FORM FOR CONSTRUCTING A SLAB FOR TALUS OR BOTTOM PROTECTION

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ABSTRACT OF THE DISCLOSURE

A form for forming slabs on a talus or other surface comprised of a pair of sheets of flexible material joined to each other around the peripheries thereof defining a closed space into which a hardenable cementitious material may be flowed and means inwardly of the periphery jointing the pair of spaced points. Each point of attachment permits the passage of water therethrough whereby the hydrostatic pressure on both sides of the slab may be equalized. The points of attachment also comprise sections of reduced thickness which permit selective cracking of the slab, thereby allowing the slab to conform to the surface on which it is placed.

This invention pertains to the art of protecting taluses or water bottoms and, more particularly, to an apparatus for forming a slab for such protection.

It is conventional, nowadays, to protect a river bank to use, instead of porous mattresses, a solid material such as a solid layer of asphalt or a plurality of concrete slabs laid on the bank. These coverings have the disadvantage over the use of a mattress that they cannot readily be placed under water when they are desired. First a sheet piling must be made to exclude the water, so that the talus or bottom can be prepared and then the slabs are installed.

Another difficulty, particularly when using an asphalt layer, is that the asphalt layer must be perforated to prevent ground water from creating a hydrostatic pressure behind or under the layer which bends or breaks the slabs. Therefore small slabs with holes in them have been provided or the seams between slabs are left wide enough to let the ground water pass through. The slabs will thus not lose their position. Another problem is that it is difficult to level the talus sufficiently accurately so that the slab can be readily and quickly laid.

The present invention contemplates an apparatus for constructing a slab, which avoids all of the above referred to difficulties and others, and enables a slab to be quickly and easily installed regardless of the contour of the surface, and either under water or out of the water, and which slab readily holds itself to the surface on which it is to be laid.

In accordance with the invention, at least two large sheets of flexible material joined at the edges are spread out over the talus or bottom and the space between these two sheets is then filled with a liquid or plastic material that will ultimately harden.

The positioning of these sheets under water can be readily done with the use of divers, or weights can be fastened thereto and the sheets allowed to sink through the water due to this weight. After the sheets have been placed, the hardenable liquid or plastic material can be flowed or pumped into the space between the sheets through hoses or the like.

Further in accordance with the invention, the pairs of sheets of flexible material are laid separately on the talus or the bottom, next to each other, so that a large area can be covered and each pair of sheets can have one or more separate spaces therebetween. To all of these separate spaces, the hardenable liquid or plastic can be introduced.

After the hardenable material has been introduced, the space can be cut off, for instance by closing the supply opening to the space between the sheets, and the hoses can then be removed. When the hardenable material has ultimately hardened, a slab is formed which fits closely to the ground on which it lays.

A problem with a slab so formed is that possibly part or all of it can be swept away by the flushing of the water currents or wave action, or by hydrostatic pressure of the ground water building up under the slab. To prevent this, in accordance with the invention, the sheets before they are spread on the talus or the bottom, or afterward, but at least before the space therebetween is filled with the hardenable substance and which are locally joined to each other in such a way that after the space is filled and the material has hardened, openings will extend therethrough to allow movement of water therethrough.

Another problem with slabs is that the talus or the bottom on which the slab rests can sag due to shifts in the earth's surface. Also, because of the openings in the slab, part of the soil behind the slab can be washed away and a hollow formed thereunder. It is desirable, therefore, that the slab be able to adapt itself to changes in the shape of the ground in the course of time.

In accordance with the present invention, this is provided for by joining the sheets locally, so as to provide areas in the hardened slab of reduced cross section which can crack and allow the slab to conform to changes in the bottom on which it rests.

Further, the openings for the passage of the water and the cracked joints can be made in accordance with a special pattern, such that when the slab cracks and parts of it sag down, the various parts of the slab will be interlocked and cannot slide down the bank.

Further in accordance with the invention, prior to placing the sheets into position, a special substratum can be laid, made up of gravel or pebble or the like, which will assist ground water to move horizontally under the slab to the previously formed openings for the passage of such water.

The principal object of the present invention is the provision of a new and improved arrangement for forming a slab on a talus or water bottom which enables such slab to be quickly, easily and economically placed.

Another object of the invention is the provision of a new and improved arrangement for placing a hardened slab on a water bottom or talus, which slab can readily conform to variations in the bottom or the talus.

Another object of the invention is the provision of a new and improved arrangement for providing a slab on a water bottom, whereby the action of the waves or the currents on such slab will not be detrimental.

Still another object of the invention is the provision of a new and improved arrangement of providing a slab on a water bottom, which slab has crack lines therein so that it can crack into individual sections and maintain close contact with the bottom as the bottom changes in contour.

The invention may take physical form in certain parts and arrangements of parts, preferred embodiments of which will be described in detail in this specification and illustrated in the accompanying drawing which is a part hereof and wherein:

FIGURE 1 is a perspective view of a flexible form consisting of two sheets of flexible material having hardenable material being introduced into the space therebetween illustrating a preferred embodiment of the invention.
FIGURE 2 is a cross section of a talus or a bank on which, for protection, slabs constructed in accordance with the invention are positioned. FIGURE 3 is a cross section, greatly enlarged, of a portion of a slab showing one arrangement for forming openings therethrough for the passage of water.

FIGURE 4 is a cross sectional view of a portion of the bottom showing how the slab cracks to take the shape of the bottom.

Referring now to the drawings wherein the showings are for the purposes of illustrating preferred embodiments of the invention only and not for the purposes of limiting same, FIGURE 1 shows a form generally in the shape of a rectangle, composed of lower and upper sheets 12, 13 of flexible material, joined together by stitching, cementing or welding around their entire periphery to enclose a space into which a hardenable material will subsequently be introduced.

The size and shape of the sheets 12, 13 may be as desired, but for the purposes of ease of handling they are desirable in the shape of an elongated rectangle, as is shown in FIGURE 1. The sheets can be made of any desired material, preferably of nylon or other flexible material. The sheets must be woven in such a manner, that the hardenable substance which is forced into the space between the sheets cannot leak through the material. It will also be appreciated that when extra large sheets are used, that is with extra long lengths, they can be divided into sections.

These sheets form a space into which a hardenable material will be flowed. Such material may be as desired, but normally will be a cementitious grout or slurry; that is, a colloidal mixture of Portland cement and water and which may or may not include an aggregate or sand as may be desired. The grout, however, should be of a consistency that it can be readily pumped over long distances and various lubricating substances to enable this pumping or to keep the particles in a colloidal suspension may be employed. Also, instead of using a Portland cement, asphalt can be used for causing the mixture to ultimately harden. This colloidal mixture will hereinafter be referred to as a grout.

The grout can be flowed into the spaces between the sheets 12, 13 by means of hoses or otherwise. Thus in FIGURE 1 there is shown a main supply pipe 1 to which branch hoses 2 are connected. Preferably, these hoses 2 are flexible, so that they may be used with a nozzle which extends into an opening through the fabric itself, 12, 13 or through a seam therebetween so as to communicate with the space between the sheets. The grout is then introduced preferably under pressure until all of the space is filled and the sheets of flexible material are tight and under tension.

To keep the ultimate slab in a relatively flat state, the sheets are joined together at various spots. This joining is chosen preferably in such a way that the grout cannot penetrate into the points of attachment. By this arrangement, holes will be formed in the slab after the grout has hardened. These holes in accordance with the invention are very useful. Thus, when ground water comes out under the slabs, it can flow through these holes or attachment points to maintain the hydrostatic pressure on both sides of the slab the same.

Also these holes are preferably fixed according to a particular pattern. FIGURE 1 shows the holes fixed according to a rectangular pattern indicated at 4. By the formation of these holes, the resultant slabs have portions between the holes of lesser thickness forming crack lines which intersect at right angles to each other at the holes 4. However, as indicated at 5, the holes may be set up in a rhomboid pattern.

It will be appreciated that before the sheets 12, 13 are joined together, reinforcement members such as a metallic screen can be placed between the sheets.

The construction of the slab can be done above the water level as well as under the water level. Thus, as shown in FIGURE 2, a form 8, made up of two sheets 12, 13 are laid on the bottom and can be fixed in such position by means of pins (not shown) extending through the form 8 into the bottom. Next, the form 8 is filled with a hardenable grout, the next form 11 constructed as is shown in FIGURE 1 can then be laid on the bottom side of the first and the grout is pumped into the space of this form 8 through a hose 10.

After the grout in the spaces formed by the forms 8 and 11 has hardened, a slab lays on the bottom which was completely made under water.

After positioning the forms 8 and 11 and filling them with a hardenable grout, the next form 11 constructed as shown in FIGURE 1 can be laid alongside against the talus and a hardenable grout flowed into the space of the form.

It is to be noted that, with the forms 8 and 11 the section line is through the holes 4, while in the forms 11 the section line is between the holes 4.

In the embodiment of the invention shown, the long dimension of the forms has been laid parallel to the shoreline of the body of water. It will be appreciated that the long dimension is transverse to this shoreline. The exact shape of any of the forms forms no part of the present invention.

FIGURE 3 shows how the openings 4 can be formed through the form of FIGURE 1. Thus, in FIGURE 3, the bottom sheet of flexible material 12 is joined to the upper sheet of flexible material 13 by means of a nail 14 which rests on a metal washer 15. Part of the sheets 12 and 13 are pulled through the opening of the washer 15 and the nail 14 is then perforated through the fabric to prevent withdrawal of the fabric from the opening of the washer 15.

After the grout 16 has been introduced into the space of the form and has hardened, the sheets 12 and 13 are superfusious and may be removed and/or may be allowed to rot away over a period of time. Also, after the grout has hardened, the washer 15 and the nail 14 are superfusious.

It will be appreciated other means can be employed for joining the sheets 12 and 13 together at spaced points.

For example, sheets 12 and 13 can be joined together by sewing or thermal welding. It is to be noted that the joining of the sheets 12 and 13 between the edges has the advantage of preventing the formation of water a far apart while the grout is being forced into the space between the sheets and the resultant slab which is formed will be rather thin.

It is obvious from FIGURES 2 and 4 that the bottom side of the formed slab will follow the shape of the ground rather exactly. Thus, when there is a protruding stone as is indicated at 17 of FIGURE 4 the slab will be thinner at the sharp point of the stone; such that, in effect, the stone is imbedded rather completely into the form and the ultimate slab.

Also in FIGURE 4, the dotted line indicates the original position of a slab constructed in accordance with the present invention. When the soil under the slab sags or washes away, the slab can adjust itself again to the new shape because the slab breaks along the crack joints 18.

In some instances when the soil of the talus is very fine, e.g., of clay and there is a chance that the clay particles will be washed away through the openings, this can be prevented by laying a sheet, for example of a synthetic foil or plastic, unto the surface before the forms for laying the slab are laid unto the surface. Also, instead of using this sheet of impervious material, a layer of gravel or something similar can be placed on the surface before the forms of the invention are laid thereon.

The invention has been described with reference to preferred embodiments. Obviously, modifications and
alterations will occur to others upon reading and understanding of this specification, and it is my intention to include all such modifications and alterations insofar as they come within the scope of the appended claims or the equivalents thereof.

Having described my invention, I claim:

1. A form for forming slabs on a talus or other surface comprised of:
   a pair of sheets of flexible material joined to each other around the peripheries thereof defining a completed closed hollow interior space into which a hardenable cementitious readily flowable material can be flowed; the material comprising the sheets being adapted to define an opening therein through which a tube may be inserted to introduce the flowable material into the hollow space; and, means joining said sheets in abutting engagement at a plurality of longitudinally and laterally spaced points inwardly of the periphery thereof.

2. The form of claim 1 wherein said means comprises a plurality of annular means overlying said sheets, a portion of both of said sheets extending through each of said annular means, and means preventing withdrawal of said portions of said sheets from said annular means.

3. The form of claim 1 wherein said means permits passage of water through said inwardly abutted spaced points thereby to equalize the hydrostatic pressure on both sides of said slab.

4. The form of claim 1 wherein said inwardly abutted spaced points provide sections of reduced thickness immediately adjacent thereto when said form is inflated thereby relieving the rigidity of the slab and permitting the slab to conform to the underlying surface.

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