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Glenn

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[54] **SHORELINE CONSTRUCTION FOR ARTIFICIAL WATER BODIES**

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[52] **U.S. Cl.** **61/37,** 61/39, 61/49

[51] **Int. Cl.** **E02b 3/04**

[58] **Field of Search** 61/3, 37, 35, 39, 61/49; 52/742, 169; 264/313, 31, 32, 35

[56] **References Cited**

UNITED STATES PATENTS

3,616,649	11/1971	Laing	52/742
3,428,725	2/1969	Delmonte	264/338
3,426,122	2/1969	Gaudelli	264/297
2,960,745	11/1960	Wallace	52/742
2,873,505	2/1959	Sheldon	264/32
1,561,260	11/1925	Mallery	61/.5
1,083,289	1/1914	Mason	61/39
592,738	10/1897	Judson	61/39

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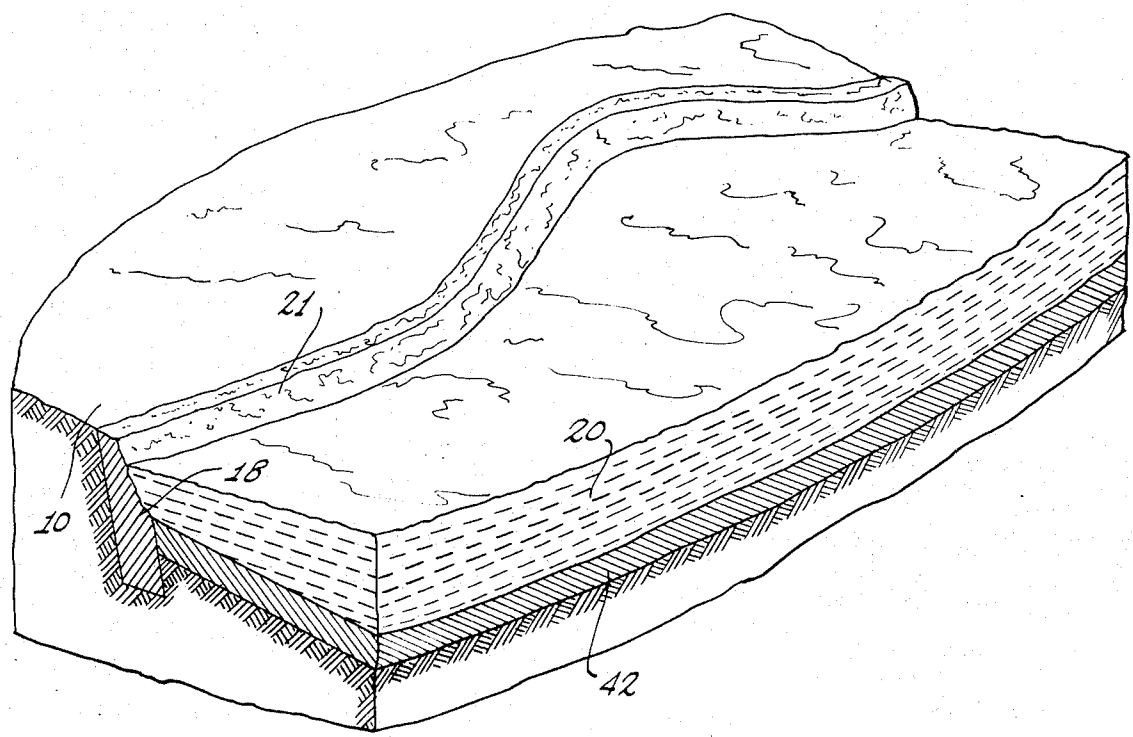
[57] **ABSTRACT**

This invention relates to a method of constructing shorelines for artificial water bodies at a reasonable cost and which will, at the same time, be highly wave resistant and provide adequate seepage and erosion control of the shoreline.

The method comprises the excavation of a trench in the outline of the periphery of the desired shoreline. The trench may have a depth of about 4 feet and a width of about eight inches. An elongated pre-molded plastic section is then secured to the upper portion of the trench sidewall closest to the body of water to be enclosed. The opposite side of the pre-molded plastic section is provided with surface irregularities and is thinner than the trench width so as to form an opening between the plastic section and the trench wall. Concrete is then poured through the opening and fills the trench and fully occupies the opening in the trench adjacent the exposed irregular surface of the pre-molded plastic section.

The soil adjacent the premolded section is removed after the concrete has initially set and the plastic sections are then also removed to reveal the irregular surface formed in the concrete. The irregular surface, in its preferred embodiment has a natural rock-like formation and forms the shoreline for the water body to be retained. The plastic sections are preferably made of polyurethane foam core material with a concrete release agent coated thereover.

12 Claims, 5 Drawing Figures



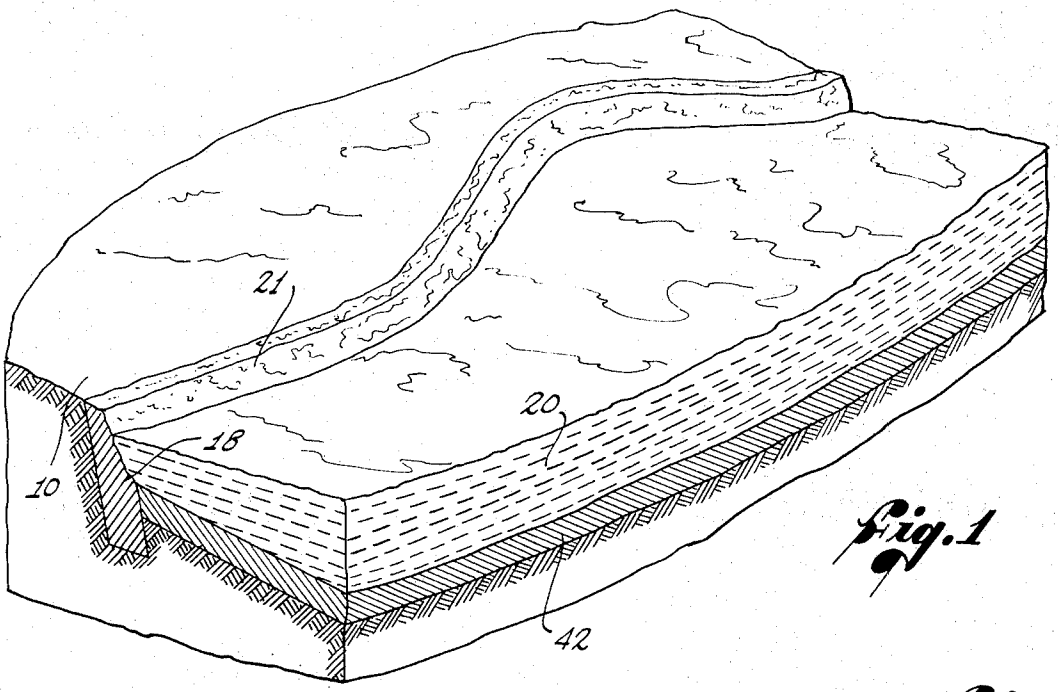


Fig. 1

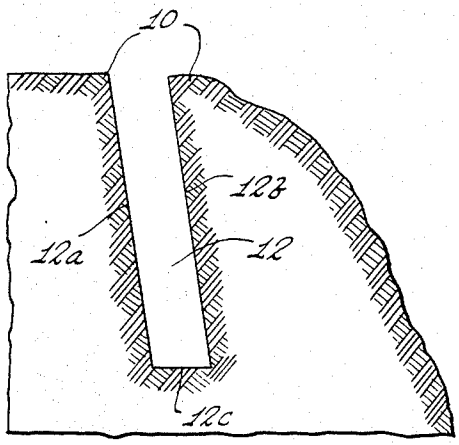


Fig. 2

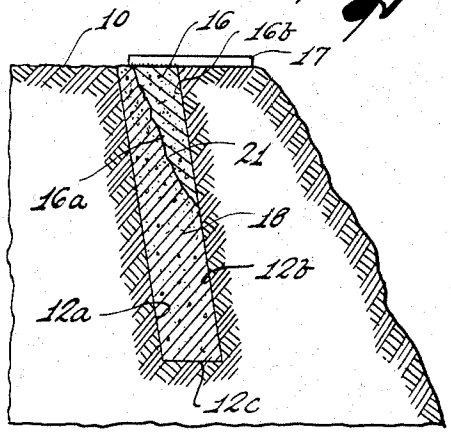


Fig. 3

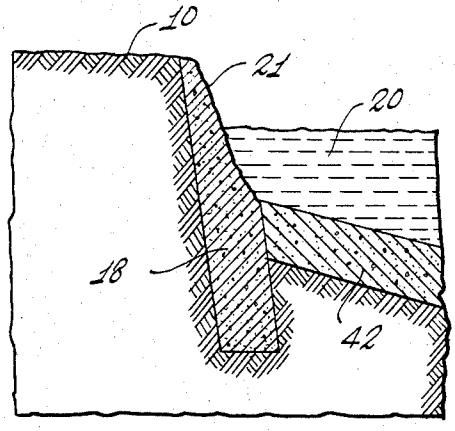


Fig. 4

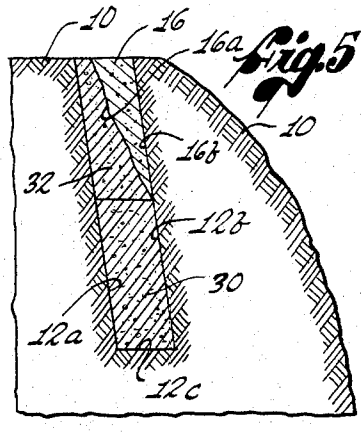


Fig. 5

SHORELINE CONSTRUCTION FOR ARTIFICIAL WATER BODIES

SUMMARY OF THE INVENTION

The invention relates to a method of constructing shorelines for artificial water bodies, at a reasonable cost, and which will be, at the same time, highly wave resistant and provide adequate seepage and erosion control of the shoreline. The favorable cost factor is mainly due to the fact that the present method eliminates some of the conventional aspects of constructing artificial seashores, including pile driving and capping.

Excavation of a trench to outline the periphery of the water body constitutes the first step in construction of the artificial shoreline. The dimensions of the trench may be adapted to specific requirement, although a depth of about 4 feet and a width of about 8 to 10 inches are found to be the preferred dimensions of the trench.

The flat side of a pre-molded plastic section of perhaps 8-15 feet in length is then secured to an upper portion of the trench sidewall, its opposite side being provided with surface irregularaties or inequalities closely approximating natural sand or rock formations. The plastic section is thinner than the trench width so as to form an opening between the plastic section and the trench wall. Concrete is then poured into the trench through the opening and will first fill up the bottom portion of the trench below the plastic section and will thereupon occupy the opening in the trench opposite the exposed irregular surface of the pre-molded plastic section. The upper portion of the concrete will thus, while in the process of setting in the trench, receive the mirror image of the irregular surface of the plastic section. The plastic section is readily removed from the trench and the irregular surface formed of concrete is exposed. In this way, a natural rock-like formation emerges as the shoreline for the water body to be retained therewithin.

The plastic sections are preferably made of polyurethane foam core, irregular in appearance and having its irregular face impregnated with sand, stone, or gravel to approximate a natural shoreline appearance. These plastic sections may be reused a number of times.

Another embodiment of the invention comprises a method of preparing shorelines wherein two separate pourings of concrete are made. The first pouring of concrete occupies the lower portion of the trench and serves as a footing for the plastic section. The plastic section is then placed on the concrete footing against the trench wall as described above and concrete is then poured, a second time, into the remaining void of the trench. The concrete above the footing has imparted to it the decorative impression of the plastic section, as aforedescribed.

More particularly, the invention refers to a novel method of outlining and erecting a substantially vertical shoreline, primarily, to enclose artificial lakes and other bodies of water.

The heretofore utilized constructions for shorelines call for the pouring of rigid material over the sloping outlines of soil surrounding the water body. This method has proven impractical, in that it is difficult to operate working equipment on the sloping sides and seepage and erosion controls become inadequate. These drawbacks have, at least partially, been overcome by the construction of so-called seawalls; however, this method is unduly time consuming, and therefore, the cost of their construction becomes almost prohibitive.

Thus, it is the primary object of the invention to streamline the operational steps in excavating the soil outlining the water body and accommodating therein a highly wave resistant concrete shoreline, being actually formed and simultaneously provided with the appearance of a naturally occurring shoreline in situ within the walls of a trench, within a very short period of time.

It is also a major object of the invention to provide such a shoreline at minimal cost, while, at the same time maintaining adequate control of seepage and erosion of such shoreline.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view in perspective of a portion of a completed natural looking concrete shoreline outlining the periphery of an artificial body of water.

FIG. **2** is a cross-sectional view of an empty trench, excavated adjacent the periphery of a water body, preparatory to the erection of the shoreline.

FIG. **3** is a cross-sectional view of the trench, wherein a decorative molding means has been placed and the concrete has been poured, according to a first preferred embodiment of the invention.

FIG. **4** shows, in a cross-sectional view, the completed shoreline facing the body of water with a lining of compacted material placed on the bottom of the water site.

FIG. **5** is a cross-sectional view of the trench, wherein a decorative molding means has been placed and concrete has been poured in two separate steps, according to a second preferred embodiment of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring especially to FIGS. **1** and **2**, a portion of the soil **10**, outlining the area for the artificial water body to be enclosed, is first excavated so as to form a trench **12**, defined by sidewalls **12***a*, **12***b* and a bottom wall **12***c*. The trench **12** should, preferably, be about 8 to 10 inches in width and 4 to 8 feet deep. The dimensions of the trench **12** may, obviously, differ from what is suggested here, dependent on their individual requirements of construction. The trench is, preferably, excavated in a substantially rectangular cross-section; however, it is found advantageous to angle the wall of the trench facing the waterside progressively toward the bottom **12***c* by about 1 to 2 inches per foot of the depth, so as to increase the stability of the resultant concrete wall **18** to be poured into trench **12**.

By means of appropriate trenching equipment, it is generally desired to additionally provide the trench **12** with an irregular periphery as shown in FIG. **1**, thereby imparting a waxy appearance to the trench and consequently, to the planned shoreline.

The excavation of the trench **12** thus defines the outline of the water body to be retained therein and serves to establish reference points for subsequent excavation of the water body proper.

In FIG. **3**, an elongated molded plastic section **16** of perhaps 10 feet to 15 feet in length, is shown, having a flat surface **16***b* and an opposed irregular surface **16***a*. The flat side **16***b* of molded plastic section or mold **16** is secured against the interior wall **12***b* of trench **12** by means of any appropriate fastening means and covers

approximately the upper half of wall **12***b*. One fastening means **17** shown in FIG. **3**, takes the form of paddles affixed to mold **16** at intervals. The irregular surface **16***a* of mold **16**, faces the void in the trench **12**. The mold **16** may be made of a polyurethane foam core or other lightweight material which is provided with surface irregularities on side **16***a*, for example, copied directly from natural rock formations or being imitations thereof, or side **16***a* may have a sandstone surface, or other natural shoreline type of surfacing affixed thereto.

Mold **16** has an average thickness less than that of the width of the trench so that an opening will be formed for the pouring of concrete into the trench **12**. Mold **16** is preferably made of a fairly rigid but very light polyurethane foam, having a density of about 1.5–2.5 lbs. per cubic foot; it can be made in stable shapes and is found to possess sufficient flexibility to yield and conform to the irregular contours of trench **12**. The polyurethane foam mold is mentioned by way of example only; other foams or materials may serve the purpose equally well. Mold surface **16***a* is also preferably coated with a cement release agent of a conventional type, e.g., diesel oil, form oil, or silicone release agents.

Once mold **16** is securely positioned, the remaining void of trench **12** is then filled with concrete **18**. The portion of concrete **18**, which fills the upper part of trench **12**, comes in contact with the decorative and irregular side of mold surface **16***a* and the concrete will have imparted to it a mirror image thereof. For example, if the mold **16** has been provided with a surface **16***a* imitating rock formations, then the concrete **18**, when set, will appear as a stoney rock formation ultimately facing the body of water.

The concrete **18** may be colored to enhance the natural look of the artificial shoreline. Furthermore, reinforced steel (not shown) may be placed within the concrete **18** to add to its stability and durability. Upon the initial setting of concrete **18**, one may, without delay, remove the earth, adjacent trench wall **12***b*, thereby exposing the flat side **16***b* of molding means **16**, which now may be pulled away from the further concrete shoreline leaving the decorative impression **21** of mold **16** on the then exposed surface of the concrete. FIG. **4** shows the completed shoreline, in section, with the earth adjacent trench wall **12***b* removed.

The texture of the impression **21** will vary with the time elapsed before removal of mold **16**. Thus, it would be possible to achieve certain desirable textures of surface **21** by simply accelerating or delaying the removal thereof. It should, however, be noted that a delay in withdrawing the molding means **16** may make its removal progressively difficult because of the hardening surface of concrete **18**. It is also possible to reuse mold means **16** for other areas of the concrete shoreline **18** when the mold **16** is coated with a suitable releasing agent, as mentioned previously.

Referring to FIG. **4**, in particular, it will be seen that the level of water **20** reaches approximately the halfway point of the decorative surface **21** of the concrete shoreline **18**; the remaining upper half of the surface **21** will, thus, constitute the exposed natural looking shoreline.

The underside or bottom **40** of the water body is excavated so as to slope downwardly from the concrete shoreline **18** and is provided with a lining **42**, consisting, for example, of compacted soil or the like, so as to form an optional safeguard against seepage and erosion of the shoreline.

If the total depth of the trench is estimated at 4 feet with 2 feet of colored decorative shoreline concrete exposed 1 foot above and 1 foot below the normal level of the water body, it is estimated that the colored shorelines will require about 0.04 cubic yards of colored concrete and about 0.067 cubic yards of concrete footing per linear foot of shoreline.

FIG. **5** illustrates another embodiment of the invention, in which concrete **30** is first poured into the lower half of trench **12**, so as to form a footing for the shoreline; the molding means **16** is then placed on the concrete footing **18***a* against trench wall **12***b*, as described above. A second quantity of colored concrete **32** is then poured into the remaining void of trench **12** and will, while in the process of setting, receive the mirror image of the surface of the irregularities **16***a* of molding means **16**. The removal of the soil and molding means **16** to expose the decorative concrete shoreline surface **34** is carried out in the same manner as described above with reference to FIGS. **1–4**.

While the foregoing has illustrated and described what is now contemplated to be the best mode of carrying out the invention, the embodiments of the invention are, of course, subject to modification without departing from the spirit and scope of the invention. Therefore, it is not desired to restrict the invention to the particular form of construction illustrated and described, but to cover all modifications that may fall within the scope of the appended claims.

I claim:

1. In the construction of shorelines to enclose bodies of water, the method comprising the steps of:

a. excavating a trench, having opposed first and second sidewalls, along the periphery of a water body to be enclosed;

b. placing elongated molding means in said trench, one side of said molding means having an irregular surface of decorative qualities and the other side being generally flat, the flat side of said molding means being held against the upper portion of the first sidewall of said trench closest to said water body to be enclosed, said molding means having an average thickness less than that of the width of the trench to form a void between the molding means and said second sidewall;

c. pouring sufficient concrete into said void of said trench to substantially fill said void;

d. allowing said concrete to initially set;

e. excavating the soil adjacent said first sidewall so as to expose the flat side of the molding means; and

f. removing the molding means subsequent to the initial setting of the poured-in concrete, whereby the concrete facing the irregular surface of the molding means has imparted to it the impressions of said irregular surface thereby resulting in a natural looking shoreline for the body of water to be retained therewithin.

2. The method of claim **1**, including excavating at least one of the trench walls angularly.

3. The method of claim **1** including excavating the trench non-linearly so as to impart an irregular apearance to the shoreline.

4. The method of claim **1**, including using a polyurethane foam core in the molding means.

5. The method of claim 1 wherein said irregular surface resembles a natural rock-like surface.

6. The method of claim 1 wherein said irregular surface resembles a sandstone surface.

7. The method of claim 1, including delaying or accelerating the removal of the molding means from the concrete adhering thereto so as to vary the texture impressed by the molding means on said concrete.

8. The method of claim 1, including pouring concrete to a level substantially above the level of the water body to be retained therewithin.

9. The method of claim 1, including providing a release agent to facilitate removal of the molding means from the concrete.

10. The method of claim 1, including placing a lining of compacted material on the bottom of the water body for control of seepage and erosion in the shoreline, said lining extending to a level substantially below the exposed concrete portion of the shoreline.

11. The method of claim 1 wherein said trench is sloped inwardly towards the body of water to be enclosed from the top to the bottom thereof.

12. In the construction of shorelines for artificial water bodies, the method comprising the steps of:

a. excavating a trench in soil bordering the periphery of a water body;

b. pouring a first quantity of concrete into the trench so as to fill up the lower portion of the trench and form a footing;

c. placing molding means, one side of which has a surface of decorative irregularities, on said footing adjacent the wall of the trench bordering the periphery of the water body, said irregular surface of the molding means facing the oppositely situated wall of the trench;

d. pouring a second quantity of concrete into the remaining void of the trench;

e. excavating the soil of the wall of the trench bordering the periphery of the water body, whereby the molding means are exposed; and

f. removing the molding means subsequent to the setting of the second quantity of concrete, whereby said concrete facing the side of the water body, having received a mirror image of the decorative inequalities of the molding means, is exposed so as to emerge as a natural looking shore-line for the water body to be retained therein.

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