June 27, 1961 S. L. FRIEDLANDER ET AL 2,989,757

POOL STRUCTURE

Filed Nov. 24, 1958 2 Sheets-Sheet 1

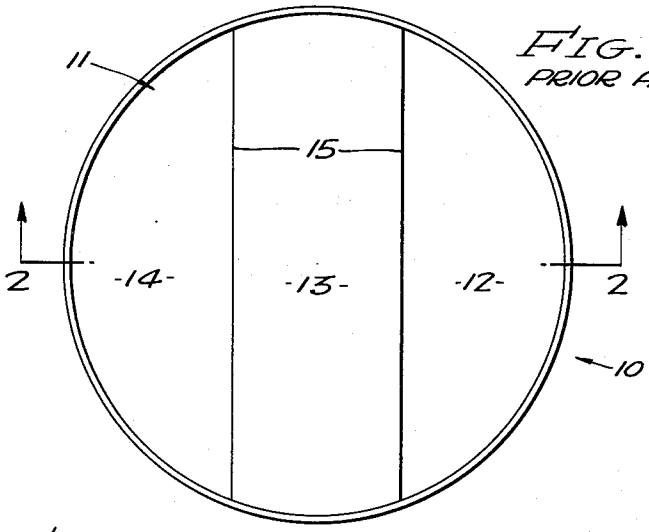

FIG. 1.
PRIOR ART

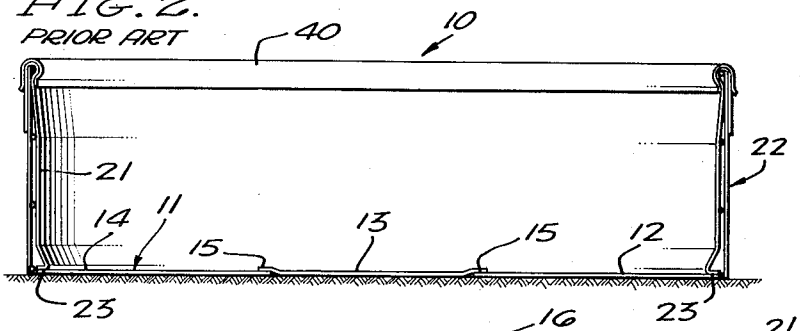

FIG. 2.
PRIOR ART

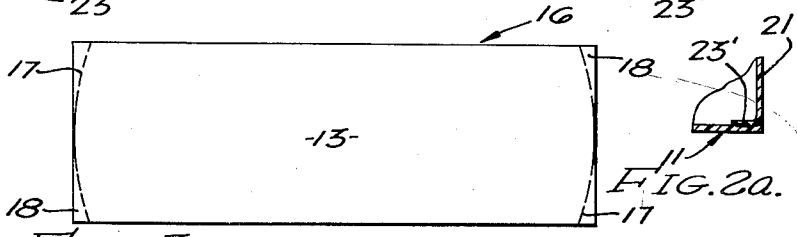

FIG. 3
PRIOR ART

FIG. 2a.

FIG. 4.
PRIOR ART

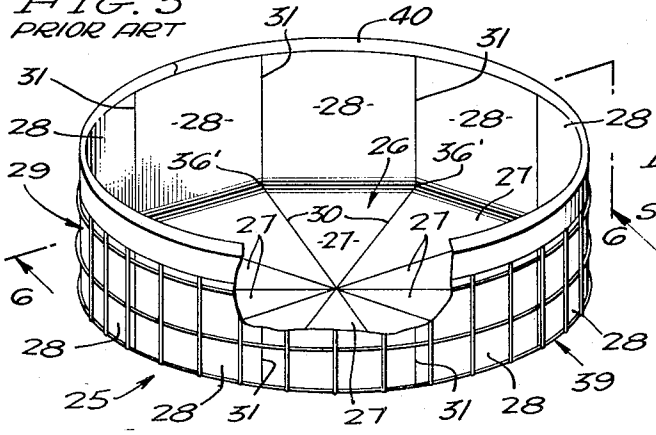

FIG. 5.

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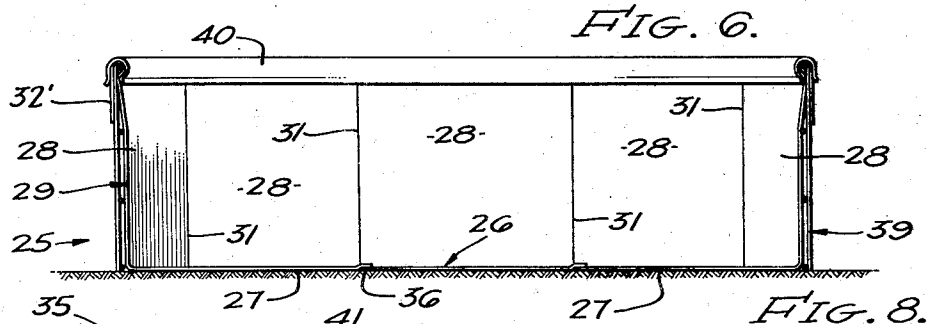
June 27, 1961 S. L. FRIEDLANDER ET AL 2,989,757

POOL STRUCTURE

Filed Nov. 24, 1958 2 Sheets-Sheet 2

FIG. 6.



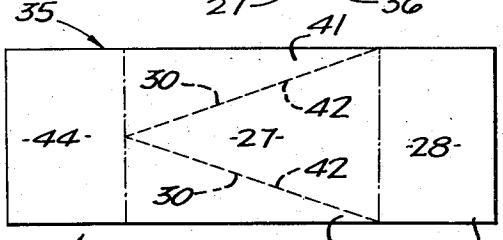
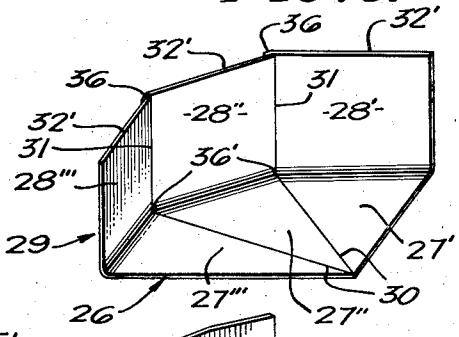


FIG. 7.

FIG. 8.



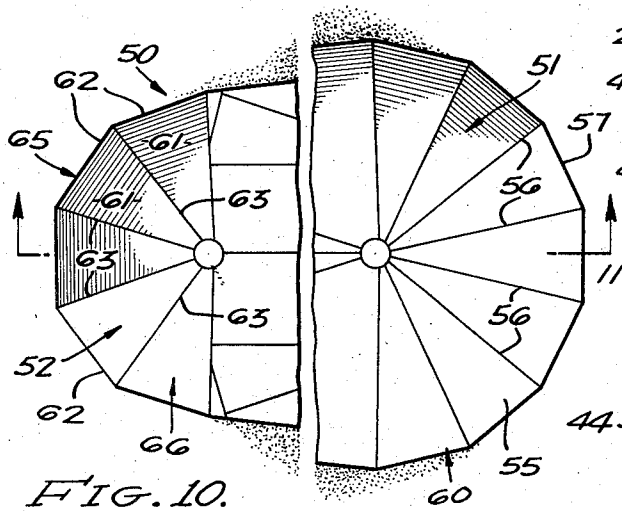
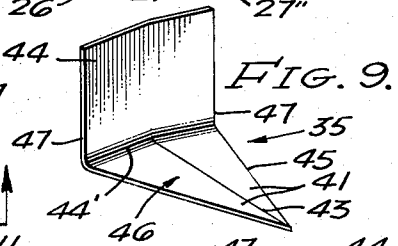


FIG. 10.

FIG. 9.



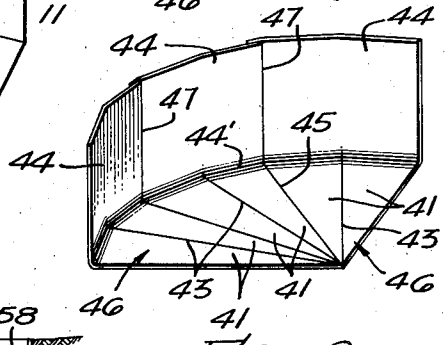


FIG. 9a.

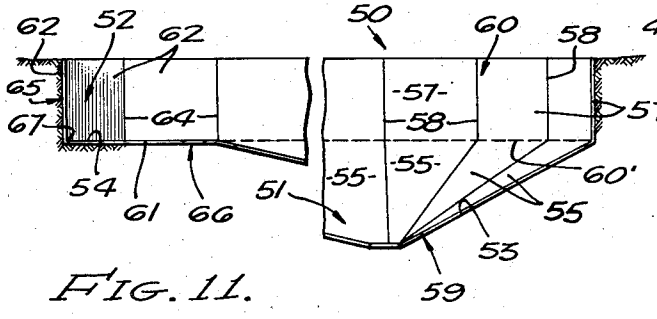


FIG. 11.

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POOL STRUCTURE

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3 Claims. (Cl. 4—172)

This invention relates to an improvement in a pool liner, particularly of the type adapted for use in wading pools, and is more particularly concerned with a novel plastic wading pool liner and the process for producing same.

It has been customary practice in the manufacture of portable wading pools, for example, of the type especially adapted to be placed in a yard for use by children, to support a flexible plastic liner on a cylindrical or oval shaped ring support. The liner has a downwardly depending bottom portion and a cylindrical or oval shaped side portion, the upper edge of which is bent over and around the upper edge of the support and maintained in position thereon to thus support the plastic liner about and within the ring when the liner is filled with water.

FIGURES 1 to 4 of the accompanying drawing illustrate one mode of prior art practice for constructing the prior art liner of such portable wading pools. FIG. 1 shows a plan view of the bottom portion of the liner, and FIG. 2 is a vertical section taken on line 2—2 of FIG. 1, showing the side portion of the liner and the support therefor. It will be noted from FIG. 1 that the circular bottom portion 11 of the liner 10 is formed of pieces 12, 13 and 14 which are sealed along parallel chords 15. While three pieces are shown, more are also used, the adjacent pieces being generally sealed along parallel chords such as 15.

Referring to FIGS. 3 and 4, showing the prior art manner of fabricating the proper shapes for pieces 12, 13 and 14 from sheet plastic, e.g., a vinyl plastic, the center piece 13 is formed from a rectangular sheet 16, shown in FIG. 3, which is cut adjacent its opposite ends to form arcs 17. This produces waste end strips of plastic 18 cut from the sheet 16. Further, in forming the two outer semicircular shape portions 12 and 14 of the bottom 11, these portions are generally cut from a length of plastic sheeting indicated at 19 in FIG. 4. The members 12 and 14 are cut in opposite alternating fashion from the strip 19, as shown in FIG. 4, leaving adjacent strips of sheeting 20 as waste material. The strips 12 and 14 are then sealed along adjacent edges 15 to the center strip 13 to form the bottom 11 of the liner. It is thus seen that there is a substantial amount of wasted plastic sheeting material resulting form the prior art practice of forming the bottom portion 11 of the liner, and in view of the relatively high price of plastic sheeting, e.g., vinyl plastics, for this purpose, such waste represents a considerable loss, especially since pools of this type are manufactured on a volume basis with cost of production a vital factor.

Further, as shown in FIG. 2, according to such prior art practice the cylindrical side portion 21 of the liner 10, which is supported from its upper edge on a ring shaped vertically positioned support, e.g., a wire mesh type support, indicated at 22, is sealed around its bottom edge to the outer periphery of the bottom portion 11 of the liner. This seal indicated at 23 may be formed by any of the various types of conventional welds, for example, a butt weld as shown in FIG. 2. This weld which joins the bottom 11 and the side wall 21 of the liner where they intersect at right angles to each other, forms a line of weakness, and when water is placed in the pool considerable strain is developed at the weld 23, particularly when there is movement of the body of water in the

liner, often causing the liner to rupture at such weld or seal. Where a lap weld is employed for sealing at 23 instead of a butt weld, the seal between the intersection of the bottom 11 and the side wall 21 is strengthened, but a lap weld of this nature, as indicated at 23′ in FIG. 2*a*, can only be produced using expensive dies and fixtures, the cost of which increases still further as the diameter of bottom 11 of the liner increases.

It is an object of this invention to provide a pool structure having a flexible plastic liner formed of a plurality of plastic sheets shaped and connected together in such manner as to reduce the amount of wastage of material resulting from prior art practice.

It is another object to provide a pool structure having a flexible plastic liner formed of a plurality of plastic sheets shaped and sealed together in a manner to avoid the use of a peripheral seal between the bottom edge of the liner side wall and the outer periphery of the liner bottom portion.

Still another object is the provision of a novel flexible plastic liner, especially adapted for wading pools, and having increased resistance to rupture as compared to prior art liners and providing greater economy in fabrication.

A still further object is the provision of procedure for fabricating the aforementioned flexible liner.

According to a preferred embodiment of the invention, we have provided a pool liner, preferably one adapted to be supported on a ring shaped member, formed of a plurality of pie shaped sheets of flexible, preferably plastic sheet material, e.g., vinyl plastic, each preshaped piece having an integral outer extension or flap with parallel side edges. The adjacent pie shaped sections are sealed together along their radially extending edges to form the bottom of the liner, and the aforementioned extensions or flaps are sealed together along adjacent parallel edges and bend upward from the plane of the pie sections, to form the outer peripheral wall of the liner, which extends upwardly substantially at right angles to the bottom portion of the liner. The upper portion of the liner wall is bent back over the top edge of a ring shaped liner support, e.g., in the form of a wire mesh ring, and can be secured in this manner, if desired, by a suitable clamp member.

In the liner so produced, since the pie shaped sections form the bottom of the liner and the outer extensions thereof form the side wall of the liner, there is no need for a separate bottom portion and a separate wall portion and hence no requirement for producing a seal at the intersections of these respective portions. Hence, in the liner construction according to the invention, the peripheral seal formed between the lower edge of the prior art liner side wall and the outer periphery of the prior art liner bottom portion, e.g., as shown at 23 in FIG. 2, is avoided, and there is thus a minimum of sealing or welding at the intersection of the liner bottom portion and the liner side wall in the liner of the invention. This results in a liner which has substantially enhanced strength and hence affords much less danger of rupture than conventional liners.

Further, by forming pie shaped sections with integral outer extensions from plastic sheet material and by sealing said pie shaped sections and extensions together as indicated above and in the manner described in detail hereinafter, there is practically no wasted material resulting from the fabrication process, thus providing substantial economics in production.

The invention will be more fully understood by reference to the description below, taken in connection with FIGS. 5 to 11 of the accompanying drawings wherein:

FIG. 5 is a perspective view of a pool embodying a flexible liner according to the invention;

FIG. 6 is a vertical section taken on line 6—6 of FIG. 5;

FIG. 7 shows the manner of cutting a plastic sheet to form pie shaped sections and extensions used in fabricating the invention liner;

FIG. 8 shows the manner of sealing one type of pie shaped section formed by the cutting technique of FIG. 7;

FIG. 9 shows another way of producing pie shaped sections from portions of the aforementioned cut sheet;

FIG. 9*a* shows the manner of sealing the type of pie shaped sections produced according to FIG. 9;

FIG. 10 shows application of the invention principles to another form of pool; and

FIG. 11 is a section taken on line 11—11 of FIG. 10.

Referring to FIGS. 5 and 6, the bottom 26 of the liner 25 is composed of a number of pie sections 27, herein shown as ten in number, radiating outwardly from the center of the bottom 26. The pie sections each have extensions 28 at their outer ends, said extensions each having parallel edges 31 and being bent upwardly at about a 90° angle to the pie sections, forming the outer wall 29 of the liner. The pie sections are sealed together along their adjacent edges 30 and the extensions 28 thereof are sealed together along their adjacent parallel edges 31.

Now referring to FIG. 7 showing the first step in the technique for fabricating the liner of FIGS. 5 and 6, a number of like rectangular sheets of plastic 32 are provided or cut out from a large sheet of a flexible plastic, preferably a plastic material of good strength and water impermeability characteristics, e.g., a vinyl plastic. The width of sheets 32 is chosen in accordance with predetermined circumference of the pool liner and the number of pie shaped sections to be employed. While the number of pie shaped sections shown in FIG. 5 is illustrated as ten, it will of course be understood that more or less can be employed. The length of sheets 32 is chosen such as to equal the sum of twice the height of the wall portion 29, plus the approximate radial length of the pie shaped section 27, for a purpose which will be made clear below.

Leaving at one end 28*a* a sufficient amount of material to form the extension or flap 28, the pie shaped section 27 is cut out as indicated by dotted lines along the edges 30 of the pie section. This leaves another notched section 35 having a pair of wedge portions 41 and an end portion 44, which section can be employed alternatively to pie shaped sections 27 to form the liner of the invention in a manner described more fully below.

Referring now to FIG. 8, it is seen that one pie section 27′ is connected to adjacent pie sections 27″ and 27‴ by sealing together the adjacent radial edges 30 of the adjacent pie sections 27′, 27″ and 27‴, and sealing the adjacent parallel edges 31 of the adjacent extensions 28′, 28″ and 28‴ of pie sections 27′, 27″ and 27‴. This can be done by any suitable type of sealing means, e.g., dielectric heat sealing, forming, for example, a lap weld indicated at 36, along the sealed edges. If desired, a butt weld can be employed instead of a lap weld. As each of the adjacent pie sections 27 and each of the adjacent outer extensions 28 is sealed along their outer edges it will be noted that the extensions 28 curl or bend up at their intersections with the respective pie sections due to the parallel edges 31 of said extensions not being in direct alignment with the divergent radial edges 30 of the attached pie sections 27. Thus, when all of the pie sections 27 and their respective outer extensions or flaps 28 have been sealed along their edges in the manner above described, the flaps 28 will form an essentially vertical wall portion 29 integrally connected to the bottom portion 26 formed by the sealed-together pie sections.

It will be noted that the liner so formed has no circumferential seal line or weld between the bottom portion 26 and the wall portion 29, and that there is but a minimum of sealing at points indicated by numeral 36′, at the intersection of the bottom and wall surfaces 26 and 29 of the liner, the peripheral intersection between these surfaces being otherwise unwelded. Also, of particular significance, it is noted that since the sealing lines 30 and 31 between the adjacent pie sections 27 and their respective outer extensions 28 extend in an outward essentially radial direction from the center of the liner, and since the force developed by the mass of water in the liner is directed outward against the side wall 29 of the liner which is in turn rigidly supported against the ring support, there is a minimum of tensile stress developed in opposite directions across the sealing lines 30 and 31. On the other hand, the conventional peripheral seal of conventional liners, e.g., 23 in FIG. 2, extending around the circumference of the bottom of the liner is subject to a substantial strain due to the force exerted by the water acting on the liner wall just above the circumferential seal and around the bend formed at the circumferential seal and against the adjacent outer peripheral portion of the liner bottom, tending to bulge out the liner at the bottom adjacent the peripheral seal. These forces act in opposite directions across the circumferential seal, inducing substantial tensile stress all along the peripheral seal.

It will be noted that while the liner is stated to be substantially circular, actually the upstanding portions 28 are straight rather than curved, viewing FIG. 8, and together form a decagon, rather than a pure circle. However, when these end portions 28 are supported in the manner noted below, said end portions are slightly stretched, and tend to form a circle so that the liner wall 29 is essentially cylindrical in shape.

The upper end portions 32′ of the wall 29 formed by extensions 28 can be stretched over and around the top of a circular ring support for the liner, such as a wire mesh ring 39. Such ring should be sufficiently rigid to support the wall portion 29 and prevent its bowing out when water is placed in the pool. Other suitable and known types of ring supports can be used, if desired, such as a solid metal ring formed of aluminum, galvanized metal, masonite or concrete. Preferably, a clamping member 40, e.g. in the form of a ring of extruded plastic such as polyethylene, can be clamped over the upper peripheral edge portion of the wall 29 and the upper supporting edge of the wire mesh ring, as illustrated in FIG. 6, to maintain the wall portion 29 in position on the ring 39.

The notched portions 35 (see FIG. 7) which are also cut from the plastic sheets 32, can be utilized to form a liner substantially the same as that shown in FIGS. 5 and 6. Here, however, the two outer wedge portions 41 of each of these notched portions are first bent toward each other and sealed together along their edges 42, as indicated at 43 in FIG. 9, causing the outer extension 44 of each of portions 35 to bend upward at its intersection 44′ with its two integral wedge portions 41. This forms a pie section 46 similar to pie section 27, with integral extensions 44. The adjacent outwardly diverging edges 45 of adjacently placed pie sections 46 are sealed together, and the adjacent substantially parallel edges 47 of the attached extensions 44 are sealed together, e.g., by heat welding in the manner described above and illustrated in FIG. 9*a*, forming a liner substantially the same as 25, except that there are additional welds at 43 down the center of each pie section 46.

In this manner a wading pool liner can be constructed without any waste of plastic sheeting material, and the liner so constructed is devoid of the peripheral seal at the intersection between the bottom and wall portion of the liner, which seal is present in conventional liners.

It will be noted that a liner can be constructed using pie shaped members 27 exclusively, pie shaped members 46 exclusively, or using a combination of members 27 and 46.

The principles of the invention can be applied also to pools having a shape other than circular, and to production of pool liners other than those utilized for wading pools. Thus, for example, as illustrated in FIGS. 10 and 11, showing an excavated large swimming pool **50**, there is shown a generally semicircular deep end **51** and generally semicircular but smaller shallow end **52**. The deep end portion **51** has a downwardly inclined bottom portion **53** and the shallow end **52** has a horizontal bottom portion **54**. The portion of the liner placed in the deep end can be formed of a series of adjacent pie sections **55** sealed along their adjacent edges **56**, and a series of adjacent flaps or extensions **57** integrally connected to each of the pie sections and sealed along their adjacent edges **58**. It will be noted that in view of the downwardly sloping bottom of the deep end of the pool, the bottom **59** of the liner formed by pie sections **55** intersects at **60'** the wall portion **60** formed by the adjacent flaps **57**, at an obtuse angle substantially greater than a right angle.

The liner at the shallow end of the pool is formed of pie sections **61** having integral flaps or extensions **62**, the pie sections being sealed along their adjacent edges **63** to cover the semicircular bottom of the shallow end, and the flaps being sealed along their adjacent edges **64** to form the wall portion **65** of the liner. Here, however, the intersection at **67** between the bottom portion **66** of the liner and the wall portion **65** is substantially a right angle, as in the case of the liner **25** of FIG. 5, described above.

It is thus seen that we have designed a novel flexible liner for use in wading and swimming pools, having improved strength and durability, and which is readily fabricated and economical to produce.

While we have described particular embodiments of our invention for the purpose of illustration, it should be understood that various modifications and adaptations thereof may be made within the spirit of the invention as set forth in the appended claims.

We claim:

1. In combination a flexible pool liner and a ring shaped support, said flexible pool liner being mounted within and about said support, said pool liner having a bottom portion and an upstanding substantially cylindrical wall portion, and comprising a plurality of planar pie shaped sections formed of a flexible sheet material, each of said sections having outwardly diverging radially extending edges and an integral outer extension in the form of a rectangle, said extensions each having parallel edges extending from the outer divergent ends of said radially extending edges and at equal angles to said divergent edges, the adjacent pie shaped sections being sealed together along their adjacent radially extending edges from the inner apex of each pie section to the outer ends of said radially extending edges, to form a substantially circular bottom portion of said liner, said extensions being sealed together along adjacent parallel edges and bent upward from the plane of said pie sections at the intersection of said extensions with said pie sections, said extensions forming said subtantially cylindrical wall portion, said cylindrical wall portion of said pool liner being disposed closely adjacent to and supported by said ring shaped support, the upper end of said cylindrical wall portion being folded over the top of said support and around the outer periphery of said support adjacent the top thereof.

2. In combination a flexible pool liner and a wire mesh ring shaped support, said flexible pool liner being mounted within and about said support, said pool liner having a bottom portion and an upstanding substantially cylindrical wall portion, and comprising a plurality of planar pie shaped sections formed of a flexible sheet material, each of said sections having outwardly diverging radially extending edges and an integral outer extension in the form of a rectangle, said extensions each having parallel edges extending from the outer divergent ends of said radially extending edges and at equal angles to said divergent edges, the adjacent pie shaped sections being sealed together along their adjacent radially extending edges from the inner apex of each pie section to the outer ends of said radially extending edges, to form a substantially circular bottom portion of said liner, said extensions being sealed together along adjacent parallel edges and bent upward from the plane of said pie sections at the intersection of said extensions with said pie sections, said extensions forming said substantially cylindrical wall portion, said cylindrical wall portion of said pool liner being disposed closely adjacent to and supported by said ring shaped support, the upper end of said cylindrical wall portion being folded over the top of said support and around the outer periphery of said support adjacent the top thereof, and a clamping ring of channel shaped cross section clamped over the top peripheral edge of said ring shaped support, clamping the adjacent end portion of said pool liner to said support.

3. In combination a flexible pool liner and a ring shaped support, said flexible pool liner being mounted within said support, said pool liner having a bottom portion and an upstanding substantially cylindrical wall portion, and comprising a plurality of planar pie shaped sections formed of a flexible sheet material, each of said sections having outwardly diverging radially extending edges and an integral outer extension in the form of a rectangle, said extensions each having parallel edges extending from the outer divergent ends of said radially extending edges, the adjacent pie shaped sections being sealed together along their adjacent radially extending edges from the inner apex of each pie section to the outer ends of said radially extending edges, to form a substantially circular bottom portion of said liner, said extensions being sealed together along adjacent parallel edges and bent upward from the plane of said pie sections at the intersection of said extensions with said pie sections, said extensions forming said subtantially cylindrical wall portion, said cylindrical wall portion of said pool liner being disposed adjacent to the inner periphery of said ring shaped support, and means for supporting the upper section of said cylindrical wall portion around the periphery of said ring shaped support.

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