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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **EROSION-PROTECTING SURFACE COVERING FOR LAYING OUT ON EARTH SURFACES EXPOSED TO WATER.**

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(56) References cited :
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DK-B- 128 328
DK-B- 130 654
FR-A- 2 411 269

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Description

The invention relates to an erosion-protecting surface covering for laying out on the sea bed, coastal areas and other earth surfaces which are exposed to water, said covering comprising a mat with concrete blocks resting on the top side. Such a covering is known, for example, from FR-A-2 411 269.

Erosion can arise during storms and floods, while harbours are exposed to a bottom erosion which occurs particularly in sailing channels, and at ferry ports where the ferries are so large that the propellers are only a few metres above the sea bed.

When the ships execute the necessary manœuvres, the propellers frequently flush sand away from the bottom and from the area near the piling walls, so that the lower ends of the piles are more or less exposed, and thus there is danger of collapse of the quay and its approaches.

In order to moderate the effects of the current from the propellers, it is known to lay mats on the sea bed, self-locking slabs, gabions or the like. The mats are secured by large sea-stones of up to 3 tonnes with eyebolts inserted, which are held together by heavy iron chains through these eyebolts.

However, when such a securing of a strongly-influenced bottom area has taken place, there occurs a violent erosion of the non-secured sea bed along the edges of the mats, whereby the large sea-stones can come to hang freely in their chains over the sea bed, with the risk of the mats being ruined, and thereby the securing of the bottom.

The use of mutually interlocking concrete slabs demands a levelling of the sea bed and a securing of the outer edge area of the concrete slabs, which can be effected by means of large gabions which are buried down in the bottom. These slabs must be controlled and firmly locked by divers. This is an extremely difficult and time-consuming procedure, and in the event of an eventual break in the slabs, repair operations are very difficult and expensive to carry out.

It is also known to lay out a membrane made of synthetic material, steel mesh or asphalt to which concrete elements are affixed or secured. However, this is an expensive and complicated laying-out procedure, in that the construction of. this securing arrangement demands that it be layed out in one continuous course.

It is the object of the invention to remedy these deficiences in the known surface coverings, and at the same time to improve and reduce the cost of bottom securing, and also to make it possible for eventual repairs to be carried out in a good and convenient manner for the divers.

This is achieved by a surface covering where on the underside of the mat, opposite each of the concrete blocks resting on it, there is mounted a further concrete block in such a manner that the mat is clamped between the pairs of opposite-facing concrete blocks. There is thus achieved a protection covering which can remain on the bottom, in that it can normally be laid down completely without levelling of the bottom, with possibility of adapting of the weight of the elements in accordance with the current conditions and the type of bottom. The mat functions as a protection layer against erosion brought about by water currents from above, and gradually it will become an integral part of the sea bottom, the reason being that earth, sand and the like will be deposited under the mat, so that it will finally become embedded in the bottom.

As presented in claim 2, by bolting the concrete blocks together around the mat, the possibility is achieved of constructing the covering in modules on land, and by means of lifting cables through the eyes, the covering can be lowered down into place, where a diver can then assemble adjacent modules in a safe and simple manner.

As presented in claim 3, the providing of a resilient bush in at least the hole in the upper block prevents the formation of cracks and destruction of the blocks by powerful influence from the bolts by dimensional changes, frost and the like.

As presented in claim 4, by providing the concrete blocks with plane assembly surfaces, the greatest possible degree of protection is achieved for the mat and the blocks.

As presented in claim 5, by providing the lower blocks with a hollowed-out bottom, these can suck themselves firmly to the sea bed, and by making the upper blocks tapered, the surface of attack is smaller and therefore less exposed to the influences of the current.

Finally, as presented in claim 6, it is expedient to provide the blocks with a hexagon form, in that they will then be able to be placed at the same mutual intervals in staggered rows on the mat.

The invention will now be described in closer detail with reference to the drawing, where

fig. 1 shows a cross-section of the upper concrete block,

fig. 2 shows a cross-section of the lower concrete block,

fig. 3 shows a cross-section of the blocks bolted together on a mat,

fig. 4 shows the covering from above,

fig. 5 shows the covering with lifting arrangement, and

fig. 6 shows the assembly of adjacent covering modules.

In the drawing is shown a preferred embodiment of the covering according to the invention. It is built up of hexagon-shaped concrete blocks, as shown in fig. 4, which shows the upper block 1 seen from above, mounted on a mat 8.

The blocks comprise an upper block 1, which is shown in fig. 1, and a lower block 4, which is shown in fig. 2.

The blocks 1, 4 have plane upper and lower

sides respectively, so that they can lie up against the flexible loom in the form of the mat 8.

Through the blocks 1 and 4 there are holes through which a bolt 6 with a bent-over head can be inserted with the bent head in a countersinking 5 in the bottom of the lower block 4. The upper block 1 is provided with an elastic bush 2 of synthetic material or rubber for the absorption of possible stresses. As will appear from fig. 3, the parts are tightened together around the mat 8 by means of an eyebolt 7.

The underside of the lower block 4 is also made concave, and it can suck itself firmly to the bottom after the laying out. Furthermore, the upper block 1 is tapered upwards in order to reduce the resistance to current.

Preferably, the blocks are made by being moulded in concrete, and can have a breadth of about 50 cm and thickness of about 15 cm. Moreover, the blocks 1 and 4 are rounded off 3 on the undersides along the side edges in order to make them more resistant to external influences.

As will appear from fig. 4, staggered rows of blocks are secured to the mat, which can be of synthetic fibres or the like. The mat can have a breadth of about 2.5 m and a length of about 6 m. Such an assembled covering will have a weight of about 6,000 kg.

As shown in fig. 5, the laying out can be effected by suspension in a lifting arrangement comprising a yoke 10 with lifting lines 11 and a lifting cable 12 for a crane.

When the covering is placed on the sea bottom, as shown in fig. 6, the mats 8a and 8b can be positioned in such way that they overlap each other, after which a diver can bore holes through the mats and place concrete blocks under and over the mats respectively as shown in the drawing.

In this way, a coherent covering can be built up on the sea bed, and this can be effected in a hitherto unknown simple and effective manner.

Claims

1. Erosion-protecting surface covering for laying out on the sea bed, coastal areas and other earth surfaces which are exposed to water, said covering comprising a mat (8) with concrete blocks (1) resting on the top side, characterized in that on the underside of the mat (8), opposite each of the resting concrete blocks (1), there is mounted a further concrete block (4) in such a manner that the mat (8) is clamped firmly between the pairs of opposite-facing concrete blocks (1, 4).

2. Erosion-protecting surface covering according to claim 1, characterized in that each pair of concrete blocks (1, 4) has a through-going hole and is held together by means of a through-going threaded bolt (6) with a ring-nut (7) above.

3. Erosion-protecting surface covering according to claims 1 and 2, characterized in that a resilient bush (2) is inserted through the hole in the upper concrete block (1).

4. Erosion-protecting surface covering according to claims 1-3, characterized in that the concrete blocks (1, 4) have plane assembly surfaces.

5. Erosion-protecting surface covering according to claims 1-4, characterized in that the underside of the lower concrete block (4) is hollowed-out in a concave manner, while the upper concrete block (1) has sloping side surfaces which make said block (1) tapered.

6. Erosion-protecting surface covering according to claims 1-5, characterized in that the concrete blocks (1, 4) are six-sided in shape, in that the side walls constitute a hexagon.

Patentansprüche

1. Gegen Erosion schützende Flächendecke zum Auslegen auf den Seeboden, in Küstenbereichen und sonstigen Erdbodenflächen, die dem Wasser ausgesetzt sind, wobei diese Decke eine Matte (8) mit auf der Oberseite ruhenden Betonblöcken (1) umfasst, dadurch gekennzeichnet, dass an der Unterseite der Matte (8), gegenüber jedem der ruhenden Betonblöcken (1), ein weiterer Betonblock (4) auf solche Weise montiert ist, dass die Matte (8) zwischen den Paaren von einander gegenüberliegenden Betonblöcken (1, 4) festgeklemmt ist.

2. Gegen Erosion schützende Flächendecke gemäss Anspruch 1, dadurch gekennzeichnet, dass jedes Paar von Betonblöcken (1, 4) ein durchgehendes Loch aufweist und mittels eines durchgeführten Gewindebolzens (6) mit einer oben angeordneten Ringmutter (7) zusammengehalten ist.

3. Gegen Erosion schützende Flächendecke gemäss den Ansprüchen 1 und 2, dadurch gekennzeichnet, dass eine elastische Hülse (2) durch das Loch im Betonblock (1) eingesetzt ist.

4. Gegen Erosion schützende Flächendecke gemäss den Ansprüchen 1 bis 3, dadurch gekennzeichnet, dass die Betonblöcke (1, 4) ebene Zusammenbauflächen aufweisen.

5. Gegen Erosion schützende Flächendecke gemäss den Ansprüchen 1 bis 4, dadurch gekennzeichnet, dass die unterseite des unteren Betonblocks (4) konkav ausgehöhlt ist, während der obere Betonblock (1) schräge Seitenflächen aufweist, welche diesen Block (1) verjüngen.

6. Gegen Erosion schützende Flächendecke gemäss den Ansprüchen 1 bis 5, dadurch gekennzeichnet, dass die Betonblöcke (1, 4) sechsseitig ausgebildet sind, indem die Seitenflächen ein Hexagon bilden.

Revendications

1. Couverture de surface pour protection contre l'érosion destinée à être étendue sur le fond de la mer, des domaines côtiers ou d'autres surfaces de terre qui sont exposées à l'eau, cette couverture comportant un tapis (8) sur la face

supérieure duquel reposent des blocs de béton (1), caractérisée en ce que sur la face inférieure du tapis (8), vis-à-vis de chacun des blocs de béton (1) reposants, d'autres blocs de béton (4) sont montés de manière telle que le tapis (8) se trouve pincé fermement entre les paires de blocs de béton (1, 4) qui se font face.

2. Couverture de surface pour protection contre l'érosion selon la revendication 1, caractérisée en ce que chaque paire de blocs de béton (1, 4) comporte un trou traversant et se trouve assemblée au moyen d'un boulon fileté traversant comportant sur le dessus un écrou à anneau.

3. Couverture de surface pour protection contre l'érosion selon les revendications 1 et 2, caractérisée en ce qu'une douille élastique (2) est insérée à travers le trou dans le bloc de béton supérieur (1).

4. Couverture de surface pour protection contre l'érosion selon les revendications 1 à 3, caractérisée en ce que les blocs de béton (1, 4) présentent des surfaces d'assemblage planes.

5. Couverture de surface pour protection contre l'érosion selon les revendications 1 à 4, caractérisée en ce que la face inférieure du bloc de béton inférieur (4) est creusée de façon concave tandis que le bloc de béton supérieur (1) est muni de surfaces latérales obliques qui rétrécissent ce bloc (1).

6. Couverture de surface pour protection contre l'érosion selon les revendications 1 à 5, caractérisée en ce que les blocs de béton (1, 4) sont d'une forme à six faces du fait que les parois latérales constituent un hexagone.

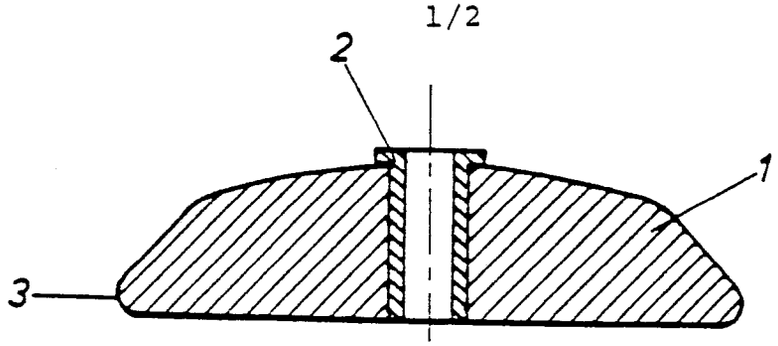

Fig. 1

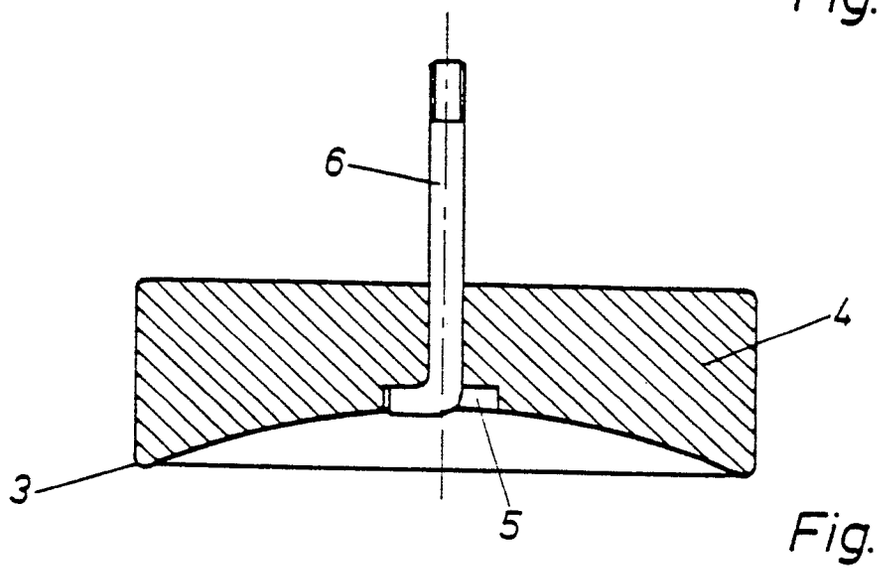

Fig. 2

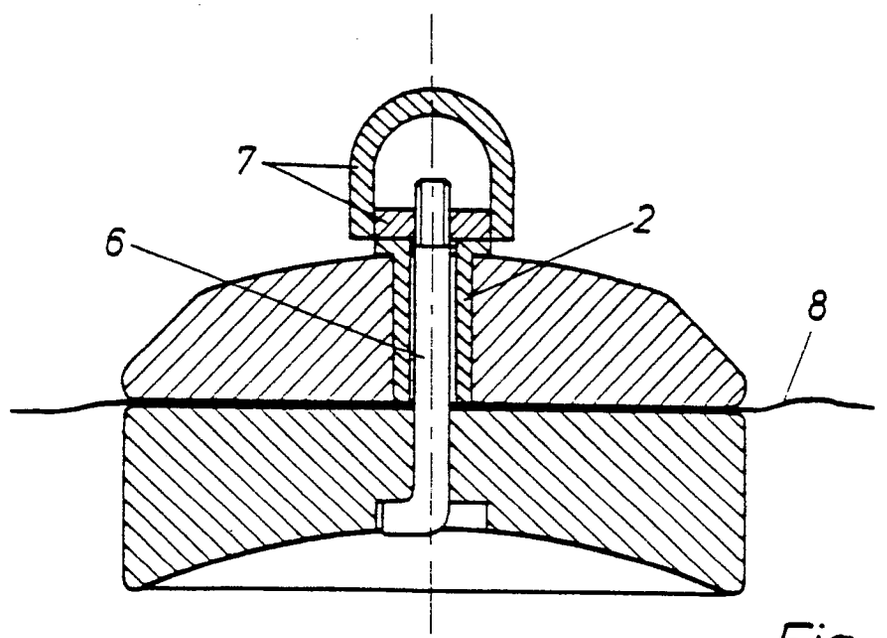

Fig. 3

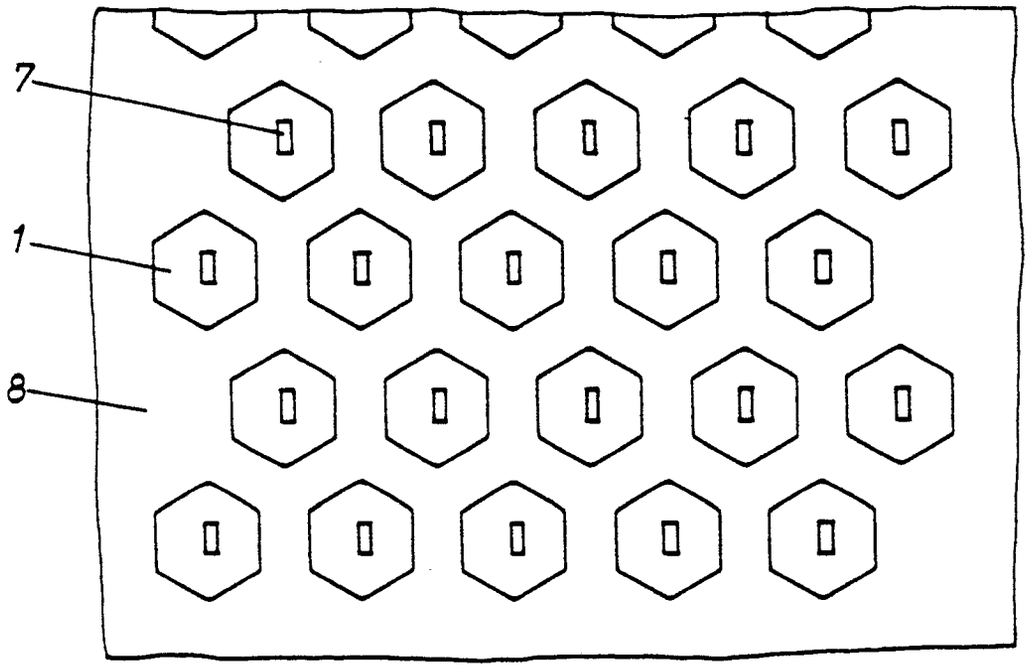

Fig. 4

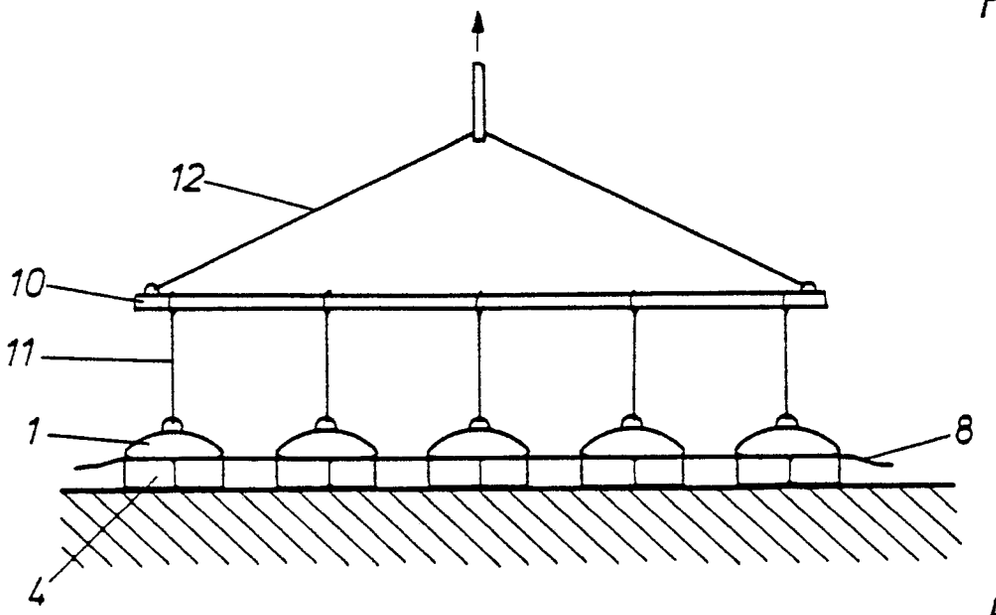

Fig. 5

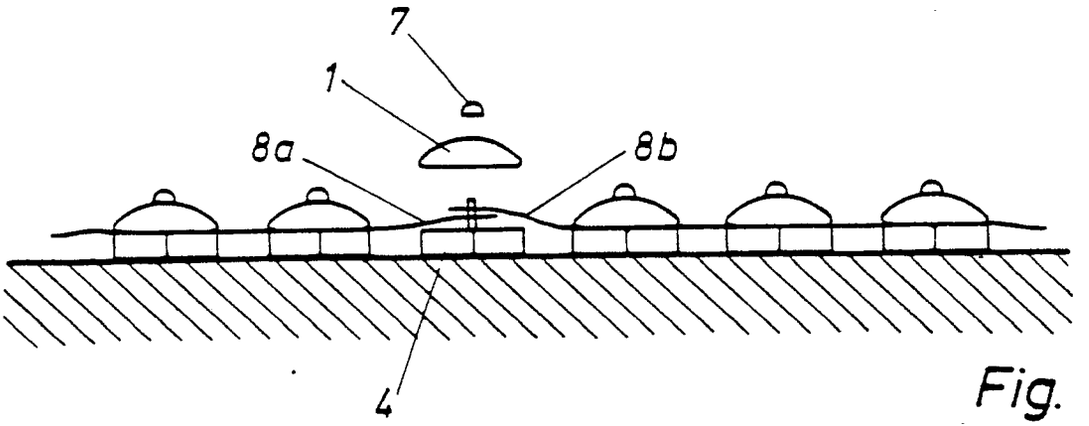

Fig. 6