outer side wall portions **18**, **20** and upper and lower wall portions **22**, **24**. The upper wall portion **22** extends inwardly from the outer side wall portion **20** and terminates at a point spaced from the inner side wall portion **18** to provide a channel **26** which receives the lower edge portion of the side wall panel **8**. To rigidify the upper wall portion **22** and provide firmer support for the side wall panel **8**, the upper wall portion **22** has a depending flange **28** at its free end.

Except at the intersections C, D of the circular components A and B, the end portions of adjacent base rails **14** are telescopicially received and held in alignment by aligning or locking elements generally designated by the numeral **30** which have a body portion **32** and laterally extending arm portions **34**, **36**. The body portion **32** is of greater radial width than the arm portions **34**, **36** and provides a relatively large upwardly opening aperture (not shown) for a purpose to be described hereinafter. The arm portions **34**, **36** are formed so as to provide generally tubular enclosures which slidably receive the end portions of the base rails **14** and an upwardly opening channel **38** adjacent the inner end thereof extending

through the entire length of the locking element **30** and into which is fitted the side wall panel **8**.

Cooperating with the base locking elements **30** are a plurality of vertical support members or posts generally designated by the numeral **40** and of generally U-shaped configuration. The posts **40** have generally parallel side wall portions **42** connected by an outer wall or web portion **44** and seat in the apertures (not shown) of the locking element body portion **32**. To lock the base rails **14** firmly in position, the components are cooperatively dimensioned so that the end portions of the rails **14** extend inwardly of the locking element body portion **32** and are provided with slots **48** in the outer side wall portion **20** and upper wall portion **22** thereof which receive the side wall portions **42** of the posts **40**. The outer wall portion **44** of the post **40** butts against the outer wall of the locking element body portion **32** and is desirably secured thereto by suitable disengageable fastening means **46** such as a sheet metal screw. In a preferred embodiment, deflectable fingers (not shown) are staked from the side wall portions **42** and extend outwardly and upwardly therefrom so as to abut against the under surface of the upper wall portions **22** of the base rails **14** to restrain the posts **40** from relative vertical movement. At the upper end, the posts **40** are capped by seating plates or members **50** which are secured thereto by any suitable means.

The top rails or horizontal support members **16** are generally rectilinear along their length and have a reversely bent inner side wall portion **52** which provides a shoulder against which the steel coping strip **12** may bear to provide lateral support for the side wall panel **8** and liner **2**. The outer side wall portion **54** of the top rails **16** curves downwardly and inwardly and terminates in an inwardly extending L-shaped flange which provides a relatively rigid element and a seating surface without sharp edges for users of the structure. The upper ends of the posts **40** fit snugly into the channels between the inner and outer side wall portions **52**, **54** to form a snug fit therein with the sidewall panel **8**, liner side wall portion **6** and coping elements **10**, **12**. Except at the intersections C and D, the top rails **16** have their ends cut at an angle to conform generally to the radius of the circular components A and B so that the ends of the adjacent rails may abut evenly along a straight line and so that each rail **16** forms the chord of a circle about the liner side wall portion **6**.

Overlying the end portion of abutting top rails **16** at the posts **40** are locking plates generally designated by the numerical **60** which have two pairs of depending leg portions or retaining elements **62** with horizontally extending arm portions **64** therebetween at each side thereof. Each locking plate **60** straddles the junction between two adjacent top rails **16** and each pair of depending leg portions **62** at each side passes through one of two apertures **69** in each of the adjacent top rails **16** to hold the top rails **16** in alignment. A V-shaped groove **66** in the bottom surface of the locking plate **60** seats on longitudinally extending ribs **68** on each of the adjacent top rails **16** for aligning the locking plates **60** thereon. The depending leg portions **62** are received in a pair of aligned, elongated apertures **70** on each side of the seating plates **50** on the posts **40** which also receive a pair of leg portions or retaining elements **72** formed from the top wall portion of the top rail **16** to provide the apertures **69** and depend therefrom adjacent the apertures **69**. The leg portions **62**, **72** and apertures **70** are dimensioned to provide a snug assembly and thus secure the top rails **16** in horizontal alignment on the posts **40**. Self-tapping sheet metal screws **74** disposed in spaced apertures **76** in the locking plate **60** and extending through the apertures **69** of the top rails **16** are engaged in the apertures **78** of the seating plate **50** to retain the locking plate **60** and the two adjacent top rails **16** in engagement with the seating plate **50** and the posts **40**.

Overlying the locking plates **60** and the abutting end portions of adjacent top rail members **16** are a pair of overlapping outer and inner cover members **80** and **82** which are provided at each of the posts **40**. The outer cover member **80** has a depending inwardly curved outer side wall portion **84** which flexibly engages the curved side wall portions **54** of the adjacent top rails **16**. A flange portion **86** depends from the end of the curved side wall portion **84** so that its inner surface abuts against the outer wall **44** of the post **40** and a self-tapping sheet metal screw **88** locks in apertures in the flange **86** and outer side wall portion **44**, thereby securing the outer cover member **80** to the post **40**.

The inner cover member **82** has a depressed portion **90** which is overlapped by the outer cover member **80** so as to provide a substantially flush surface and a side wall portion **92** thereon has an inwardly extending lip portion **94** at the free end thereof engaged with the top rail side wall portion **52** so that the inner element **82** is restrained from vertical movement on the top rail **16**. The cover members **80**, **82** have depending flanges along their side edges which interfit to limit relative horizontal movement and provide a neat appearance and which have notches therein which receive the arm portions **64** of the locking plate **60** to prevent relative horizontal movement.

A threaded fastener **96** is disposed in the aperture **98** in the outer cover member **80** and extends through the aligned elongated aperture **100** in the inner cover member **82** and through the aperture **102** in the locking plate **60** and through the notched-out portions **104** in the ends of the top rails **16**, or therebetween depending upon the spacing, to engage in the nut **106** in the center portion of the seating plate **50**. In this manner, the several members are releasably but firmly engaged in assembly.

At the intersections C and D of the circular components A and B, the adjacent top rails **16***a*, **16***b* and base rails **14***a*, **14***b* are interconnected by vertical apex posts generally designated by the numeral **110** of greater strength illustrated as an I-beam with inner and outer flanges **112**, **114** and a connecting web portion **116**. As seen in FIGURES 1–3, the apex post **110** is of greater height than the side wall panel **8** and extends below the base rails **14** into the ground, preferably to a distance of about one-third the overall height thereof. At its lower end, the apex post **110** has a stabilizing bar **118** which projects laterally to either side thereof and is affixed to the outer flange **114** by bolts **120**. Braces **122** extend diagonally upwardly from the outer ends of the stabilizing bar **118** and connect to the web portion **116** of the post **110** at a point above the base rail **14** and thereby the ground. Affixed to the outer flange **114** of the apex post **110** at a point spaced upwardly from the stabilizing bar **118** and adjacent but below the base rail **14** is a tension bar bracket **124** which projects a short distance to either side thereof.

The base rails **14** are engaged with the apex post **110** by bracket assemblies generally designated by the numeral **126** on either side of the web portion **116** and each provided by a generally L-shaped bracket **128** and a locator element **130** disposed thereabove, both elements being secured to the web portion **116** of the apex post **110** by bolt fasteners **131**. The locator element **130** is spaced a short distance above the laterally extending arm of the bracket **128** and has a mounting flange portion **132** disposed against the bracket portion and the web portion **116**. An arm portion **134** extends from the outer end of the flange portion **132** and has its end bent inwardly so as to conform to the angle of and seat within the slot **48** of the base rail **14**. The inner free edge of the laterally extending arm of the bracket **128** is bent upwardly and provides a deflectable lock engaging behind the inner side wall portion **18** of the base rail **16**, thus providing firm location of the base rails **14** and locking thereof against relatively horizontal movement. As can be seen, the base rails **14***a* and **14***b* thus may be identical to the rest of the base rails **14** so as to be fully interchangeable therewith.

At the upper end of the apex post **110** are top rail locators **140** of generally L-shaped configuration which are secured to either side of the web portion **116** by bolt fasteners **142**. The laterally projecting arms **144** each

have a pair of spaced and aligned apertures **146** adjacent the web portion **116** and a pair of spaced and aligned elongated apertures **148** adjacent the free end thereof. In this instance, the top rails **16***a*, **16***b* are cut into generally V-shaped configurations so that the outer legs of the V-shaped cuts butt together to provide an outwardly opening V-shaped joint therebetween. Thus, the top rail members **16***a*, **16***b* are not interchangeable with the rest of the top rail members **16**.

The locating plate **60** is assembled similarly to those at the posts **40** with the leg portions **72***a*, **72***b* of the rails **16***a*, **16***b* and the leg portions **62** of the locking plates **60** firmly and snugly seating within the elongated apertures **148** of the locator elements **140**. The threaded fasteners **74** seat in the inner apertures **76** of the locking plate **60** and extend through the apertures **69***a*, **69***b* of the rails **16***a*, **16***b* to lock in the inner apertures **146** of the locator elements **140**. Overlying and covering the entire assembly is an apex cover plate **150** which has front and rear wall portions **152** and side wall portions **154** configured so as to snugly fit over the top rails **16**. Threaded fasteners **156** seat in apertures **158** therein and extend through the outer apertures **76** in the locking plate **60** and the apertures **69** of the top rails **16***a*, **16***b* to seat in the outer apertures **146** of the locator elements **140**. In this manner, the top rails **16***a*, **16***b* are firmly and aesthetically engaged to the apex post **110** in a rugged assembly.

To resist stresses and pressures applied against the apex posts **110** at the intersections C and D of the circular components A and B, the posts **110** are joined together as a working unit. Extending between the lower ends of the apex posts **110** are a pair of compression bars **160**, **162** of tubular configuration which are threadably joined by an internally threaded coupling **164** and which have their ends fitted onto a generally circular boss **166** bolted to the inner flange **112** at the base of the apex posts **110**. Extending between each laterally extending arm portion of the tension bar brackets **124** the apex posts **110** are a pair of tension bars **168**, **170** which are threadably engaged to the brackets **124** and coupled at their opposed ends by the threaded coupling elements **172** so as to provide an adjustable connection therebetween.

In assembling the embodiment of FIGURES 1–5, the centers of the two circular components A and B are first located and a line is extended therebetween. The midpoint along this line at which the circular components A and B will intersect is then determined and the points of intersection to either side are located where the apex posts **110** will be placed. The stabilizing bar **118** is assembled to the base of the apex posts **110** by the bolts **120** and the braces **122** are thereafter attached. The circular boss **166** for locating the compression bars **160**, **162** are attached to the bases of the apex posts **110**, and the bracket assemblies **126** and top rail locators are also fastened thereto. The compression bars **160**, **162** are then threaded into the coupling **164** until they butt.

Holes are then dug for the apex assemblies to the desired depth and a trench of equivalent depth is dug therebetween. The apex posts **110** are inserted into the holes prepared therefor, and the compression bars **160**, **162** are then inserted into the trench and fitted onto the bosses **166** at the bases of the apex posts **110**. The apex posts **110** are now checked to ensure that they are perfectly vertical and of equal height conveniently by placing a plank therebetween and locating a level thereon. Adjustments may be required and may be made easily by removing earth from one side or the other until the desired leveled condition is obtained. Stakes are desirably provided to hold the apex posts **110** in proper alignment, and some dirt is introduced into the trench and into the bottom of the hole about the apex posts **110** and thereafter tamped.

The tension bars **166**, **168** are threaded through the tension bar brackets **124** which then are located in the proper position on the apex posts **110** and secured thereto by fasteners. The tension bar couplings **172** are then tightened on the ends of the tension bars **167**, **170** until the desired tension is obtained therein, it being important that the tension in both tension bars be susbtantially the same to avoid torque on the apex posts **110**. Dirt is then placed in the trench and about the apex posts **110** to the desired height.

The base rails **14***a*, **14***b* are attached to the bracket assemblies **126** on the apex posts **110** by fitting the slots **48** in the base rails **14** over the end portions of the locator elements **130** until fully seated and the upturned lip on the bracket **128** has seated therebehind. The remaining base rails **14** are then assembled in end-to-end relationship with the base locking elements **30** to define the curvilinear outline of the pool. The side wall panel **8** is then uncoiled and seated into the channels **26** and **38** of the base rails **14** and base locking elements **30** respectively and the overlapping ends thereof secured together by fastening means (not shown). The posts **40** are then inserted into the base locking elements **30** so as to engage in the slots **48** in the base rails **14** and are secured to the locking elements **30** by the fasteners **46**. Desirably, a layer of sifted dirt is placed around the bottom of the pool to protect the liner from injury by the base rails **14**. The liner **2** is then mounted by fitting the coping **10** over the upper edge of the side wall panel **8** and securing it thereto by the steel coping **12**.

The top rails **16***a*, **16***b* are now assembled to the apex posts **110** by seating the depending leg portions **72***a*, **72***b* in the apertures **148** of the top rail locators **140**. The locking plates **60** are inserted thereover with the leg portions **62** thereof extending therethrough and fitting into the elongated apertures **148** of the top rail locators **140**. The fasteners **74** in the rear apertures **76** lock the top rails **16***a*, **16***b* to the apex posts **110**. The rest of the top rails **16** are readily assembled to the posts **40** about the remainder of the circular components A and B in end-to-end relationship by similarly inserting the leg portions **72** into the elongated apertures **70** of the seating plates **50**, placing the locking plates **60** thereon, and securing the locking plate and rails in assembly by the fasteners **74**. The apex cover plates **150** and the outer and inner cover members **80**, **82** are assembled over the locking plates **60** to complete the installation.

Thus, it can be seen that the assembly is readily erected and adjusted to ensure maximum structural strength. The tension and compression bars are disassemblable for shipping and storage and the tension bars are adjustable to obtain proper action in cooperation with the compression bars.

Referring now to the embodiment of FIGURES 6 and 7, the construction is generally identical to that in FIGURES 1–5 except at the intersections C and D of the circular components. The apex posts in this embodiment are generally designated by the numeral **211** and are channel-shaped steel members with the channel opening outwardly. The lower end of the apex post **211** fits between the side walls of the body portion **203** of the bottom rail connector generally designated by the numeral **201**. The connector **201** also has generally tubular arm portions **205** which telescopically receive the end portions of the base rails **214***a*, **214***b* and provide channels **207** which align with the channels **226** in the base rails **214***a*, **214***b* and receive the side wall panel **208**. The bottom rail connectors **201** and apex posts **211** are secured in assembly by the fasteners **209**.

The top rails **216***a*, **216***b* are joined to the apex post **211** by a structural assembly essentially similar to that employed for the rails **16** at the posts **40** in the embodiment of FIGURES 1–5, the exceptions being that the top rails **216***a*, **216***b* have their ends cut into a generally V-shaped configuration as in the instance of the top rails **16***a*, **16***b* and that the configuration of the cover members **80**, **82** is slightly altered to accommodate the altered angular relationship.

In this embodiment, the apex posts **211** are buttressed by an assembly including a diagonal member **255** which extends diagonally outwardly and downwardly from approximately the midpoint thereof and is received between the outer ends of a pair of horizontal members **256, 257**. The several members **255, 256** and **257** are fastened together by a length of tubing **258** which extends through cooperating apertures therein and projects laterally therefrom to act as a stabilizer and anchor when covered by dirt. The horizontal members **256, 257** diverge from the lower end of the diagonal member **255** and extend below the base rails **216***a*, **216***b* and inwardly of the pool structure. Tubular braces **259, 261** extend downwardly from the apex posts **211** and connect to the horizontal tubular members **256, 257** adjacent the base rails **216***a*, **216***b*. To cover the channel of the apex posts **211**, a pair of generally channel-shaped cover elements **263, 265** are snapped into place thereover above and below the juncture with the diagonal tubular steel member **255**.

The two apex posts **211** are tied together to function as a unit by the steel strap **267** which extends across the width of the structure and outwardly beneath the apex posts **211** and about the ends of the diagonal members **255** so that its ends are secured to the base or web thereof by the bolt fasteners **269**. As best seen in FIGURE 7, lifting of the frame assembly is limited by a multiplicity of pressure plates **271** which have a flange **273** seated in the channels **226** of the base rails **214** and a relatively large pressure plate **275** which is disposed over the steel strap **267**. Sand or dirt **277** is applied there over to press upon the base rail **214**, and if so desired, the large pad **275** may be bolted in position.

Thus, it can be seen that in this embodiment the base and top rails again are firmly secured to the apex posts **211** which in turn are firmly buttressed to resist deflection along its length and the two apex posts **211** are secured together to function as a unit in resisting pressures.

Referring now to the embodiment of FIGURES 8 and 9, therein illustrated is a structure suitable for pools containing a lesser volume of water. In this embodiment the base and top rails **314, 316** are identically configured and provide opposed channels **326** extending therealong which receive the side wall panel **308** (and the side wall portion **306** of the liner member **302**). The base and top rails **314, 316** are secured together except at the intersections C and D by identical locking and aligning members generally designated by the numeral **330** which have body portions **332** which receive the tubular posts **340** and arm portions **334, 336** which telescopically receive the ends of the rails **314, 316**. The posts **340** are releasably secured thereto by fasteners such as sheet metal screws **346** and a channel (not shown) is provided in the locking members **330** cooperating with the channel **326**.

At the intersections C and D, an apex post **313** is provided as a part of a rectangular frame which is generally indicated by the numeral **315**. The base rails **314***a*, **314***b* and top rails **316***a*, **316***b* are secured to the apex post **313** by connecting members generally designated by the numeral **317** which have a body portion **331** and diverging arm portions **333, 335** which receive the ends thereof. A channel **321** extends along the length of the connecting members **317** and cooperates with the channel **326** in the base rails **314** and top rails **316**. The apex post **313** is supported by the diagonal brace **341** which extends from a point intermediate its length to the outer end of the base element **343** of the frame **315**. The top element **323** is reinforced and widened by side pieces **325** which extend to and are fastened to the upright element **327** of the frame **315**. Metal straps **349** are desirably employed to secure together various elements of the frame **315** and diagonal brace **341**. To enhance the stability of the assembly, a pair of feet **329** are mounted on the upright member **327** of the frame **315** to bear upon the ground and to be partially embedded therein. A deck element **331** is seated on the top rails **316***a*, **316***b* and frame **315** to provide a seat and cover the apex elements.

Extending between the apex posts **313** to tie them together for functioning as a unit is a steel strap **367** which extends below the liner members **302**, base rails **314***a*, **314***b* and connecting members **317**. The strap **367** extends along the bottom surface of the base element **343** and upwardly along the outside surface of the upright element **327** to which it is secured by threaded fasteners **333**.

As in the instance of the embodiment of FIGURES 6 and 7, the frame is restrained against lifting pressures by a multiplicity of pressure plates **371** which have a flange **373** seated in the channels **326** of the base rails **314** and a relatively large pressure plate **375** which is disposed over the steel strap **367**. Sand or dirt **377** is applied thereover.

Turining now to the embodiments of FIGURES 10 and 11, therein illustrated is a relatively inexpensive structure suitable for use in pools of relatively short length and low height. A multiplicity of generally arcuate top and bottom rail members **400, 402** of identical configuration have a channel **404** therein which receives the side wall panel **406** (and the side wall portion **408** of the liner member **410**). The top and bottom rails **400, 402** are connected and aligned in end-to-end relationship by tubular connecting members **412** which telescopically receive the ends thereof and have a channel (not shown) cooperating with the channel **404**. The flattened ends of the tubular vertical posts **414** are frictionally received in the channels **404** of the rails **400, 402**.

At the intersections C and D of the circular components A and B, the apex post comprises an elongated wooden member **416** which extends into the ground to a distance of about one-third its overall length and which has adjacent its lower end a pair of horizontally extending stabilizers **418** which are covered with dirt so as to more firmly anchor the base thereof. To provide additional stability and support for the apex post **416**, a reversely bent tubular brace **420** is fastened to the outer surface thereof and desirably bears upon a hard relatively wide support such as the rock **422**.

The top rails **400***a*, **400***b* and bottom rails **402***a*, **402***b* are secured to the apex post **416** by the apex connectors generally designated by the numeral **424** which have a channel-shaped body portion **426** which fits about the sides of the apex post **416** and tubular arm portions **428, 430** diverging therefrom which receive the end portions of the rails and have a channel **432** therein to receive the edges of the side wall panel **406**. A seat and cover member **434** is fastened to the top of the apex post by nails **436** or other suitable fasteners.

FIGURE 12 illustrates a further embodiment of construction in accordance with the present invention wherein three circular components A, B and C intersect at points D, E and F to form a trilobal curvilinear configuration. Here again, the horizontal support members must be coupled to the apex posts at the points of intersection D, E and F and diverge outwardly therefrom. In accordance with the preferred aspect of the present invention, the apex posts at the points of intersection D, E and F are tied together so as to function as a unit in resisting pressures upon the frame assembly.

In FIGURE 13, three circular components A, B and C are arranged with their centers in a line and therefore intersect at the four points D, E, F and G. In this embodiment, the opposing apex posts at the points of intersection D and E and F and G are desirably coupled so as to function as a unit.

It will be apparent that other configurations utilizing a plurality of circular components may be created such as a tetralobal design or one where four or more cir-

cular components are arranged with their centers in line or one wherein a configuration such as that in FIGURE 12 is elongated by having one of the lobes comprised of two intersecting circular components. In this manner, a deep diving well can be provided in one portion of the structure and a relatively shallow wading area may be provided in another portion of the structure.

In each of the several embodiments hereinbefore specifically described, the structure has a curvilinear peripheral configuration defined by a plurality of intersecting generally circular components and the chords defined by the points of intersection are of lesser length than the diameter of the circular components. The elongated horizontal support members are coupled to the vertical support members at the intersections to provide a firm assembly wherein the horizontal support members diverge outwardly from the vertical support members to form the walls of the circular components. Means are provided at the intersections to increase the ability of the vertical support members to resist deformation by the pressures exerted thereon, most desirably in the form of actual tie means between the vertical support members at the points of intersection, although external buttressing may also be employed.

Thus, it can be seen that the present invention provides a novel water-retaining recreational structure adapted to form an elongated configuration and which is easily assembled and highly rugged in construction. The structure of the present invention utilizes a rugged frame assembly of great strength capable of withstanding pressures upon the peripheral wall exerted by volumes of water of relatively great height and is readily adaptable to variation in design to provide cross sections of various curvilinear patterns, thus enabling separate diving wells and wading areas. The structure is readily assembled, relatively economical and simple to manufacture and may be readily disassembled for portage or storage.

Having thus described the invention, we claim:

1. A water-retaining, above ground prefabricated recreational structure adapted to be disassembled and having a curvilinear peripheral configuration defined by a plurality of generally circular components intersecting at apices, the chords extending between said apices being of lesser length than the diameter of the intersecting circular components, said recreational structure having a liner member of flexible, relatively waterproof sheet material providing a bottom wall portion and a side wall portion extending about the periphery of said bottom wall portion; a relatively rigid, generally vertical support panel extending about the periphery of said liner side wall portion and closely adjacent thereto to provide a relatively rigid horizontal support therefor in said curvilinear peripheral configuration; a plurality of elongated horizontal support members extending in end-to-end relationship about said liner member in said curvilinear configuration; vertical support members at said apices between said circular components extending vertically of the outer surface of said support panel; coupling means engaging the adjacent ends of horizontal support members with said vertical support members at said apices to provide a firm assembly thereof with said horizontal support members diverging outwardly from said vertical support members; and means at said vertical support members compensating against pressures thereon.

2. The water-retaining recreational structure of claim 1 wherein said compensating means includes portions on said vertical support members at said apices extending substantially below said vertical support panel and adapted to extend into the ground, a tension member extending between said portions of said vertical support members adjacent said vertical support panel and a compression member extending therebetween adjacent the lower ends thereof.

3. The water-retaining recreational structure of claim 1 wherein said compensating means includes portions on said vertical support members extending substantially below said vertical support panel and adapted to extend into the ground so as to be anchored therein, and brace member on said vertical support members extending outwardly therefrom and adapted to obtain support from the ground and buttress said support members.

4. The water-retaining recreational structure of claim 3 wherein the portions of said vertical support members below said vertical support panel have laterally projecting elements adapted to more firmly seat the support member in the ground.

5. The water-retaining recreational structure of claim 1 wherein tie means extend chordally between said vertical support members at said apices below said liner member.

6. The water-retaining recreational structure of claim 1 wherein said compensating means includes outwardly projecting braces on said vertical support members at said apices and adapted to bear upon the ground and provide a buttress support therefor.

7. The water-retaining recreational structure of claim 1 wherein said coupling means has a pair of diverging wing portions providing a generally V-shaped configuration and telescopically receiving the adjacent ends of horizontal support members and a central body portion engaged with the upper ends of said vertical support members at said intersections.

8. The water-retaining recreational structure of claim 1 wherein said curvilinear peripheral configuration is defined by two apices at the generally circular components intersecting to provide a generally figure-8 cross section.

9. The water-retaining recreational structure of claim 1 wherein said curvilinear peripheral configuration is defined by at least three circular components having their centers arranged rectilinearly.

10. The water-retaining recreational structure of claim 1 wherein said curvilinear peripheral configuration is defined by at least three circular components, one of said circular components intersecting two other circular components so that the centers thereof are disposed in a triangle to define a trilobal design.

11. The water-retaining recreational structure of claim 10 wherein the compensating means includes tie members extending between said vertical support members at the apices at the intersections of said circular components.

12. The water-retaining recreational structure of claim 1 wherein said horizontal support members extend above the upper and lower edges of said vertical support panel and have opposed channels therein receiving the edge portions of said vertical support panel.

13. The water-retaining recreational structure of claim 1 wherein said coupling means includes seating portions on said vertical support members at the upper end thereof and depending retaining elements on the end portions of adjacent horizontal support members engaged in said seating surface portions.

14. The water-retaining recreational structure of claim 13 wherein said retaining elements on said end portions of said horizontal support members include depending portions formed on a locking member disposed thereabove and extending therethrough and wherein said coupling means includes cover members overlying the end portions of said adjacent horizontal support members and locking member with retaining means thereon engaged with said seating portion and horizontal support members to provide a firm assembly therewith.

15. The water-retaining recreational structure of claim 1 wherein said vertical support members at said intersections are of generally I-shaped cross section providing inner and outer flanges and a web portion extending generally chordally of the circular components and wherein said coupling means includes elements mounted on said vertical post releasably engaging the adjacent ends of horizontal support members, and wherein said compensating means includes a portion on said vertical support

member extending substantially below said vertical support panel and adapted to extend into the ground so as to be anchored therein, a tension member extending between said portions of said vertical support members at opposed apices below said liner member and a compression member extending therebetween adjacent the lower ends thereof.

16. A water-retaining, above ground prefabricated recreational structure adapted to be disassembled and having a curvilinear peripheral configuration defined by a plurality of generally circular components intersecting at apices, the chords extending between said apices being of lesser length than the diameter of the intersecting circular components, said recreational structure having a liner member of flexible, relatively waterproof sheet material providing a bottom wall portion and a side wall portion extending about the periphery of said bottom wall portion; a relatively rigid, generally vertical support panel extending about the periphery of said liner side wall portion and closely adjacent thereto to provide a relatively rigid horizontal support therefore in said curvilinear peripheral configuration; a plurality of elongated horizontal support members extending in end-to-end relationship about both the top and the bottom of said liner member and vertical support panel in said curvilinear configuration, said horizontal support members retaining said vertical support panel in assembly therewith; vertical support members at said circular components and at a multiplicity of points about the circumference of said circular components extending vertically of the outer surface of said support panel; coupling means engaging the adjacent ends of said top and bottom horizontal support members with said vertical support members to provide a firm assembly thereof with said horizontal support members diverging outwardly from said vertical support members at said apices; and means at said vertical support members at said apices compensating against pressures thereon including tie means extending chordally between said vertical support members at said apices and below said liner member.

17. The water-retaining recreational structure of claim 16 wherein said vertical support members at said apices are of generally I-shaped cross section providing inner and outer flanges and a web portion extending generally chordally of the circular components and wherein said coupling means includes elements mounted on said vertical post releasably engaging the adjacent ends of horizontal support members, and wherein said compensating means includes a portion on said vertical support

member extending substantially below said vertical support panel and adapted to extend into the ground so as to be anchored therein, a tension member extending between said portions of said vertical support members at opposed apices below said liner member and a compression member extending therebetween adjacent the lower ends thereof.

18. The water-retaining recreational structure of claim 16 wherein said coupling means includes seating portions on said vertical support members at the upper end thereof and depending retaining elements on the end portions of adjacent horizontal support members engaged in said seating surface portions.

19. The water-retaining recreational structure of claim 18 wherein said retaining elements on said end portions of said horizontal support members include depending portions formed on a locking member disposed thereabove and extending therethrough and wherein said coupling means includes cover members overlying the end portions of said adjacent horizontal support members and locking member with retaining means thereon engaged with said seating portion and horizontal support members to provide a firm assembly therewith.

20. The water-retaining recreational structure of claim 16 wherein said vertical support members at said apices of said circular components extend below the horizontal support members at the bottom of said liner member and are adapted to extend into the ground and wherein said tie means includes a relatively rigid member extending between said portions of said vertical support members spaced below said bottom horizontal support members.

21. The water-retaining recreational structure of claim 16 wherein said curvilinear peripheral configuration is defined by a pair of generally circular components intersecting to form a Figure Eight pattern.

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