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MINIMIZING SCOURING ACTION IN WATER FLOW CHANNELS

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2 Sheets-Sheet 1

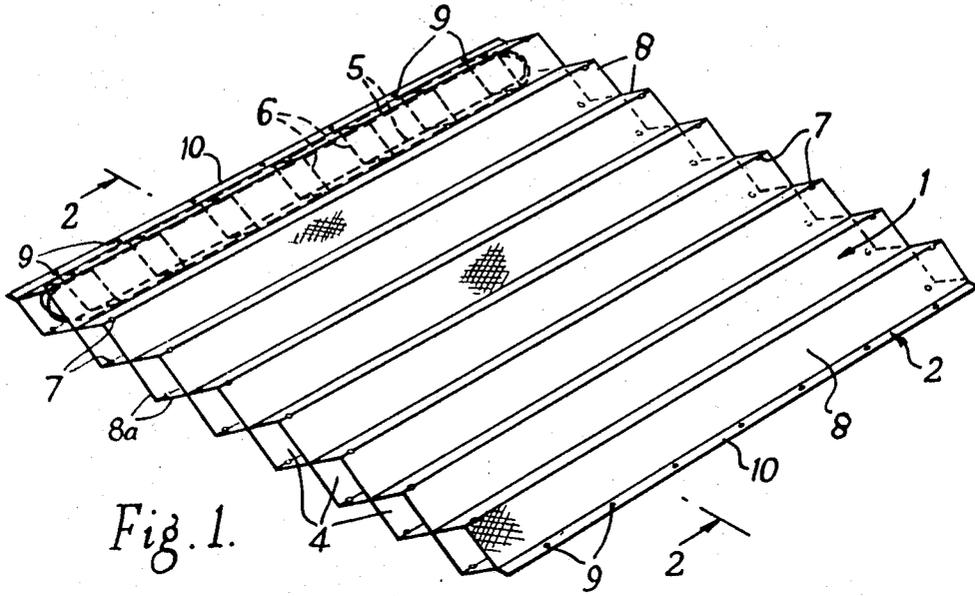


Fig. 1.

Fig. 2.

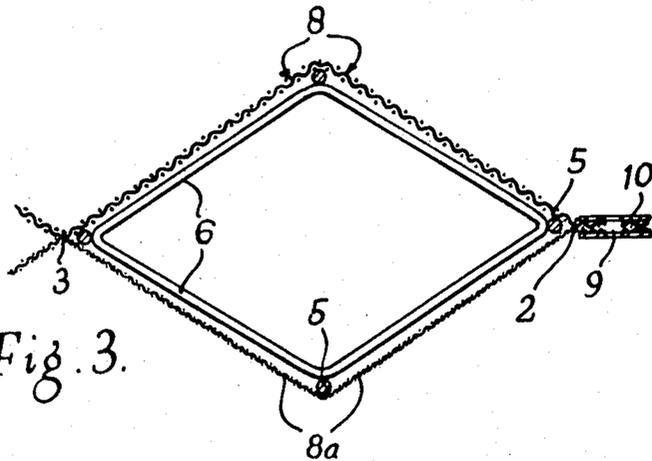
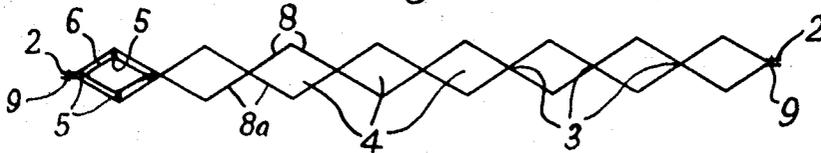


Fig. 3.

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**MINIMIZING SCOURING ACTION IN WATER FLOW CHANNELS**

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9 Claims

**ABSTRACT OF THE DISCLOSURE**

A means for minimising the scouring effect of water flow on the beds of rivers, estuaries and the sea bed comprising a tubular element composed of a meshed upper panel through which ballast material can pass to the interior of the element. If desired, the element may have a meshed lower panel through which sand or other bed material may pass but through which the ballast is unable to escape and a plurality of elements may be joined together in parallel relationship to form a unit.

The or each tubular element may be provided internally with a plurality of spaced apart distending members.

**CROSS REFERENCES TO RELATED APPLICATIONS**

United Kingdom applications Nos:12,429/65 dated Mar. 24, 1965 and 34,252/68 dated July 18, 1968.

**BACKGROUND OF THE INVENTION**

This invention relates to an improved means for minimising the scouring effect of water flow on the beds and banks of water channels such as rivers, estuaries and the sea.

Heretofore, among the methods used to minimise this scouring action in water flow channels, mattresses composed of bundles of willow and reed have been constructed in the form of rafts which are floated to the particular site and sunk by means of pieces of rock placed upon them by hand from an accompanying barge. This method has disadvantages in that the willow and reed have to be cut at a certain period, they are bulky to transport, and the rocks, unless available on the site, also have to be transported, the rafts can only be placed in position in certain tidal conditions, and when in position are liable to be undercut by scour, so that the raft is liable to tilt and allow the rocks to be displaced.

An object of the invention is to provide an improved means for minimising scouring of water flow channels which avoids the above disadvantages.

**SUMMARY OF THE INVENTION**

According to the invention, there is provided means for minimising the scouring action in water flow channels comprising a tubular element composed of a meshed upper panel through which ballast material can pass to the interior of the element.

According to a feature of the invention the element is constructed from rot-proof flexible material. It may be associated with a supporting framing and it may have a meshed lower panel through which sand or other bed material may pass but through which the ballast is unable to escape.

According to a further feature of the invention a plurality of elements may be joined together in parallel relationship to form a unit.

According to a still further feature of the invention, the or each tubular element is provided internally with a plurality of spaced apart distending members. The dis-

tending members may be of spherical, ovoid or other shape and may be provided with irregular cavities. The distending members in each section may be threaded on a wire with tubular spacing pieces between the members. The distending members may be partially or fully filled with concrete or other heavy material so that they will assist in causing the element to sink when it is released.

According to another feature of the invention there is provided a method of minimising scouring action in water flow channels which comprises floating one or a plurality of the said elements or units into position in relation to the desired ultimate location, pouring or projecting ballast thereon so that this enters the interior and causes the element, elements or units to sink to the ultimate location, and continuing with the pouring or projecting of the ballast over the sunken element, elements or units to complete the filling thereof.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a perspective view of a mattress-like unit constructed in accordance with the invention and having eight elements joined together;

FIG. 2 is a section on the line II—II of FIG. 1;

FIG. 3 is a transverse section through one of the compartments formed inside an element on a large scale;

FIG. 4 is a longitudinal section through a part of an element constructed according to a second embodiment of the invention; and

FIG. 5 is a transverse section through a part of an element which is a modification of the element shown in FIG. 4.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

Referring to FIGS. 1 to 3 of the drawings, a mattress-like unit indicated generally by reference 1, is formed by two co-extensive sheets of rot-proof material such as polyester fibre, for example that sold under the trademark Terylene. The superimposed sheets are stitched or otherwise secured together along their longitudinal edges 2, and also along longitudinal parallel lines 3 to form eight tubular elements 4.

To maintain the elements in an open condition suitable framing or spacers can be inserted into each element. This framing is conveniently in the form of four longitudinal metal members 5 intermediate the ends of the elements, arranged and held in equidistant peripheral location by a number of transverse frame elements 6 secured thereto. These frame elements are conveniently of diamond shape whereby the framing will impart a diamond shape to the section of each element. The ends of each element are conveniently closed by means of nylon lacing or other rot-proof material threaded through lacing holes 7 formed in the upper and lower sheets of the element adjacent the ends thereof. The holes 7, which may also serve for joining the ends of elements together by lacing, are conveniently reinforced by means of nylon webbing stitched or otherwise secured along the upper and lower edges of the ends of the elements, and through which the said holes, which may be eyeleted, are formed.

To enable two or more mattress units to be joined together side by side, similar lacing holes 9 may be provided along each side of each unit, the reinforcing nylon webbing being indicated by reference 10.

Each element is provided with a meshed upper panel 8, that is, the panel portion which will normally face upwardly, the gauge of the mesh being such as to permit the particular grade of ballast employed to pass there-through into the interior of the element, the mesh conveniently being about 3/8 inch square or 1/2 inch square.

If the mattress is to be sunk in water at the chosen

location it can be floated into position above the location and the ballast is poured or projected onto the upper surface of the mattress so that it will pass through the mesh of the upper panel into the interior of the elements, and finally sink the mattress to the required submerged position. Further ballast may, if desired, be deposited on the upper surface of the mattress, to be retained in the corrugations formed by the diamond section of the elements.

In a modified construction, the underface of the elements are formed with meshed panels 8a, the mesh being such that when the mattress is laid on the surface of the channel bed the bed material, such as sand, will tend to penetrate or percolate through the mesh of the underface into the interior of the compartment. The mesh of the underface is of such size that while allowing the ingress of sand or other bed material into the element, it will not allow the egress of the ballast with which the mattress was originally weighted.

The ballast employed may be a mix of wet sand with a small percentage, say 2 or 3 percent, of lime mixed cold with about 20 percent hot bitumen fluxed with a small amount of coal tar (creosote) brought to about 300° F. The proportions of the mix will vary with the type and grading of the sand available at the particular site at which the mix is to be used, and with the type of bitumen used.

Whilst it is preferred to use a mix as above described, other forms of ballast may be employed, such, for example, as sand or gravel alone, depending upon the hydraulic or other conditions existing at the site.

To retain a mattress in location, varying amounts of the ballast will be used in and on top of the mattress according to the hydraulic conditions, e.g. tides and currents and nature of the bed or surface on which the mattress is finally located. However, as a general example, the amount of mix or other ballast supplied before immersion to the floating mattress to effect immersion, is conveniently such as to impart, when the mattress is immersed, from about 3 pounds to 20 pounds per square foot of negative buoyancy.

Each mattress is conveniently about 15 feet along the length of the elements and about 15 feet wide. The mattress units can be joined end to end and side to side in a convenient manner by passing lacing of nylon through adjoining end lacing holes of the elements and through adjoining side lacing holes, and the units thus joined can be passed or floated into the water into the required position.

Although reference has been made to floating the mattresses into position and then sinking them, it or they can be positioned directly on locations where these are not submerged at certain times, such as at low tide, or in the construction or reinforcing of river banks above normal water level.

Although a diamond shaped cross-section has been mentioned for the elements 4, the framing 5 and 6 may be formed to impart to the elements other cross-sections, such as circular, elliptical or triangular.

Referring now to FIGS. 4 and 5 of the drawings, the element according to this second embodiment is in the form of a mattress constructed from an upper sheet 11 and a lower sheet 12, both of rot-proof material such as a polyester fibre. The upper sheet 11 is in the form of a mesh of square, diamond, triangular, elliptical or circular pattern and of such size that ballast which is to be used to weight the finished mattress onto the bed of the water flow channel and material contained in suspension by the water will pass through it and into the mattress. The sheet 12 may be a closely woven or impervious sheet, or in a modification to be described later it may be a fine mesh material. The two sheets 11 and 12 are sewn, thermally welded or otherwise fastened together along their longitudinal edges, of which one edge 13 is shown in FIG. 5.

They are also sewn or otherwise fastened together along lines, respectively 14, 15, 16 etc., which are parallel to the edge 13 so as to form a series of tubular sections which each have an upper wall composed of the wide mesh material and a lower wall which is of the impervious closely woven or finely meshed material. The mesh of the material of the upper walls of the tubular sections is such that ballast of a size which is to be used will pass through the mesh, while the material of the lower walls will retain the ballast within the mattress. The tubular sections are of such diameter that a number of distending members 17 may easily be pushed into each of the tubular sections in order to keep the tubular sections distended. The members 17 may be round, oval or of any other convenient shape and they preferably contain regular or irregular cavities 18. One possible form is a sphere made of a synthetic plastics material having a number of cavities 18 which are of irregular shape and the cavity may be between one-quarter of a square inch and one square inch in area. If desired the distending member 17 may be filled with concrete or other heavy material so that the members 17 will assist in sinking the element when it is placed in the water. Each of the members 17 has a hole through its centre and a wire 19 is passed through the holes in the line of members in each tube. The wire may consist of a solid or multistrand metal cable which has a thick covering of a synthetic plastics material extruded over it. In order to separate the members 17 by a desired distance spacers 20 of appropriate length are placed over the wires 19. The spacers 20 may, for example, be short lengths of half-inch bore synthetic garden hose.

After each of the tubular cavities has been filled with a desired number of the members 17 and spacers 20 the ends of the wires 19 may be secured either at the outer ends of the two end members 17, or the wires may be continued as shown in FIG. 4 and incorporated in a joint indicated at 21 at which the two sheets 11 and 12 are secured together. Provision for securing the ends of the sheets together may be made by fixing eyelets along the end edges of the two sheets, and if desired reinforcing webbing may be sewn or otherwise secured to the end edges of the sheets to strengthen them in order to form a firm anchorage for the eyelets. A rot-proof cord, for example nylon cord, may be used to lace up the ends of the sheets to close the sections.

The longitudinal edges 13 may also be provided with strengthening webs and eyelets so that adjacent mattresses may be laced together to form a large composite mattress covering any desired areas. The eyelets at the ends of the mattresses may also be used to lace mattresses together end to end.

The individual mattresses may, of course, be completely prefabricated and they only require to be laced together on site if two or more are to be used together to cover a large area. After the mattresses have been sunk ballast is poured into the water so that it falls on to the mattress or mattresses and passes through the mesh of the upper sheet 11 into the inside of the mattress. It will readily be understood that because of the presence of the distending members 17 the ballast will fall into the tubular sections between the distending members, which help to retain the ballast. Once in position in the mattress, the ballast and waterborne material which has entered the mattress, will not be readily dislodged by powerful under-currents so that the mattress retains its shape and remains in position indefinitely.

In a modification the lower sheet 12 is also made of a meshed material but of much finer mesh size than the upper sheet 11, so that the bed material, such as sand, may enter the mattress thereby helping it to "settle down" on the bed on which it has been placed but is not sufficiently large to enable the ballast which has entered the mattress to escape.

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The ballast employed, or alternative forms thereof, and the manner in which it is used may be substantially the same as that already described with reference to FIGS. 1 to 3. The size of the mattresses may be the same as previously mentioned and may be floated into position or placed directly in a nonsubmerged position as already explained.

I claim:

1. Means for minimizing scouring action in water flow channels comprising a tubular element of rot-proof flexible material having a meshed upper panel through which ballast can be passed to the interior of the element, a meshed lower panel, the size of the mesh of said lower panel being such that sand or other bed material from the water channel may pass into the element but ballast which has entered through the upper panel cannot escape through said lower panel.

2. Means as claimed in claim 1, wherein said tubular element is provided internally with a plurality of spaced apart distending members of spherical, ovoid or other shape, the surfaces of which are formed with irregular cavities.

3. Means as claimed in claim 2 wherein the distending members in the element are threaded on a wire with tubular spacing pieces between said members, the latter being partially or fully filled with concrete or other heavy material so that they will assist in causing the element to sink when it is released.

4. Means as claimed in claim 1 including supporting framing so arranged to maintain the element in open position.

5. Means as claimed in claim 1 including a number of elements joined together in parallel relationship to form a mattress unit.

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6. Means as claimed in claim 4 in which the supporting framing comprises, in each element, four longitudinal metal members extending intermediate the ends of the elements, arranged and held in equidistant peripheral location by a number of transverse framing elements secured thereto.

7. Means as claimed in claim 1 including comprising lacing holes in the upper and lower panels of each element adjacent the ends thereof, to enable the element to be closed.

8. Means as claimed in claim 7 including reinforcing webbing stitched or otherwise secured along the upper and lower edges of the element or each element, through which the lacing holes are formed.

9. Means as claimed in claim 1 comprising reinforcing webbing along each side of the element or unit, lacing holes being formed in the reinforcing webbing to enable elements or units to be joined together.

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U.S. Cl. X.R.

61—37; 139—384, 387