

May 1, 1962

E. G. LEUTHESSER

3,031,801

METHOD OF INSTALLING SWIMMING POOLS

Filed Dec. 14, 1956

5 Sheets-Sheet 1

Fig. 1.

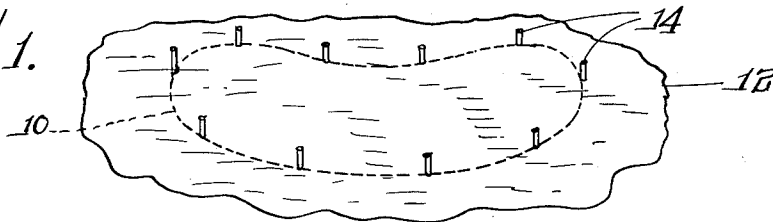


Fig. 2.

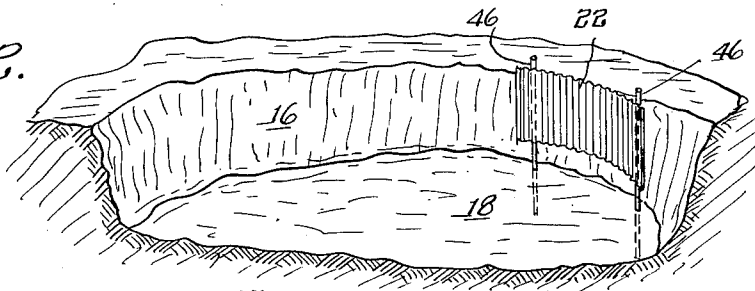


Fig. 3.

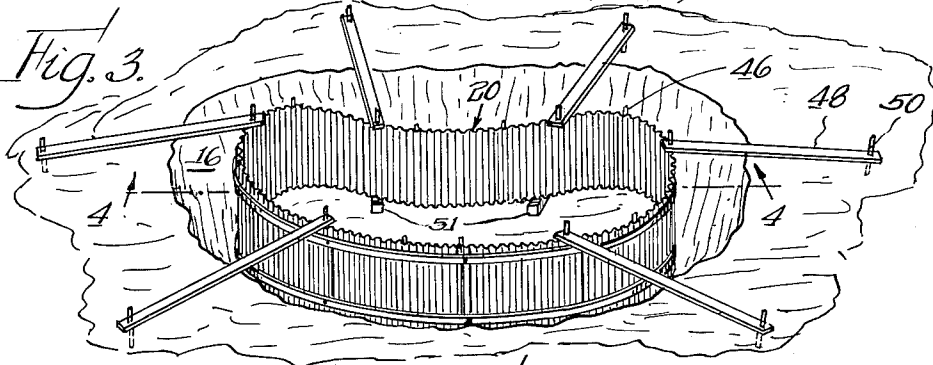
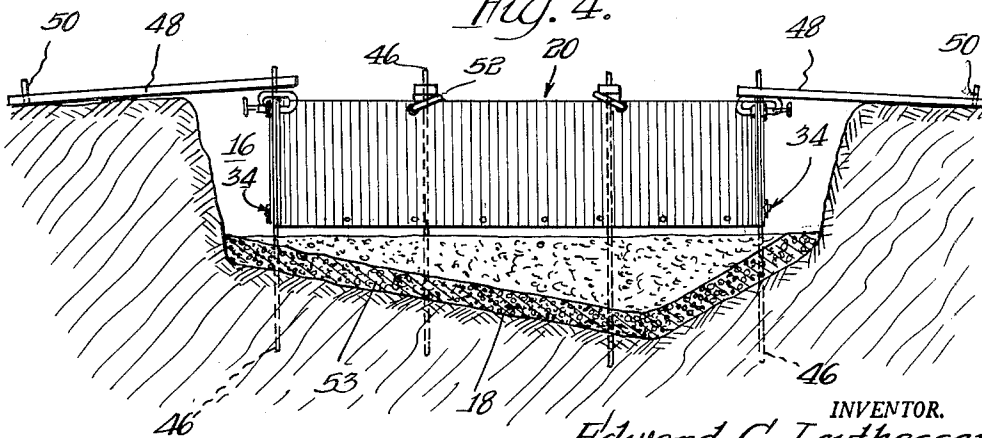


Fig. 4.



INVENTOR.

Edward G. Leuthesser

BY

Olson & Trevelyan

May 1, 1962

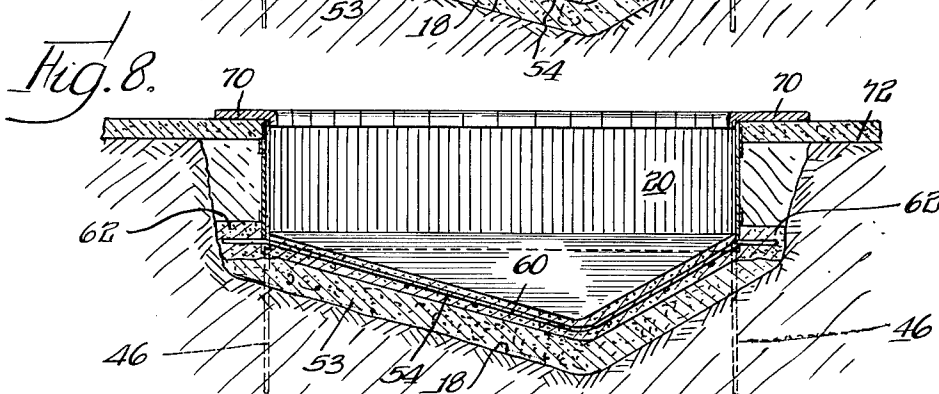
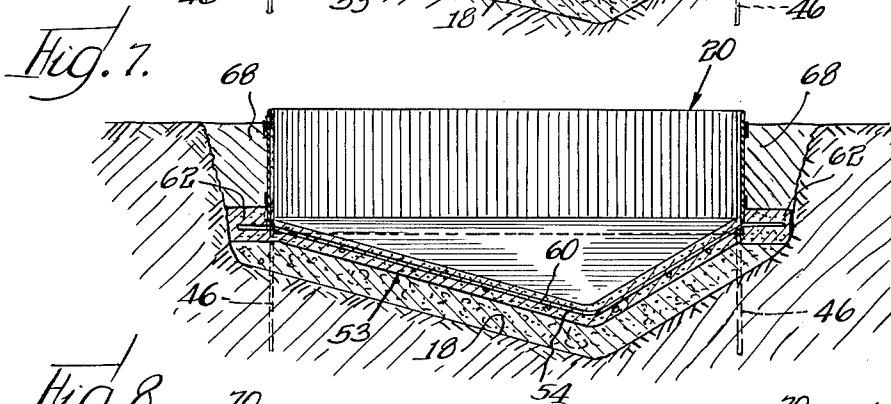
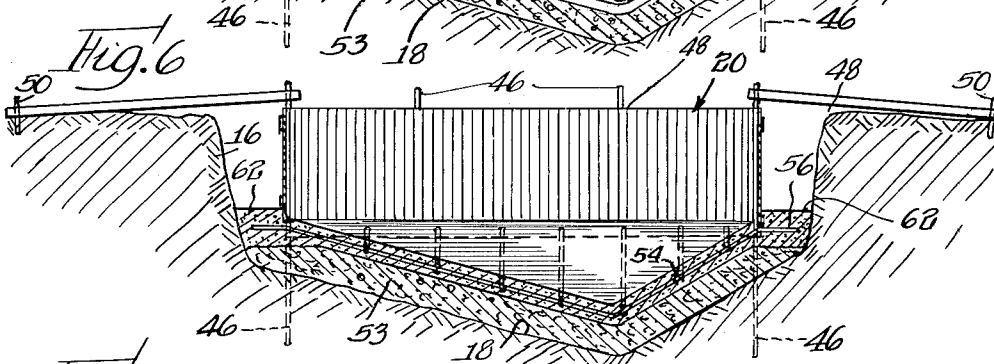
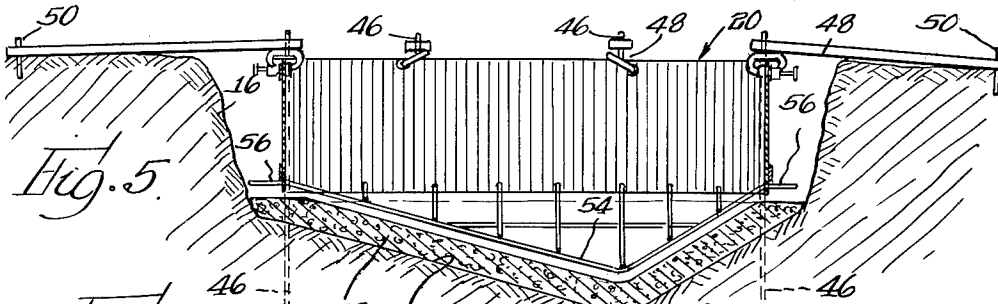
E. G. LEUTHESSER

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5 Sheets-Sheet 2



INVENTOR.

INVENTOR.
Edward G. Leuthesser
BY

BY

Olsen & Trexler
attys.

May 1, 1962

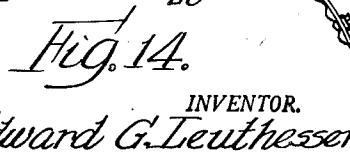
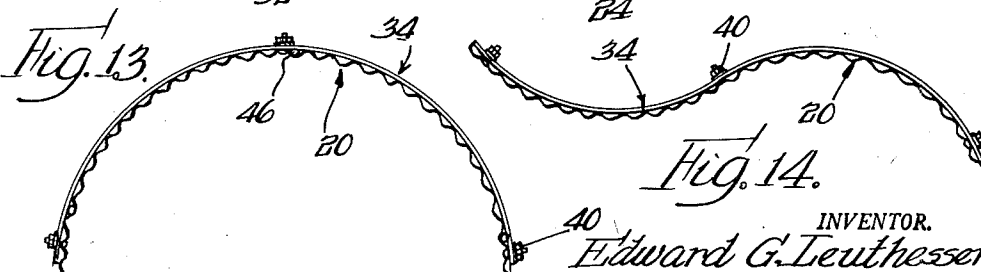
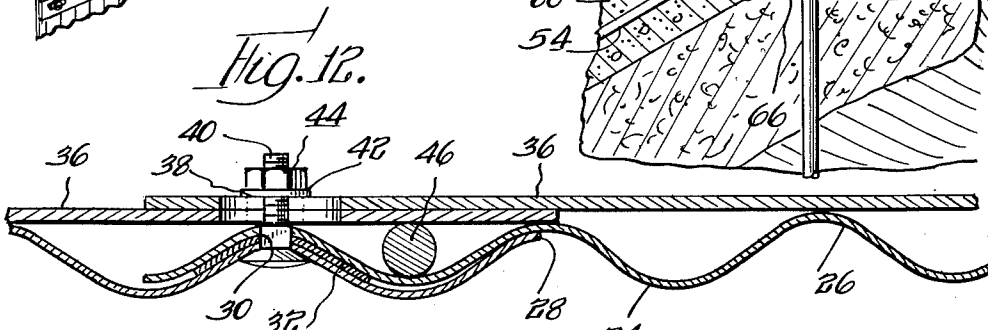
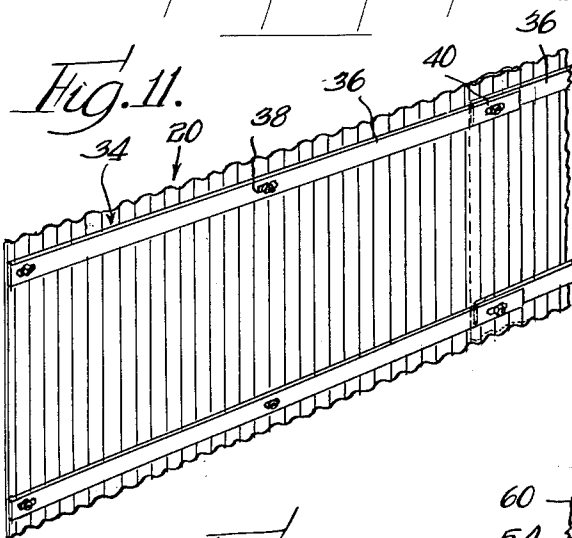
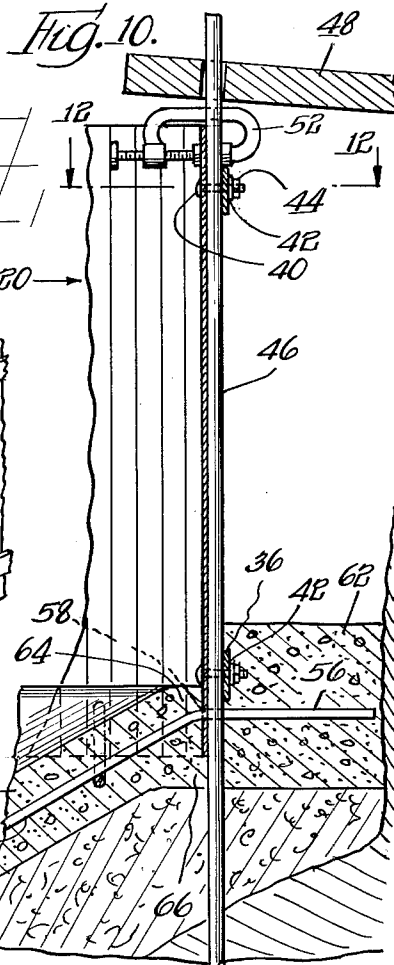
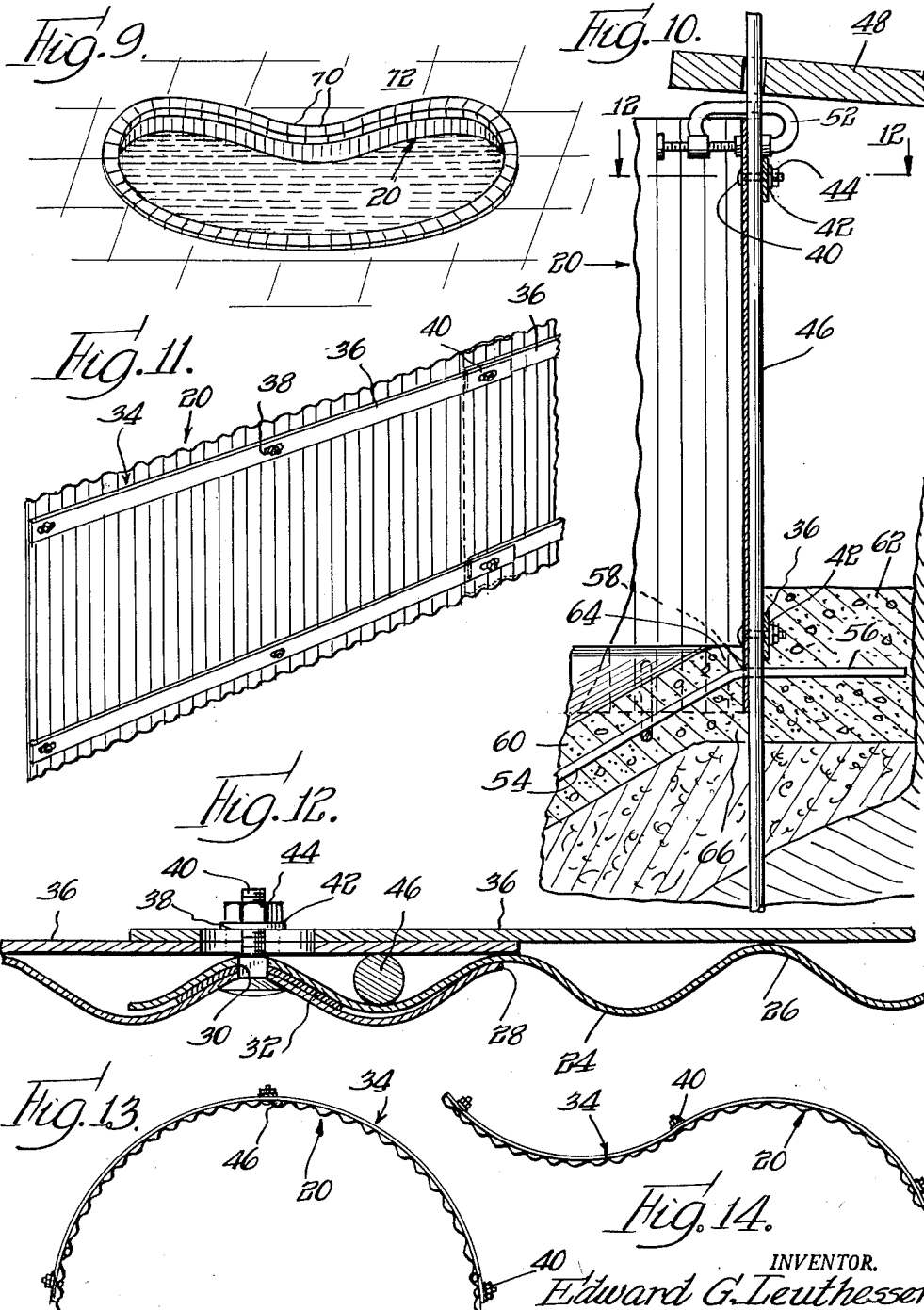
E. G. LEUTHESSER

3,031,801

METHOD OF INSTALLING SWIMMING POOLS

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5 Sheets-Sheet 3



40 INVENTOR.
Edward G. Leuthesser
BY

BY

Olson & Treple^{attys}

May 1, 1962

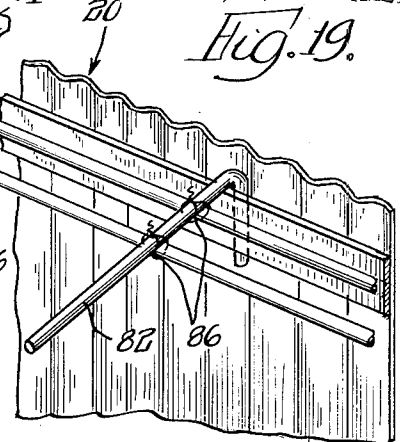
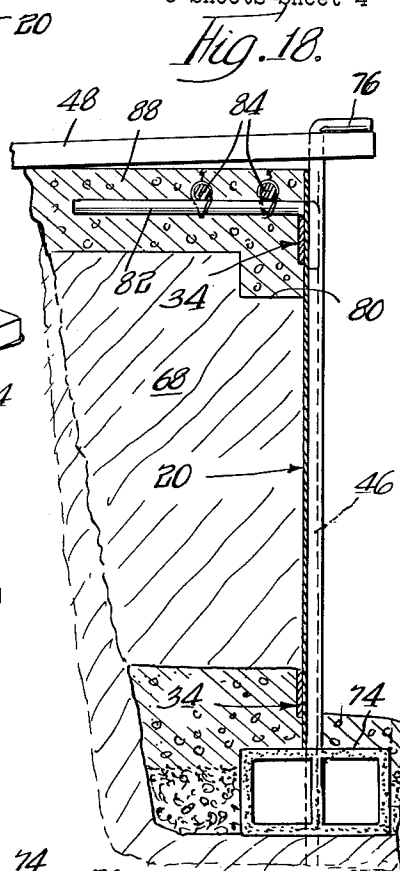
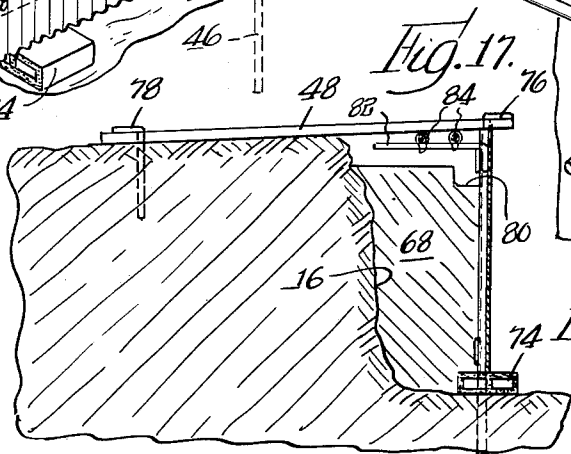
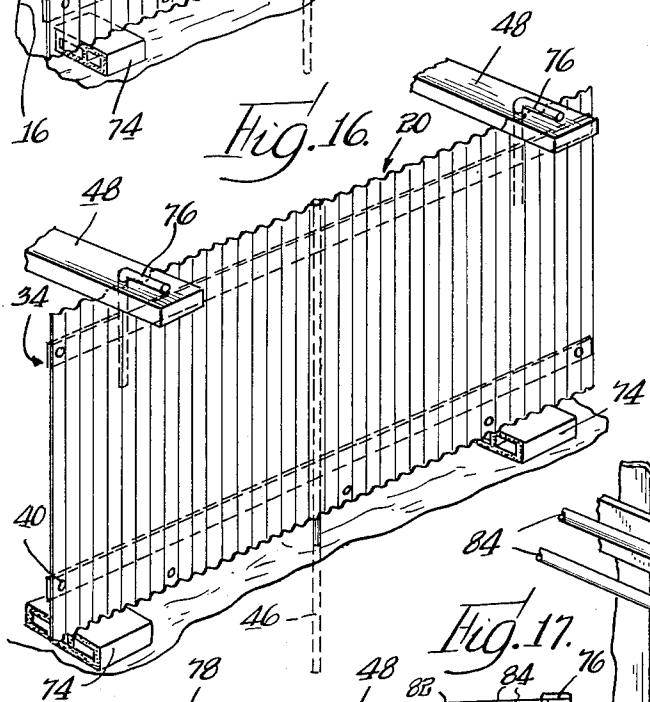
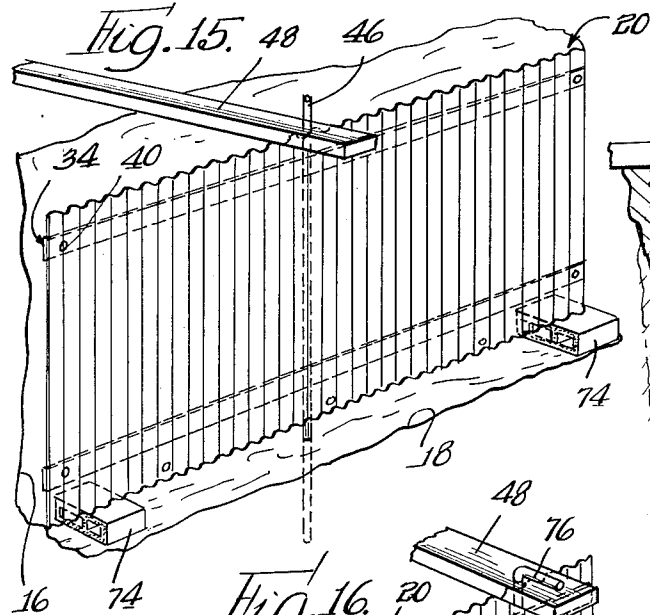
E. G. LEUTHESSER

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METHOD OF INSTALLING SWIMMING POOLS

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5 Sheets-Sheet 4



INVENTOR.

Edward G. Leuthesser

BY

Olson & Tupper attys

May 1, 1962

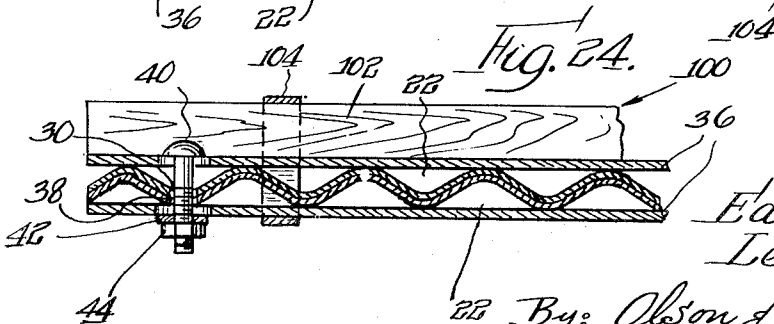
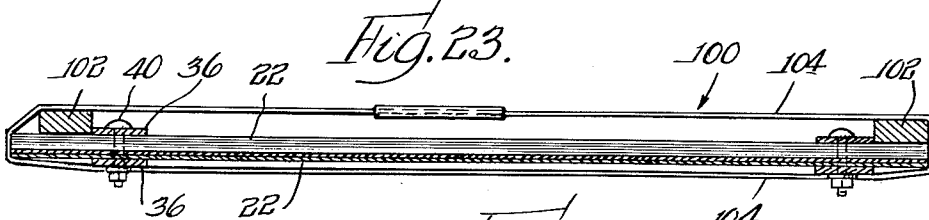
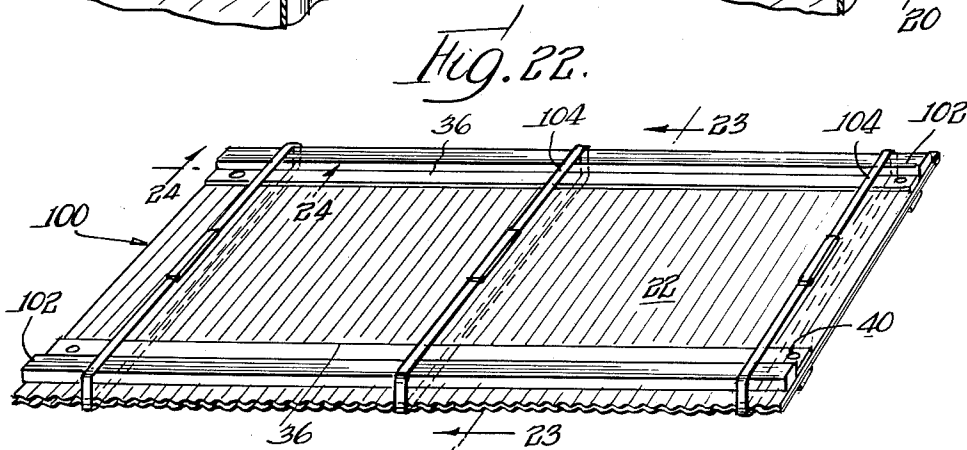
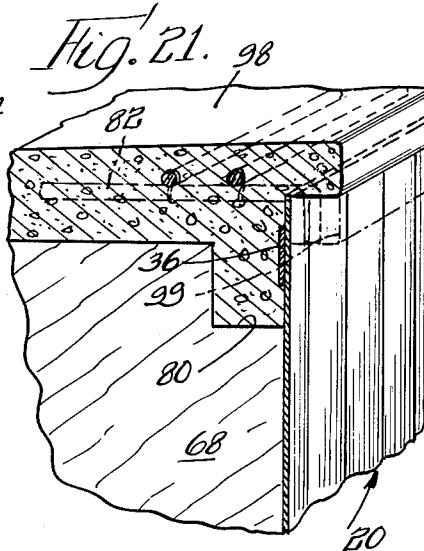
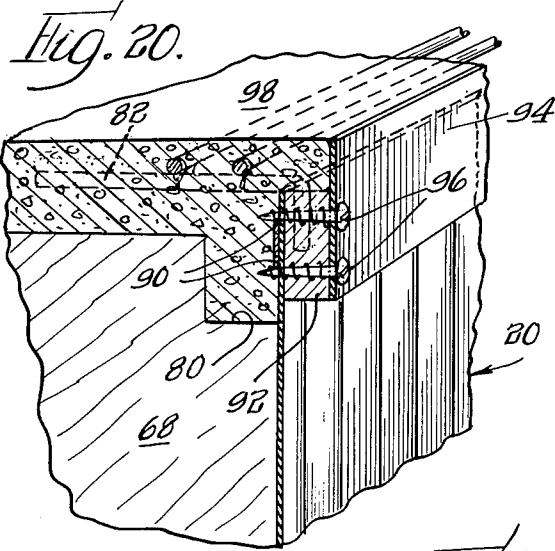
E. G. LEUTHESSER

3,031,801

METHOD OF INSTALLING SWIMMING POOLS

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5 Sheets-Sheet 5



INVENTOR.
Edward G.
Leuthesser

By: Olson & Triplett attys.

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3,031,801

METHOD OF INSTALLING SWIMMING POOLS

Edward G. Leuthesser, Glen Ellyn, Ill.

(160 NW. 11th St., Boca Raton, Fla.)

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13 Claims. (Cl. 50-532)

This invention relates to novel pool structures, to prefabricated units for constructing pool structures, and to methods of installing pool structures. This invention is particularly adapted for construction of outdoor swimming pools.

The pool structures of the present invention are characterized by all the desirable features of the structure of my co-pending application Serial No. 568,723 entitled "Swimming Pool Structure" filed March 1, 1956, now Patent No. 2,888,818. Reference is made to this co-pending application for a complete disclosure of all the details of said structure.

An object of the present invention is to provide a swimming pool of modular construction which is easily and conveniently installed with a minimum of labor and using only a limited number of different structural parts which may be prefabricated and supplied in packaged form.

According to the present invention, a swimming pool having a concrete bottom and a sidewall made up of a plurality of panels which may be supplied in prefabricated and packaged form is installed in a suitable excavation by simply erecting a sidewall which is not by itself completely self-supporting, supporting the sidewall above the bottom of the excavation while holding the sidewall against tilting, and while the sidewall is thus supported and held pouring the concrete bottom of the pool. After the concrete has set, the sidewall no longer requires further support or holding, since the lower margin of the sidewall is firmly embedded in the concrete. Thus, I eliminate the labor and the structural parts required for erecting a sidewall which is completely self-supporting before the concrete has been poured. For all practical purposes, the finished pool structure is as strong as a structure having a sidewall which by itself is completely self-supporting. A further advantage of the present pool structure is that the sidewall may be so constructed as to permit a limited displacement as between the panels forming the wall defining elements thereof and members holding said wall defining elements in assembled relationship whereby the sidewall structure can be temporarily distorted, without structural damage thereto, in response to the strong mechanical forces to which swimming pool structures are inevitably exposed, for instance, forces generated by the freezing of water in the pool. It is difficult to provide a sidewall structure for a swimming pool which is both completely self-supporting by itself and at the same time capable of limited temporary distortion without structural damage.

Other and further objects and features of the present invention will become apparent from the following description and appended claims, as illustrated by the accompanying drawings which show, by way of examples, swimming pools according to the present construction, various stages in the installation thereof, and parts used in such construction and in which drawings:

FIG. 1 is a perspective view of an area of land preparatory to the installation therein of a swimming pool according to the present invention;

FIG. 2 is a perspective view, with part of the ground shown in vertical cross section, of the land area of FIG. 1 after completion of an excavation operation and the erection of a single sidewall panel;

FIG. 3 is a perspective view of the land area of FIG. 2 after erection of all the sidewall panels;

FIG. 4 is a vertical cross sectional view taken along the

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line 4-4 of FIG. 3 and showing a layer of gravel deposited on the bottom of the excavation;

FIG. 5 is a view similar to FIG. 4 but showing reinforcing rods disposed over the gravel preparatory to a cement pouring operation;

FIG. 6 is a view similar to FIG. 5 but showing a layer of reinforced concrete poured over the gravel to form the bottom of the swimming pool;

FIG. 7 is a view similar to FIG. 6 but showing the excavation back filled around the sidewall;

FIG. 8 is a view similar to FIG. 7 but showing the finished swimming pool with an edge coping and a sidewalk therearound;

FIG. 9 is a perspective view of the finished swimming pool of FIG. 8 filled with water;

FIG. 10 is an enlarged fragmentary view similar to FIG. 6 showing the sidewall of the pool and its joint with the concrete bottom;

FIG. 11 is a perspective view of the outside of a straight sidewall (the sidewall of the preceding figures being curved) as seen before the concrete for the bottom has been poured;

FIG. 12 is an enlarged fragmentary cross sectional view, with parts shown in elevation, taken along the line 12-12 of FIG. 10;

FIG. 13 is a fragmentary plan view of the sidewall of a swimming pool according to the present invention having a round configuration;

FIG. 14 is a fragmentary plan view of the sidewall of a swimming pool according to the present invention having a dumbbell-shaped configuration;

FIG. 15 is a fragmentary perspective view showing the stage of construction illustrated in FIG. 4, but with the sidewall supported by other means than those shown in FIG. 4;

FIG. 16 is a fragmentary perspective view similar to FIG. 15, but with the sidewall held against tilting by other means than those shown in FIG. 15;

FIG. 17 is a fragmentary vertical cross sectional view showing a subsequent intermediate stage in the construction of a reinforced concrete beam around the top of the sidewall.

FIG. 18 is an enlarged fragmentary view similar to FIG. 17 but showing the completed reinforced concrete beam;

FIG. 19 is a fragmentary perspective view illustrating the outside of the top portion of the sidewall in the stage of construction of the reinforced concrete beam shown in FIG. 17;

FIG. 20 is a fragmentary perspective view, with parts shown in vertical cross section, of the upper portion of a sidewall provided with an outer reinforced concrete beam and also with a coping of different construction from that illustrated in FIG. 8, the mold parts for this coping being shown in position;

FIG. 21 is a view similar to FIG. 20 but with the mold parts removed;

FIG. 22 is a perspective view of a package of sidewall panels for the swimming pools of the preceding figures;

FIG. 23 is a cross sectional view taken along the line 23-23 of FIG. 22; and

FIG. 24 is an enlarged fragmentary cross sectional view taken along the line 24-24 of FIG. 22.

Referring now to FIGS. 1-10 and 12, the various steps in the installation of a swimming pool according to the present invention are described as follows.

First, as shown in FIG. 1, the contour (indicated by a broken line 10) of the swimming pool to be installed (in this case, a kidney-shaped pool) is outlined on the ground 12 with stakes 14. Next, as shown in FIG. 2, the ground within the stakes is excavated to a suitable depth. The resulting excavation has a sloping side 16 and a bottom 18 of any desired shape, for instance, slop-

ing from all sides towards an area of greatest depth located near one end of the excavation, as illustrated in FIGS. 4-8.

In a following step, a sidewall structure (generally indicated at 20) composed of a number of panels 22 is erected. As shown in FIGS. 10 and 12, each panel 22 is formed with vertically extending and alternately inwardly and outwardly projecting ribs or corrugations 24 and 26. Such panels are strengthened by their corrugations against distortion transversely, and can consequently be formed from relatively light weight sheet steel or stainless steel, or aluminum, or plastic, or fiber glass laminates or other materials which would be deficient in structural strength if not corrugated. However, the panels 22 (which, as supplied, have the crests of their corrugations 24 and 26 extending in parallel planes) can be bent into any desired curved configuration. In constructing the sidewall 20, the panels 22 are placed in overlapping relationship with marginal corrugations in registration. As shown in FIG. 12, adjacent panels 22 are overlapped so that at least one pair of inwardly projecting ribs or corrugations 24 are disposed in mating relationship and the free vertical edge 28 of the inner panel 22 is located in the depression between adjacent inwardly projecting ribs or corrugations 24 of the two overlapping panels.

The marginal outwardly projecting ribs 26 of each panel 22 are formed with upper and lower perforations 30 which are aligned when the panels are overlapped. At that time, a strip 32 of rubber, plastic or other suitable sealing material is placed between each pair of mating corrugations. Upper and lower straps generally indicated at 34 and made up of overlapping sections 36 are also pieced together along the sidewall 20. Specifically, the strap sections 36 are each formed with axially elongated slots 38 longer than the panel perforations 30, to permit limited displacement of the strap sections 36 with respect to the panels 22, as when the latter are bent to achieve any desired rounded pool configuration, or when the concrete bottom of the pool (described hereinbelow) contracts or expands due to temperature changes. When the sections 36 are overlapped lengthwise, a pair of slots 38 are aligned with a pair of panel perforations 30, and a bolt 40 is passed through these slots and perforations and through the strip 32. Washers 42 are threaded over the free outer ends of the bolts 40, and the margins of the panels 22, the strip 32 and the ends of the sections 36 are clamped together by nuts 44 threaded over the ends of the bolts 40. In this fashion the whole sidewall 20 is assembled, panel by panel and strap section by strap section.

As the sidewall 20 is being assembled, iron or steel stakes 46 are passed between the panels 22 and the straps 34 and driven into the ground. The stakes 46 fit between the inner crests 24 of the panels 22 and the straps 34 and, when driven into the ground, serve to hold the sidewall 20 erect. Preferably, the stakes 46 are placed where sidewall panels 22 overlap. The upper ends of the stakes 46 project above the panels 22. While the sidewall 20 is being assembled, the stakes 46 are held against lateral displacement by boards 48. One end of each board is apertured to receive the upper end of a stake 46. The other end of each board is fixed to the ground outside the excavation, as with short stakes 50 driven into the ground. Thus, the erected sidewall (shown in FIG. 3) is held against tilting due to its own weight or due to pressure exerted by wind or due to stresses generated when, as disclosed hereinbelow, reinforcing rods are passed through the lower margin of the sidewall or when the concrete is poured for the bottom of the pool.

As the sidewall is being assembled, the sidewall is held level and spaced from the floor of the excavation by the placement of wooden blocks 51 or pieces of boards or the like under the lower margin of the sidewall 20 at appropriate points. When the whole sidewall has been assembled and levelled, clamps 52 may be applied to the upper margins of the sidewall at panel and strap section overlapping areas, to hold the sidewall level and spaced from the

excavation floor, as shown in FIG. 4. The blocks 51 may then be removed, preparatory to the next succeeding operation which is the deposition of a layer of gravel 53 on the bottom 18 of the excavation. This layer 53 does not reach the bottom edge of the sidewall 20. See FIG. 4.

The stakes 46 and clamps 52 are relied on to support the erected panels only until the panels are set in concrete in a manner which provides permanent support to the panels to sustain a load of the backfill on the wall formed by the panels. As the stakes 46 can be very thin and light in weight, this is of great advantage in reducing the cost of the stakes and makes driving thereof easy. As shown, the stakes are formed of thin, round rods. Since these thin rods have only very limited resistance to bending, the wall is further stabilized horizontally as necessary by use of the braces 48 as described.

After the assembly of the sidewall 20 has been completed, the pool is provided with a grid of reinforcing rods 54 along the bottom thereof, each rod having an end portion 56 projecting through an aperture 58 formed in the lower margin of a sidewall panel 22, as shown in FIGS. 5 and 10. After the reinforcing rods have been assembled, a concrete bottom 60 for the pool is poured onto the floor of the excavation (see FIGS. 6 and 10) so that the rods 54 are embedded in and reinforce the concrete bottom. The latter is provided with an outer marginal portion 62 disposed outwardly of and against the outer surfaces of the sidewall panels 22. Further, inner marginal portions 64 of the concrete bottom 60 are sufficiently thick to extend above the apertures 58 in the sidewall panels and against the inner surfaces of the sidewall panels, and the inner marginal portions 64 and the outer marginal portion 62 of the concrete bottom are integrally joined by a portion 66 which extends below the lower edges of the sidewall panels 22. Thus, the lower marginal portions of the sidewall panels are not only firmly embedded in the concrete bottom 60 but are also tied to this concrete bottom by the reinforcing rods 54 passing through the embedded portions of the sidewall panels. Note that the end portions 56 of the rods projecting outside the wall panels are embedded in the outer marginal portion 62 of the concrete bottom. This marginal portion 62 is substantially thicker than the inner marginal portion 64, to offer stronger resistance against any portion of the outer marginal portion 62 to break away from the sidewall panels. As shown in FIG. 10, the marginal portion 62 of the concrete poured onto the bottom of the excavated hole extends horizontally from the outer side surfaces of the panels 22 into mating contact with the adjacent side 16 of the excavated hole. Thus, the poured concrete fills the excavated opening outside of the panels to a level substantially above the level of the concrete which covers the bottom of the excavated hole immediately adjacent the inner side surfaces of the corresponding panels. This thick marginal portion 62 which lies outside the area encircled by the panels 22 and seals against the outer surfaces of the panels forms a powerful buttress for the side panels, the concrete buttress itself being buttressed by the earthen side of the excavated hole.

The concrete buttress 62, which is integrally joined to the concrete bottom of the pool by concrete underlying the lower edges of the panels 22, has a width outwardly of the panels 22 which is extensive. As illustrated in the drawings, the base width of the buttress is equal to approximately twice the thickness of the concrete bottom of the pool. This width of the buttress is provided for by excavating the hole in which the pool is formed to have a shape conforming to the shape of the pool to be formed and dimensioned to extend horizontally beyond the periphery of the pool to be formed by a distance equal to the width of the buttress. Further, interlocking between the concrete bottom 60 and the sidewall panels 22 is effected by the panel corrugations 24 and 26. Thus,

the sidewall panels are rigidified and held against bending or other distortion.

When the pool structure has been completed to the extent hereinabove indicated, the boards 48 and the clamps 52 may be removed as soon as the concrete has set. The excavation is then back filled around the sidewalls 20 and above the bottom portion 62 as indicated at 68 in FIG. 7. The upper margin of the pool structure may be finished in any desired manner. For instance, the top portions of the rods 46 projecting above the panels 22 may be cut off; coping tiles 70 may be positioned over the upper edges of the sidewall 20 and a concrete sidewalk 72 may be provided around the pool structure below the outer ends of the coping tiles, as shown in FIGS. 8 and 9.

The sidewall 20 of the swimming pool of FIGS. 1 to 9 is kidney-shaped. Other configurations may be used, as desired. FIG. 11 illustrates a straight sidewall; FIG. 13, a circular sidewall; and FIG. 14, a dumbbell-shaped sidewall.

FIG. 15 illustrates different means of supporting the sidewall 20 before and during the deposition of the gravel 53, the provision of the reinforcing rods 54 and the pouring of the concrete 60. Specifically, in place of the wood blocks 51, I use hollow concrete tiles 74 or the like (for instance, baked bricks), which may be left in place permanently, thus eliminating any need for the clamps 52.

FIG. 16 illustrates different means for holding the sidewall 20 against tilting. As shown, L-shaped iron rods 76 are used to connect the ends of the boards 48 to the top of the sidewall 20. Specifically, the rods 76 each have one long leg which is threaded through an aperture in the end of each board 48 and thereafter inserted between the upper strap 36 and the outside of a sidewall panel 22, in one of the inwardly directed crests or corrugations 24 of the panel. With this arrangement, the stakes 46 may be driven deeper into the ground, or else provided in shorter form, so that the tops of the stakes are flush with the top edge of the sidewall 20. Thus, there is no need to cut off the tops of the stakes 46 after the concrete has been poured and before the coping tiles 70 are placed in position.

As shown in FIG. 17, other L-shaped iron rods 78 identical with the rods 76 may conveniently be used to stake the outer ends of the boards 48 to the ground.

FIGS. 17 to 19 show the construction of a reinforced concrete beam around the top of the sidewall 20. The construction is otherwise as in FIG. 16. Specifically, the reinforced concrete beam is constructed as follows. When the back fill 68 is deposited between the sloping sidewall 16 of the excavation and the outside of the sidewall 20, a gutter 80 is formed adjacently the sidewall 20. A number of L-shaped iron rods 82, identical with the rods 76 and 78, have their short legs inserted into sidewall corrugations 24, between the outside of the sidewall 20 and the straps 34, so that the long legs of the rods 82 project radially and horizontally from the sidewall 20 at spaced points therearound. A pair of reinforcing rods 84 are placed on the horizontal legs of the rods 82 to encircle the sidewall 20 in spaced relationship to the sidewall and to each other. The rods 84 are held in position by wires 86 tying the rods 84 to the rods 82. Concrete 88 is then poured into the gutter 80 and on top of the back fill 68 which concrete, if desired, may extend radially outwardly of the sidewall 20 to form a sidewalk around the sidewall. Preferably, the concrete 88 extends radially of the sidewall 20 to embed completely the rods 82. The gutter 80 is deep enough so that its bottom extends below the lower ends of the short, vertical legs of the rods 82. The rods 84 are completely embedded in the concrete 88, which thus forms a reinforced concrete beam around the top of the sidewall 20.

FIGS. 20 and 21 show a further modification of the structure of FIGS. 17 to 19 whereby the reinforced con-

crete beam around the sidewall 20 is enlarged to form a coping for the sidewall, thus eliminating the coping tiles 70 of the pool of FIGS. 1 to 9. Specifically, the construction of FIGS. 17 to 19 is followed up to the point where the concrete 88 is poured. At that point, a plurality of pairs of small upper and lower holes 90 are drilled through the upper margin of the sidewall 20 at spaced areas around the periphery of the sidewall. A number of wooden boards 92 are arranged on the inside of the upper margin of the sidewall with the upper surfaces of the boards flush with the top edge of the sidewall. A metal sheet strip 94 is also arranged around the inside of the boards 92, with the upper margin of the strip 94 projecting above the boards 92 and the top edge of the sidewall 20. The boards 92 and the metal strip 94 are held in place by metal screws 96 passing therethrough and through the apertures 90 in the upper margin of the sidewall 20. At this time, concrete 98 may be poured. After the concrete has set, the screws 90, the sheet metal strip 94 and the boards 92 are removed. As best shown in FIGS. 20 and 21, the concrete 98 will include a lip projecting radially inwardly immediately above the top edge of the sidewall 20 and simulating the appearance of the coping tiles 70. Further, a reinforced concrete beam integral with said lip and flush therewith extends around the outside of the sidewall 20. If desired, the concrete 98 may extend radially outwardly beyond the reinforcement to provide a sidewalk extending around the pool.

If maximum strength of construction is desired, the boards 92 may have its top short of the top edge of the sidewall 20 so that the concrete 98 will extend on both sides of the top margin of the sidewall 20, as indicated in FIG. 21 by a dot-dash line 99. In other words, the top edge of the sidewall 20 is embedded in the concrete 98.

Reference is now made to FIGS. 22 to 24 wherein like numerals indicate the same parts as in the preceding figures. FIGS. 22 to 24 show a package generally indicated at 100 and including two superposed sidewall panels 22 with their insides (the sides which in the finished pool are exposed to the water) facing each other. This arrangement is preferred particularly where the panels 22 are made of stainless steel with the "wet" or inside faces polished, or where the panels' insides are otherwise finished, and where consequently the insides need protection. The package 100 further includes a pair of strap sections 36 arranged along the long axis of the panels 22, corresponding bolts 40, washers 42 and nuts 44. The bolts 40 extend through the panel apertures 30 and the strap apertures 38, which are aligned. The greater size of the apertures 38, as compared with the apertures 30, facilitates such alignment without need for having the ends of the straps 36 projecting beyond the edges of the panels 22. The washers 42 and the nuts 44 are threaded over the bolts 40, which extend through the apertures 30 and 38 to hold the panels 22 and straps 36 in assembled relationship. A pair of wooden boards 102 (which, if desired, may be the boards 92 of FIG. 20) are placed along side the straps 36 on one side of one panel 22, preferably between the straps 36 and the long edge of the panel 22. Finally, a plurality of sheet steel straps 104, of the type conventionally used for packaging, encircle the package at spaced areas. The straps 104 extend transversely of the strap sections 36 and the boards 102.

While the preferred embodiments of the present invention have been described herein, it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. The method of making a swimming pool which includes the steps of providing a plurality of flexible wall panels of rectilinear shape and having when positioned on edge a vertical height which substantially exceeds the

depth desired in a pool along the edges thereof, providing a plurality of stakes, providing a plurality of securing means capable of firmly securing the panels to the stakes and providing for infinite adjustment of the panels vertically relative to the stakes, excavating in the ground a hole shaped to conform to the shape of the pool to be formed and dimensioned to extend horizontally an extended distance beyond the periphery of the pool to be formed, shaping the hole by excavation to have a bottom conforming to but located a substantial distance below the bottom of the pool to be formed, connecting and erecting the panels on edge in the hole progressively to form an endless series of panels, flexing the panels in a horizontal direction and working the panels horizontally and vertically into positions which conform the panels to corresponding portions of the periphery of the pool to be formed with upper edges of all the panels located on a common level and with the lower edges of the panels spaced a substantial distance above the underlying bottom portions of the excavated hole; effecting an assembled relationship of the stakes, securing means, and panels in which the stakes are driven into the ground and secured to the panels by the securing means to maintain the panels in positions which conform to the periphery of the pool to be formed; pouring concrete on the bottom of the excavated hole to fill the hole within the area encircled by the panels to a level conforming to the bottom of the pool to be formed and extending above the lower edges of the panels, to fill the space within the hole below the panels, and to form integrally with the concrete bottom of the pool a concrete peripheral buttress extending a substantial distance above the lower edges of the panels in contact with the outer surfaces thereof and having a base at the bottom of the hole which extends horizontally beyond the panels sufficiently to hold the buttress and the lower edges of the panels against outward movement upon subsequent back-filling of the hole, backfilling the excavated hole outside of the panels, and finishing the pool around the upper edges of the panels.

2. The method of constructing a swimming pool having a concrete bottom, which method includes the steps of providing a plurality of wall panels which are freely flexible in a horizontal direction when disposed vertically on edge, excavating a hole adapted to accommodate the pool to be formed, erecting the panels on edge and connecting the panels together progressively to form in the excavated hole a series of panels, flexing and working the panels horizontally into positions in which the panels determine the shape of the pool to be formed and define corresponding portions of the pool periphery, temporarily supporting the lower edges of the panels on support elements resting on the underlying bottom of the excavated hole to locate the lower edges of the panels a substantial distance above the underlying bottom of the hole, temporarily bracing the upper edges of the panels against horizontal displacement, pouring concrete to cover the bottom of the excavated hole within the area embraced by the panels and to deeply imbed the lower edges of the panels in concrete which extends horizontally beyond the panels a distance sufficient permanently to preclude outward displacement of the lower edges of the panels, backfilling the excavated hole outside of the panels, securing anchoring means to the panels to extend horizontally outwardly from the upper portions thereof, and pouring concrete around the upper edges of the panels to cover the anchoring elements and permanently hold the upper edges of the panels against inward displacement.

3. The method of constructing a swimming pool, comprising, providing flexible pool wall structure, excavating a hole shaped and dimensioned to accommodate a pool, erecting the flexible pool wall structure on edge within the hole to form a continuous wall which is freely flexible and movable horizontally, flexing the flexible wall

horizontally to have a position along the length thereof which determines the shape of the pool desired and defines its periphery, temporarily anchoring the flexible wall against horizontal displacement and temporarily supporting the wall to hold the upper edge thereof level and to support the lower edge of the wall a substantial distance above the underlying bottom portion of the excavated hole, pouring concrete in the excavated hole to cover the bottom of the hole within the area embraced by the temporarily supported wall and to imbed the lower edge of the wall within massive concrete which permanently supports the wall and permanently precludes outward displacement of the lower edge of the wall, and backfilling the hole outside of the wall.

4. The method of constructing a swimming pool having a curved periphery and a concrete bottom, which method includes the steps of providing a plurality of vertically corrugated wall panels which are freely flexible in a horizontal direction when disposed on edge, providing a plurality of straps separate from the panels, providing a plurality of stakes having a length exceeding the vertical height of the panels, excavating a hole shaped and dimensioned horizontally to conform to the shape of the pool to be formed and to extend horizontally an extended distance beyond the periphery of the pool to be formed, shaping the hole by excavation to have a bottom conforming to but spaced below the bottom of the pool to be formed, erecting the panels on edge and connecting the panels to each other progressively to form in the excavated hole an endless series of panels along the periphery of the pool to be formed, flexing the connected panels in a horizontal direction and working the panels horizontally into positions which conform the panels to the corresponding portions of the periphery of the pool to be formed, securing the straps to the outer sides of the connected panels, driving the stakes into the ground between the panels and the straps and effecting a secured relationship of the straps, panels and stakes in which the panels are maintained in the conformed positions described with the upper edges of all the panels located at a common level and with the lower edges of the panels spaced a substantial distance above the underlying bottom portions of the hole and located a substantial distance below the corresponding peripheral portions of the bottom of the pool to be formed; pouring concrete in the excavated hole to fill the hole within the area encircled by the panels to a level conforming to the bottom of the pool to be formed, to fill the space within the hole below the panels, and to form in the hole outside of the panels a peripheral buttress extending above the lower edges of the panels in engagement with the outer surfaces of the panels and having a base width sufficient to hold the buttress and the lower edges of the panels against outward movement upon subsequent back-filling of the hole; backfilling the hole outside of the panels, placing L-shaped reinforcing elements between the straps and the panels to extend horizontally away from the upper ends of the panels, attaching a temporary form to the inner surfaces of said panels in adjacent relation to the upper edges thereof, and pouring concrete around the upper periphery of the panels to cover said reinforcing element and to register with said form to produce a peripheral coping.

5. The method of constructing a swimming pool having a curved periphery and a concrete bottom, which method includes the steps of providing a plurality of vertically corrugated wall panels which are freely flexible in a horizontal direction when disposed on edge, providing a plurality of straps, providing a plurality of stakes, excavating a hole shaped and dimensioned horizontally to conform to the shape of the pool to be formed and to extend horizontally an extended distance beyond the periphery of the pool to be formed, shaping the hole by excavation to have a bottom conforming to but spaced below the bottom of the pool to be formed, erecting the individual

panels successively on edge and connecting the successive panels to each other progressively to form in the hole a series of panels which upon completion define the periphery of the pool to be formed, flexing the successively connected panels in a horizontal direction and working the panels to locate the panels in positions conforming to the corresponding portions of the periphery of the pool to be formed; securing the straps to the outer sides of the panels, driving the stakes into the ground between the panels and straps, and effecting an adjusted relationship of the straps, panels and stakes which maintains the panels in the conformed positions described in which the upper edges of the panels are located at the same vertical level and in which the lower edges of the panels are spaced a substantial distance above the underlying bottom portions of the hole and located a substantial distance below the corresponding peripheral portions of the bottom of the pool to be formed; pouring concrete on the bottom of the excavated hole to fill the hole within the area encircled by the panels to a level conforming to the bottom of the pool to be formed, to fill the space within the hole under the panels, and to form outside the panels a buttress rising above the lower edges of the panels in direct engagement with the outer surfaces of the panels and having a width outside the panels equal to at least one-half the thickness of the concrete bottom of the pool, backfilling the hole outside of the panels, and finishing the pool structure around the upper edges of the panels.

6. The method of constructing a swimming pool having a concrete bottom, which method includes the steps of providing a plurality of wall panels which are freely flexible in a horizontal direction when disposed on edge, providing a plurality of stakes, excavating a hole shaped and dimensioned horizontally to conform to the shape of the pool to be formed and to extend horizontally beyond the periphery of the pool to be formed by an extended and generally uniform distance, erecting the panels on edge and connecting panels together progressively to form in the hole a series of panels which upon completion define the periphery of the pool to be formed, flexing the panels and working the panels horizontally to conform the panels to corresponding portions of the periphery of the pool to be formed, driving the stakes into the ground and effecting an adjusted relationship of the panels and stakes in which the lower edges of the panels are temporarily supported in positions spaced a substantial distance above the underlying bottom of the hole and in which the stakes anchor the lower edges of the panels against horizontal displacement temporarily bracing the upper edges of the panels against horizontal displacement; pouring concrete to cover the bottom of the excavated hole within the area encircled by the panels and to deeply imbed the lower edges of the panels in concrete which extends horizontally beyond the panels a sufficient distance to permanently preclude outward movement of the lower edges of the panels, backfilling the hole outside of the panels, and finishing the pool structure around the upper edges of the panels.

7. The method of constructing a swimming pool having a curved periphery and a concrete bottom, which method includes the steps of providing a plurality of wall panels which are freely flexible in a horizontal direction when disposed vertically on edge, providing a plurality of stakes, excavating a hole shaped and dimensioned horizontally to conform to the shape of the pool to be formed and to extend horizontally beyond the periphery of the pool to be formed by an extended distance which is at least equal to one-half of the thickness of the concrete bottom of the pool to be formed, shaping the hole by excavation to have a bottom conforming to but spaced below the bottom of the pool to be formed by a distance equal to the thickness of the concrete bottom of the pool to be formed, erecting the individual panels on edge and connecting the panels together progressively to form in

the hole a series of panels which upon completion define the periphery of the pool to be formed, flexing the erected panels in a horizontal direction and working the panels into positions conforming to the corresponding portions of the periphery of the pool to be formed, driving the stakes into the ground along the outer sides of the panels and effecting an adjusted relationship of the stakes and panels in which the panels are maintained in the conformed positions described and in which the panels are supported with the lower edges thereof spaced a substantial distance above the underlying bottom of the hole and located a substantial distance below the corresponding peripheral portions of the bottom of the pool to be formed; pouring concrete to cover the bottom of the excavated hole all the way to the periphery of the hole outside of the panels to fill the hole within the area encircled by the panels to a level conforming to the bottom of the pool to be formed and to fill the hole outside of the panels to a level substantially above the lower edges of the panels to form a wide peripheral buttress engaging the outer surfaces of the panels, backfilling the hole outside to the panels, and finishing the pool structure around the upper edges of the panels.

8. The method of constructing a swimming pool having a concrete bottom, which method includes the steps of providing a plurality of flexible wall panels, excavating a hole shaped and dimensioned horizontally to accommodate to the shape of the pool to be formed and to extend horizontally beyond the periphery of the pool to be formed by an extended distance which is at least equal to one-half of the thickness of the concrete bottom of the pool to be formed, shaping the hole by excavation to have a bottom conforming to but spaced below the bottom of the pool to be formed by a distance equal to the thickness of the concrete bottom of the pool to be formed, erecting the panels on edge and connecting the panels progressively to form in the hole a series of panels which upon completion defines the periphery of the pool to be formed, flexing the erected panels as necessary to conform the panels to the corresponding portions of the periphery of the pool to be formed and supporting the panels with the lower edges thereof spaced a substantial distance above the underlying bottom of the excavated hole and located a substantial distance below the corresponding peripheral portions of the bottom of the pool to be formed, pouring concrete to cover the bottom of the excavated hole to a substantial extent outside of the panels and to a level within the area encircled by the panels conforming to the bottom of the pool to be formed and in engagement with the inner surfaces of the panels and to a level outside of the panels substantially above the lower edges of the panels to form a wide peripheral buttress engaging the outer surfaces of the panels, backfilling the hole outside of the panels, and finishing the pool structure around the upper edges of the panels.

9. The method of constructing a swimming pool, comprising, excavating a hole adapted to accommodate a pool, providing flexible pool wall structure, erecting the flexible pool wall structure on edge within the hole to form a continuous wall which is flexible and movable horizontally, flexing the flexible wall horizontally to have a position along the length thereof which determines the shape of the pool desired and defines its periphery, temporarily anchoring the flexible wall against horizontal displacement and temporarily supporting the wall to hold the upper edge thereof level and to support the lower edge of the wall a substantial distance above the underlying bottom portion of the excavated hole; pouring concrete in the excavated hole to cover the bottom of the hole within the area embraced by the wall to a level alongside the wall which extends above the lower edge of the wall, to fill the space within the hole below the wall, and to form integrally with the concrete covering the area embraced by the wall a concrete peripheral buttress rising above the lower edge of the wall in contact therewith and extending

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horizontally beyond the wall to have a base width outside the wall which is sufficient to permanently hold the peripheral buttress and the lower edges of the panels against outward displacement during and after subsequent backfilling of the excavated hole; backfilling the hole outside of the wall, and finishing the pool around the upper edge of the wall.

10. The method of constructing a swimming pool which includes the steps of excavating a hole shaped and dimensioned to accommodate a swimming pool, erecting flexible pool wall panels within the excavated hole to be disposed on edge and connected together to form an endless series, driving a plurality of stakes into the bottom of the excavated hole along the periphery of the pool to be formed, flexing the erected panels horizontally and vertically positioning the panels to space the lower edges of the panels a substantial distance from the underlying portions of the bottom of the excavated hole and to locate the panels in positions which define corresponding portions of the periphery of a pool having a desired shape and effecting a firm relationship of the stakes and the panels temporarily to hold the panels in the described positions thereof by means of structure which provides for infinite adjustment of the vertical positions of the panels relative to the stakes; pouring concrete on the bottom of the excavated hole to underlie the lower edges of the panels to cover the bottom of the hole within the series of panels and extend along the panels to a level substantially above the lower edges thereof, and to form outside of the series of panels a peripheral buttress integrally joined to the concrete within the series of panels and extending a substantial distance above the lower edges of the panels in abutting relation thereto and having a width sufficient to permanently support the buttress and the lower edges of the panels against outward displacement by inward tipping force on the panels incident to subsequent backfilling of the excavated hole; backfilling the excavated hole outside of the panels, and finishing the pool around the upper edges of the panels.

11. The method of constructing a swimming pool, comprising, providing a plurality of flexible wall panels, excavating a hole adapted to accommodate a pool; erecting on edge within the hole a connected series of flexible wall panels which, after being erected on edge, are freely flexible and movable horizontally, flexing the erected panels horizontally into positions which determine the shape of the pool desired and define corresponding portions of its periphery, temporarily anchoring the panels against horizontal displacement and temporarily supporting the panels with the upper edges thereof conforming to a common level and with the lower edges of the panels spaced a substantial distance above the underlying bottom portions of the excavated hole, pouring concrete in the excavated hole to cover the bottom of the hole within the area embraced by the series of panels and to imbed the lower

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edges of the panels in concrete within a massive concrete peripheral buttress for providing permanent concrete support to the panels which permanently holds the lower edges of the panels against outward displacement during and after subsequent backfilling of the excavated hole; backfilling the hole outside of the panels, and forming around the upper portion of the wall a concrete beam connected to the upper portion of the wall to permanently and strongly anchor the latter against inward displacement.

12. The method of constructing a swimming pool having a curvature in the wall thereof, comprising, excavating a hole shaped and dimensioned to accommodate a pool, providing in a generally flat condition a plurality of flexible pool wall panels, flexing at least some of the panels to conform to the pool wall curvature and positioning and assembling the wall panels in a connected series to form an assembled wall of panels conformed to the desired shape of the pool wall, providing initial support for the assembled wall of panels to hold the lower edges of the panels spaced a substantial distance above the underlying bottom of the excavated hole; pouring concrete in the excavated hole to imbed the lower edge of the wall of panels within concrete which extends upwardly above the lower edges of the panels in engagement with the inner sides of the panels, which underlies the panels to provide permanent support to the panels, and which forms outside the wall of panels and in integrally joined relation to the concrete inside the wall of panels a concrete buttress rising above the lower edges of the panels in engagement with the outer sides thereof and extending outwardly a sufficient distance beyond the wall of panels to provide sufficient strength permanently to hold the buttress and the lower edges of the panels against outward displacement during and after subsequent backfilling of the excavated hole; backfilling the excavated hole outside of the panels, and finishing the pool around the upper edge of the wall of panels.

13. The method of constructing a swimming pool as claimed in claim 12, which includes the step of producing around the upper portion of the wall of panels a strong concrete beam connected to the wall to permanently and strongly anchor the same against inward displacement.

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