May 21, 1968 J. R. BERRY 3,383,863

POND, TANK AND PIT LINER AND METHOD OF DETECTING LEAKS

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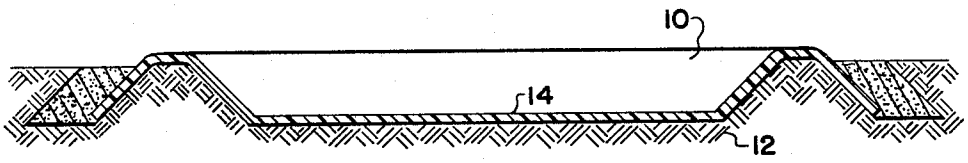

FIG. 1

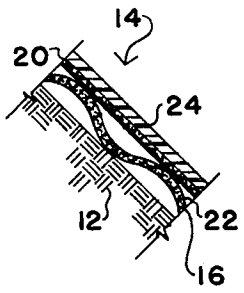

FIG. 2

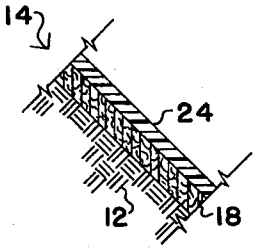

FIG. 3

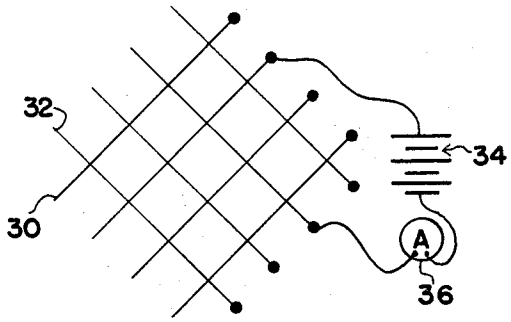

FIG. 5

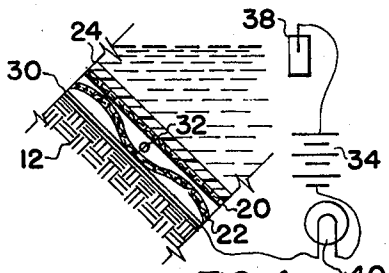

FIG. 4

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POND, TANK AND PIT LINER AND METHOD OF DETECTING LEAKS

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ABSTRACT OF THE DISCLOSURE

An earthen pond is sealed by applying an impervious reinforced resin coat to a pad in contact with the soil. The pad, e.g., cardboard or kraft paper, forms a backing when the resin is applied and forms a smoothing surface to the rough soil. The liner of resin on the pad may be preformed and rolled and the strips joined on the site. Possible leaks are located by the change of electrical resistance around two sets of wires underneath the liner.

This invention relates to preventing liquids from seeping from a reservoir into the soil. More specifically, this invention is for sealing open ponds used in the disposal of salt water in the production of petroleum, hence referred to as salt water disposal pit or brine reservoir.

In the production of petroleum, salt water is often produced with the petroleum and separated out at the surface of the earth. Care must be used in the disposal of the salt water because of its capacity for contaminating underground aquifers. The problem was recognized and discussed in Becker, Patent No. 2,348,320, May 9, 1944.

Summary

According to this invention, a pit or pond is formed in the earth by conventional earthworking equipment and the pit lined with a liquid-proof sealer. A pad is placed next to the earth to prevent the liquid resin of the sealer from being absorbed by the earth. Also, the pad forms a smooth surface to receive the sealant coat.

I have found that it is particularly desirable to spread a grid of electrical wires underneath the pad and sealer. By measurement of the resistance between different wires of this grid, it would be detected whether or not the liner to the pond leaks.

Also, I have found that it is desirable to apply the liquid resin to a pad at a shop and form the strips of the preformed liner into rolls where they are laid out over the electrical grid and the joints between adjacent strips sealed to form the liner for the pit.

An object of this invention is to form a liquid-proof coating or liner to a pit formed in the soil.

Another object is to detect leaks in the pit liner.

Other objects are to achieve the above with a construction that is sturdy, durable, repairable, simple, safe, and reliable, yet inexpensive and easy to manufacture, install, modify, and maintain.

Further objects are to achieve the above with a method that is rapid and inexpensive and does not require skilled people to install and maintain.

The specific nature of the invention, as well as other objects, uses, and advantages thereof, will clearly appear from the following description and from the accompanying drawing, the different views of which are not necessarily to the same scale, in which:

FIG. 1 is a sectional view showing a tank built according to this invention.

FIG. 2 is an enlarged section showing details of construction of the lining.

FIG. 3 is similar to FIG. 2 showing details of construction of an alternate embodiment.

FIG. 4 is similar to FIG. 2 showing details of construction of the lining of FIG. 2 modified with a leak detector.

FIG. 5 is a schematic plan representation of the electrical circuits of the leak detector.

Referring more particularly to the drawing, it may be seen that pit or cavity **10** has ben formed in the soil **12**. As stated in the introduction, this cavity would be formed in the soil by conventional earthworking equipment. The liner **14** on the surface of the soil prevents any liquids within the cavity **10** from soaking into the soil. As seen, the dams around the pit **10** have 45% sloped shoulders and are backfilled with sand to accommodate expansion and contraction of the liner **14**.

The liner **14** is formed by first applying a pad upon the surface of the soil **12** completely covering the pit area. The embodiment illustrated in FIG. 2 shows this pad as being corrugated cardboard **16**. The embodiment of FIG. 3 shows this pad as being a mat of unwoven fibers **18**. Certain foamed materials are adaptable for use as the pad. Also felt construction paper or heavy kraft paper is adaptable for use as the pad. One of the purposes of the pad is to prevent the sealing resins subsequently applied from leaching into the soil. Therefore, many suitable pad materials are available.

The corrugated board **16** has only a smooth sheet **20** on one side and the corrugations **22** are exposed to the soil **12** or the underside. Such corrugated board is sometimes known as "Coreflex."

The insulating fibers **18** are of cellulose derivation and the pad is approximately ¼ inch thick. Such pads are commonly available on the market for use in the building trades. It is characteristic of the pad in either illustrated embodiment that the pad is somewhat cushiony.

Impervious reinforced resin coat **24** is applied to the surface of the pad completely covering the pad. Reinforced resin coatings are well known and will not be described in detail except to note that a layer of glass fibers may be applied above the pad and resin sprayed upon the glass. The glass may be either woven or roving. As used herein, the term "roving" refers to a sheet of material with the fibers therein arranged in a random pattern.

As another alternative, the reinforced coat **24** may be formed by dispensing chopped glass fibers with the resin in a single spraying operation as is known in the art.

Also, it will be understood that any of several synthetic resins are adaptable for this purpose, such as those which fall in the general categories of epoxies, polyurethanes, or polyesters. Preferably, the liquid resin is applied by spraying. A heavy coat is sprayed first to wet the glass fibers. Thereafter, a light coat for making it liquid-tight is applied. The reinforced resin coating has necessary strength and flexibility to support a man walking on the liner.

As implied above, the liner **14** may be applied in situ. Also, the liner may be partially formed by applying the coating to the pad at a factory and the strip of material thus formed is made into rolls. At the site of the pit, it is then only necessary to lay the strips adjacent one another and seal the joints. The reinforced coat **24** will have sufficient flexibility to be formed into large diameter rolls without cracking.

FIGS. 4 and 5 illustrate a leak detection structure which is advantageously incorporated into my improved liner. As may be seen in FIG. 5, a grid of wires **30** and **32** is laid out beneath the impervious seal coat **24**. Under one embodiment, the first set of parallel wires **30** could be buried a few inches under the ground and covered with dry dirt and then the second set of parallel wires **32** laid on the surface of the earth and beneath the pad. The second set (**32**) intersects the wires **30** of the first set.

FIG. 4 illustrates the preferred embodiment. In this embodiment, the first set of wires **30** is laid upon the soil and the second set of wires **32** is run within the cushiony pad. As shown in FIG. 4, the wires of the second set are run between the two layers **20** and **22** of the corrugated cardboard **16**.

In either situation the wires are separated by a water pervious insulating material. Therefore, if the liquid from within the cavity **10** seeps through the impervious coat **24** through a leak, it will dampen the pervious insulating material (e.g., corrugation **22**), thus altering the electrical resistance between the wires. This change of electrical resistance is readily detected by an ohmmeter which comprises battery **34** and ammeter **36**. Thus, it may be seen that I have provided means for detecting leaks in the pit. As seen in FIG. 5, if the electrical resistance is measured between one wire of set **30** and one wire of set **32**, the electrical resistance at the area where the wires cross will be measured and therefore the location of the leak determined.

Also, it will be possible to detect leaks by measuring the electrical resistance between the water in the pit and the grid of wires. As seen in FIG. 4, the resistance is readily measured by suspending electrode **38** into the pit and connecting the electrode through means for measuring the electrical resistance to the grid. In this instance, the means for measuring electrical resistance includes battery **34** and an indicator light **40**. Although the indicator light is a rather crude form of resistance determination, it is sufficient in this application.

It will be apparent that the embodiments shown are only exemplary and that various modifications can be made in operation, construction, materials, and arrangement within the scope of the invention as defined in the appended claims.

I claim as my invention:

1. The method of sealing an earthen pit and detecting possible leaks comprising:

(a) smoothing the surface of the pit by

(b) applying against the soil a pad which is impervious to liquid resin,

(c) applying an impervious reinforced resin coat to the pad for structural strength and liquid seal,

(d) before applying the pad, setting out a first set of parallel wires on the soil,

(e) thereafter setting out a second set of parallel wires,

(f) arranging the second set of wires so that they cross the first set,

(g) insulating the wires at the area where they cross,

(h) providing an electrical path between the wires of the different sets which has high electrical resistance when dry and low electrical resistance when damp, and,

(j) after the pit is completely built and the pit filled with liquid, measuring the electrical resistance between wires to determine if the electrical path between the wires is dry or damp.

2. The method of detecting leaks from a sealed earthen pit containing an electrical conducting liquid, comprising:

(a) spreading a set of parallel wires on the surface of the earth in the pit,

(b) spreading a second set of parallel wires in the pit,

(c) the wires of the second set crossing the wires of the first set,

(d) insulating the wires of the second set from the wires of the first set,

(e) thereafter sealing the pit over the wires, and

(f) measuring the electrical resistance of a wire of the first set to a wire of the second set, thus

(g) measuring the resistance of material proximate the wires, thus determining if any conducting liquid has leaked from the pit onto the material.

3. A liquid-tight liner for a pit dug in soil comprising:

(a) a smooth pad contacting the soil,

(b) said pad being impervious to liquid resin and

(c) completely covering the pit,

(d) an impervious resin coat reinforced by glass fibers,

(e) completely covering the pad and adhered thereto,

(f) said coat having sufficient strength and flexibility to support a man walking on the liner,

(g) a grid of wires beneath the impervious coat,

(h) insulation between the wires where the wires are crossed, and

(j) means for measuring the electrical resistance between the wires.

4. In a water reservoir including

(a) a cavity in the soil with

(b) an impervious coat on the cavity;

(c) the improvement comprising in combination with the above:

(d) a grid of wires beneath the impervious coat,

(e) a cushiony pad between the impervious coat and the soil,

(f) a portion of said cushiony pad forming insulation between the wires at areas where the wires cross,

(g) means for measuring the electrical resistance of the pad proximate the wires, said grid of wires including:

(h) a first set of parallel wires, and

(j) a second set of parallel wires which

(k) cross the wires of the first set;

(m) said insulation being between the first and second set so that

(n) the location of a leak may be determined as well as detected.

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EARL J. WITMER, *Primary Examiner.*