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Nienstadt

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[54] **IRRIGATION DITCH LINER AND METHOD FOR MAKING SAME**

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[52] **U.S. Cl.** **61/7**

[51] **Int. Cl.** **E02b 5/02**

[58] **Field of Search** 61/1, 7, 14, 15, 38

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Primary Examiner—Mervin Stein

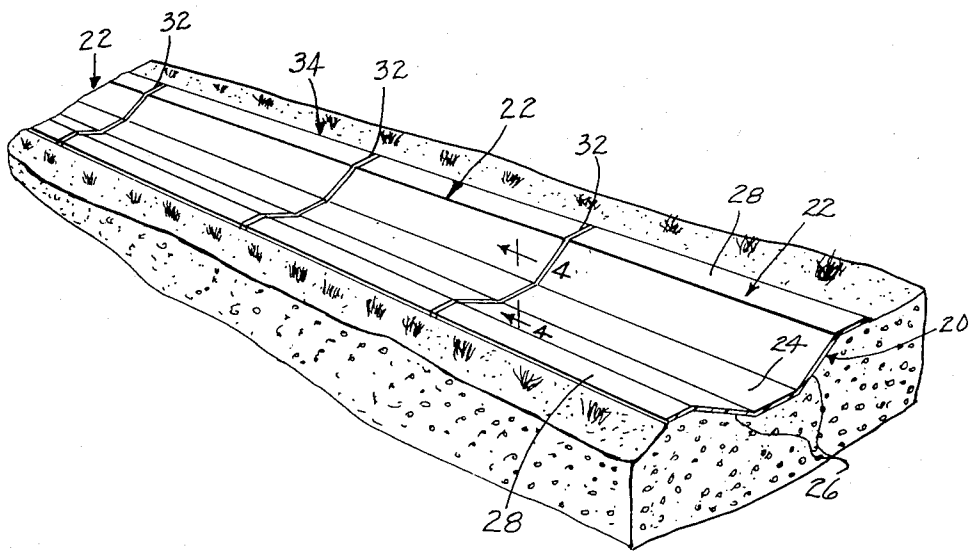
Assistant Examiner—David H. Corbin

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[57] **ABSTRACT**

A liner is provided for irrigation ditches or the like. The liner is prefabricated in sections many feet long of glass fiber reinforced plastic resin. A section of glass fiber on the order of four to 6 inches long at each end of each prefabricated section is left free of resin. The non-resin covered fiberglass ends are overlapped and coated with resin as the liner sections are applied in the ditch, thereby providing a continuous reinforced liner for the ditch.

4 Claims, 8 Drawing Figures



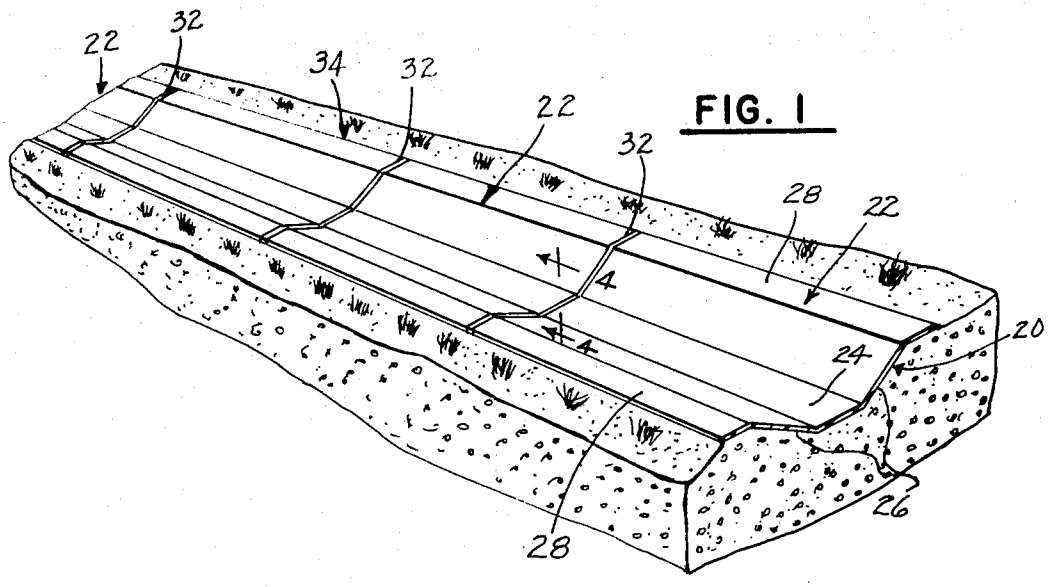


FIG. 1

FIG. 2

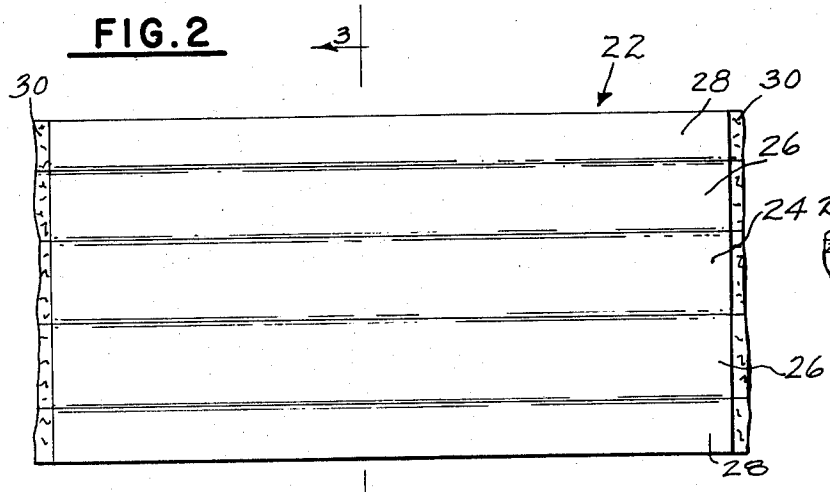


FIG. 4

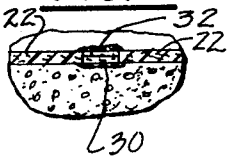


FIG. 3

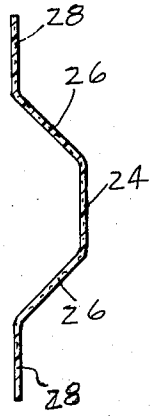
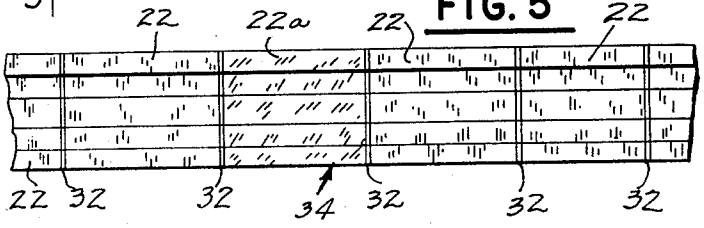


FIG. 5



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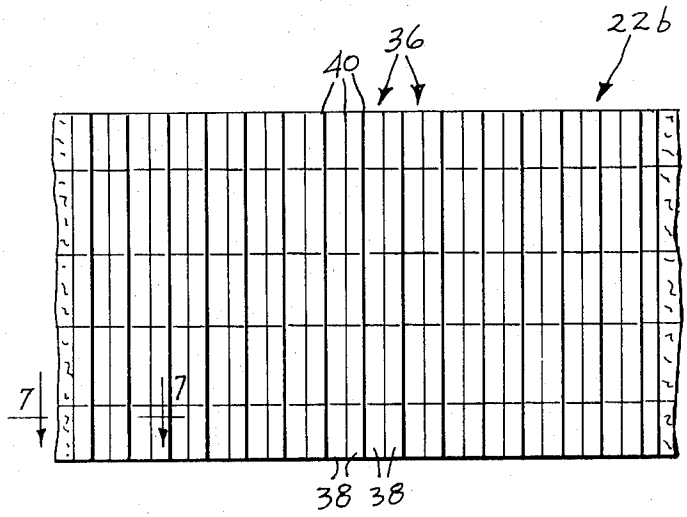


FIG. 6

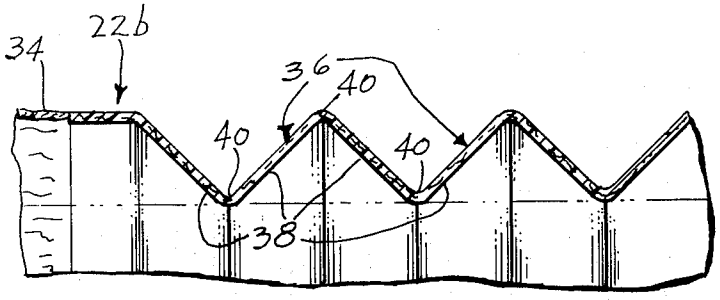


FIG. 7

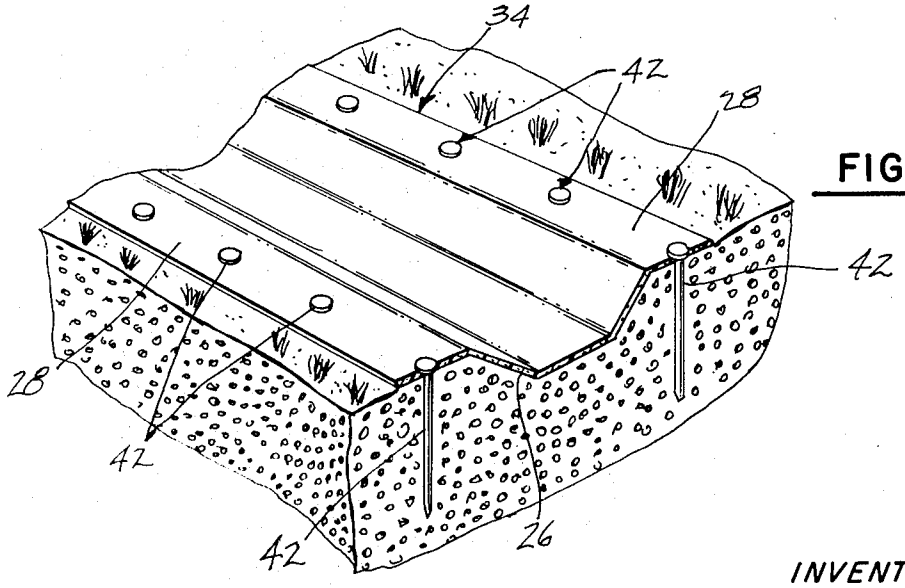


FIG. 8

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IRRIGATION DITCH LINER AND METHOD FOR MAKING SAME

BACKGROUND OF THE INVENTION

Irrigation ditches are widely used in tropical and subtropical areas wherein a natural earth cannot be used. The character of the soil is such that the water would seep into the ground with large quantities of water, up to 100 percent, being lost. Heretofore, it has been the practice to provide liners for ditches of various sorts. These have often comprised precast concrete slabs which necessarily have been planar in nature, and which have been joined together with flexible sealants. Obviously, the size of precase concrete slabs is limited by the immense weight, and also for the well known propensity for concrete to crack as it shrinks upon curing if the area of the concrete is too great. Concrete poured on the site is subject to many of the same disadvantages as precast concrete, namely that only small areas can be poured at a time, which areas must be joined together by a flexible sealing means.

The joints between concrete sections require constant servicing and present the weakest and most delicate section of the ditch liner. During the rainy season heavy growth of weeds and other vegetation in the joints requires frequent cleaning and often completely destroys the joints. Some discontinuity at the joints is inevitable, whereby there is non-laminar flow of the water, thereby reducing the velocity and volume of flow. Within my personal experience, I have seen a single tipped concrete section allow water to get under the ditch or channel liner and to float as much as 30 miles of concrete channel liner.

In addition to concrete, which has been the most prevalent, use also has been made of asphaltic materials, membranes, chemical sealants, and impermeable earth materials. None of these has proved entirely satisfactory.

OBJECTS AND SUMMARY OF THE PRESENT INVENTION

Accordingly, it is an object of the present invention to overcome the prior art drawbacks, and to provide a liner for ditches or channels which is inexpensive, easy in installation, and highly reliable in operation.

In accordance with the present invention, liner sections are prefabricated with glass fiber reinforced plastic resin, preferably polyester. The glass fiber is in the form of a mat having fibers in random orientation, and more or less felted together. Different types of polyester may be used in accordance with the temperature and ground conditions, and the characteristics may be tailored throughout the length of the ditch or channel to have different characteristics at different portions. In particular, flexible or semi-flexible sections are provided every so often to take up for thermal expansion and contraction and for use in areas where the ground is likely to shift somewhat. Furthermore, in areas which are likely to be dry from time to time, fire resistant or retardant polyester or other resins may be used. Each prefabricated section, which may be many feet in length, and from approximately ⅛ inch thickness on up, has at the opposite ends thereof a section of glass fiber mat, for example on the order of 4 to 6 inches, which is not covered with resin. Liquid resin is coated on the previously uncoated fiber at the end of each section during installation, and the mats from one prefabricated section to another are overlapped. When the fresh resin sets up, a continuous channel liner is provided.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a channel with a liner constructed in accordance with the present invention;

FIG. **2** is a top or plan view thereof;

FIG. **3** is a cross-sectional view taken along the line **3—3** in FIG. **2**;

FIG. **4** is a detailed longitudinal section taken substantially along the line **4—4** in FIG. **1** showing the overlapping construction;

FIG. **5** is a plan or top view on a reduced scale showing many sections of the liner, and illustrating the use of at least one section of different characteristics;

FIG. **6** is a top view generally similar to FIG. **2** showing one section of accordion pleated construction adapted for accommodating thermal expansion and contraction;

FIG. **7** is a fragmentary longitudinal section on an enlarged scale as taken substantially along the line **7—7** in FIG. **6**; and

FIG. **8** is a fragmentary perspective view generally similar to a portion of FIG. **1** showing one means for anchoring the channel liner in place.

Turning now to the drawings in greater particularity and first to FIGS. **1–4**, there will be seen a channel or ditch **20** formed in the earth in generally conventional fashion. The channel is lined with a plurality of similar prefabricated sections **22** of channel liner which may be many feet in length, the limitation in length being substantially as imposed by transportation, being as short as ten or twelve feet, or as long an many tens of feet. The cross-section may vary considerably, and could be arcuate, square or rectangular, but conveniently and preferably is in the form of a flat-bottomed V, having a central floor or web **24**, a pair of opposite upwardly and outwardly diagonally extending sidewalls **26**, and laterally extending side flanges **28** generally parallel to the floor or web **24**. Each section **22** is formed of a glass fiber mat having glass fibers in random orientation, impregnated and coated with a plastic resin, preferably polyester. 4 to 6 inches of raw glass fiber mat **30** is left exposed at each end of each section **22**. During installation, sections **22** have the raw fiberglass mat ends **30** coated with polyester resin, whereupon the freshly coated, raw mat ends are overlapped as may be seen at **32** in FIG. **4**.

The characteristics of the resin coated on the extending mat ends are such that it will cure quickly in place, whereby a continuous channel liner **34** of many sections is formed.

In general, it is desired that the sections be rather rigid. However, in areas where the earth may shift, or in areas where a certain amount of thermal expansion and contraction is expected, a relatively flexible section is inserted every so often. With reference to FIG. **5**, most of the sections **22** of the channel liner **34** are identical, being relatively rigid. However, one section **22*a*** is comprised of a plastic resin having different characteristics, so as to be relatively flexible. A different character of polyester may be used, or some other resin compatible therewith. Accordingly, should the earth beneath the section **22*a*** shift a bit, or should there be

thermal expansion or contraction, the relatively flexible section **22***a* will accommodate to this.

Another modification for accommodating to earth movement, or thermal expansion or contraction is shown in FIGS. **6** and **7.** In this embodiment the cross-section of the preformed channel liner section, identified in these Figures as **22***b*, is the same as heretofore, preferably a flat-bottomed, winged V. However, the longitudinal section differs, having a series of accordion pleats **36,** comprising generally flat surfaces **38** joining at apices **40.** In this instance the resin must be relatively flexible so as to prevent cracking at the apices **40.** As will be appreciated, a greater extent of longitudinal length variation can be provided with the use of the accordion pleated sections.

As will be appreciated, once the channel is more or less full of water, the channel liner will of be held in place by the weight of the water. However, during initial installation, before there is any water, it is essential that the channel be held down in place in the earthen channel **26.** The prefabricated sections are sufficiently light in weight that it may not be possible in every instance to rely simply on the weight of the channel liner to hold it in place, as contrasted with concrete, for example. Hence, in FIG. **8** large stakes **42** are shown as driven through the outer flanges **28** of the channel liner **34** and into the underlying earth to hold the channel liner securely in place against possible accidental shifting.

It will now be apparent that I have disclosed an improved channel liner. As contrasted with concrete, for identical physical strength the weight is about one twentieth. The tensil strength is much greater, and there is a higher degree of flexibility. This is accompanied with a lower grade of dilatation, lower wear, and substantially no corrosion. The cost is relatively low, and the construction can to a certain degree be self supporting at low additional cost, as by thickening the prefabricated sections, or providing reinforcing ribs thereon. Due to the relatively light weight, the prefabricated sections can be made in substantially any size, being limited only by transportation requirements. The smooth surfaces provided lead to higher flow velocities of water, and the flow is essentially laminar with no appreciable turbulence Less specialized labor is needed for manufacturing and assembling. There are no joints of sealing foreign material which are subject to deterioration and growth of weeds and other vegetation. Unlike other types of linings, the channel lining herein disclosed and claimed may be tailored to requirements as to rigidity, flexibility, fire resistance, etc. In the event of any accident causing physical damage, it is a relatively simple matter to provide a patch formed of glass fiber mat and fresh resin leaving a patched area which is substantially indistinguishable from the original construction, and which is low in cost.

The specific examples of the invention as herein shown and described are for purposes of illustration only. Various changes will no doubt occur to those skilled in the art, and will be understood as forming a part of the present invention, insofar as they come within the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A liner for use in a channel such as an irrigation ditch comprising a plurality of prefabricated sections laid end to end in a channel conformably supporting the same, each of said sections being formed of fiber reinforced plastic resin of predetermined characteristics and being concave upwards, each section having fibers initially extending from the opposite ends thereof with the extending fibers of successive sections in overlapping relation providing a double layer of fibers, and plastic resin of said predetermined characteristics cured to set in place over said overlapping fibers and thus forming with the compatible plastic resin of adjacent sections a continuous integral liner with reinforced integral areas between adjacent sections; certain spaced sections along the length of the liner being of a plastic resin of different characteristics rendering the same flexible as compared to remaining sections for accommodating shifting of the said remaining sections.

2. A liner as set forth in claim **1,** wherein the said spaced sections have portions thereof extending at least to one side of the normal longitudinal disposition thereof for accommodating shifting of the said remaining sections.

3. A liner as claimed in claim **1,** wherein the said spaced sections include accordion pleat portions.

4. The method of forming a channel liner such as for an irrigation ditch which comprises laying successive liner sections in a channel for conformable support thereby, each section comprising a fiber reinforced plastic resin initially formed with bare fibers extending from opposite ends thereof, overlapping the confronting bare fibers of successive sections to provide a double layer of fibers between adjacent sections, applying plastic resin to the overlapping fibers between adjacent sections, and curing the applied plastic resin to set up as integral reinforced areas between adjacent sections, and with at least one section along the length of the liner being **1** a plastic resin of different characteristics rendering the same flexible as compared to remaining sections for accommodating shifting of the said remaining sections.

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