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(12) # EUROPEAN PATENT SPECIFICATION

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(54) **A structure of modular elements for protecting the edges of canals, ditches and watercourses in general.**

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DE-A-2 123 523
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FR-A-1 212 671
NL-A-6 709 143

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Description

The subject of the present invention is a structure of modular elements for protecting the edges of canals, ditches and water courses in general.

As is known, the problem currently of great concern in the field of protection against water is that of providing suitable protection for the edges of water courses in general.

The solutions currently utilised generally require the provision of reinforcing walls along the edges of the banks of canals and the like. These solutions, although widely utilised, for the most part do not work as well as they could in that zones of erosion are inevitably created which, with the passage of time, undermine in practice the building work creating falls or breaches which, in many cases, can be dangerous.

Another disadvantage attributable to the techniques currently utilised is constituted by the fact that the costs of provision of such structures are rather high because the building work involves a considerable transport of materials and manual labour.

The DE—A—2 123 523 reference teaches a slab-like element for making canal and the like protecting structures which comprises a substantially flat square body provided for insertion coupling (by a male-female dovetail coupling arrangement with other like elements for making the protection structure. These slab elements, however have a rather poor mechanical connection to each other and, moreover, the openings formed therein favour the growth of grass susceptible to obstruct the canal edges and bottom, unless different solid slabs are used for covering at least the canal bottom.

The present invention seeks to eliminate the above mentioned disadvantages by providing a structure of modular elements which has been suitably designed for the protection of the edges of canals, ditches and water couses in general, which can be prefabricated in factories and put into commission with significant speed and simplicity.

Within the scope of the above described object, a particular object of the invention is that of providing modular elements which, in practice, can simply be laid on the bed of the water course, creating a stable and secure protection able to prevent the erosion of the banks by the water.

The present modular elements, by their particular constructional characteristics, are able to offer the widest guarantees of reliability and security in use.

The above object, as well as the objects listed, and others, which will become clearer below, are achieved by a structure of modular elements for the protection of the edges of canals, ditches and water courses in general, according to the claim.

Further characteristics and advantages of the invention will become clearer from an examination of the following detailed description of a structure of modular elements for the protection of the edges of canals, ditches and water courses in general, provided purely by way of non-limitative example, with reference to the attached drawings, in which;

Figure 1 schematically indicates in perspective view, a possible arrangement of the modular elements on the edge of a water course;

Figure 2 represents a plan view and cross sectional side views of the modular elements;

Figure 3 is a section through a plurality of modular elements in position on a water course;

Figure 4 is a perspective view showing the detail of the connection between slab-like elements arranged on the edge and slab-like elements arranged on the bank;

Figure 5 is a schematic perspective view of interlocking slab-like elements shown joined together;

Figure 6 is a plan and a side view of the interlocking slab-like elements of Figure 5;

Figure 7 is a transverse section through the slab-like elements fitted to a water course as in Figure 5;

Figure 8 schematically illustrates on an enlarged scale the connection between the slab-like elements and the anchoring ballast body;

Figure 9 illustrates, in perspective view, a detail of the anchoring ballast body.

With particular reference to the drawings, and in particular to Figures 1 to 4, the structure of modular elements for the protection of the edges of canals, ditches and water courses in general, according to the invention, has a plurality of modular slab-like elements, generally indicated 1, which are preferably formed of cast concrete with steel reinforcement.

The slab-like elements 1 preferably have a square shape with a square aperture 2 in its central portion. In their upper faces the slab-like elements have a slightly frusto-pyramid shape, converging towards the aperture 2, in such a way as to define a plurality of adjacent trapezoidal projections 3 on the major face.

On two opposite edges of the modular slab-like elements 1 there are projecting eyelets 4 which advantageously are formed directly by the reinforcing steel.

The modular elements 1 are disposed adjacent one another in such a way as to create cover over the edges 10 of the water course, beneath which a suitable underlying ballast or bed may be preliminarily provided. The modular elements are joined together by means of longitudinal connection wires shcematically indicated 11, inserteed into the eyelets 4.

As is shown in Figure 1, the modular slab-like element 1 disposed on the edge, are connected to a row of slab-like elements, indicated 1*a*, which are disposed on the bank and with a row of slab-like elements 1*b* disposed on the bottom of the water course or the like.

In the region where the edge joins the bank as well as where the bank joins the bottom, there is provided a linear beam, which may be prefabricated or formed in situ, indicated 15, which serves, in practice, as a support element.

The row of slab-like elements 1*b* is, moreover, connected to foundation elements constituted by an elongate plate 16 connected to an anchoring body 17 which is embedded in the bottom of the channel.

In Figures 5 to 9 there are illustrated slab-like elements, indicated 20, which are provided with interengaging dovetail elements. The modular slab-like elements 20, with interfitting elements, are conceptually similar to those previously described and, consequently, the equivalent parts are indicated with the same reference numerals.

On two opposite faces of the modular slab-like elements 20 not provided with eyelets 3, there are respectively provided a projection 21 and a recess 22 which are advantageously formed of dovetail shape and allow mutual interengagement between adjacent slab-like elements. In this embodiment, also, longitudinal connection wires are used, these being indicated 11, and at the bottom a row of slab-like elements is not required in that the lowermost row of slab-like elements on the bank can be directly connected to the elongate plate 16 which is joined to the anchoring body 17.

With the embodiment previously described there is the possibility of effecting a secure protection of the edges of a water course by forming in practice a cover with the slab-like elements of cast concrete, which are joined together with the possibility of relative movement in such a way as to create a structure able to oppose erosion of the edges and to impede the development of vegetation of the canal banks which is known to cause the gradual obstruction of the bed of the water course.

From what has been described above, it will be appreciated how the invention achieves the stated object. In particular, it is desired to underline that a modular element is formed which can be joined together easily, which can be prefabricated in factories and which can be put into use with speed and ease.

In practice, although the best results will be obtained by using the materials previously mentioned, both the materials used as well as the dimensions and the consequent shapes can be widely varied according to requirements.

Claim

A structure of modular elements for the protection of the edges of canals, ditches and water courses in general, comprising slab-like elements (1) of substantially square shape and formed in case concrete with steel reinforcements, positioned adjacent one another and joined together, said slab-like elements being positionable to cover an edge of a water course and connected to at least a row of slab-like elements (1a) positionable on a bank and at least one row of slab-like elements (1b) positionable on the bottom of the water course, characterized in that said slab-like elements (1, 1a, 1b) have on their upper face a truncated pyramid shape defining trapezoidal surfaces (3) converging at a single square aperture (2) defined at the central portion of said upper face, in that said slab-like elements have, on two opposute edges, loops or eyelets (4) which can be engaged by longitudinal connection wires (11), in that is includes foundation elements each constituted by an elongated plate (16) connected at one end to the adjacent row (1b) of said slab-like elements and at the other end to an anchoring body (17) which can be embedded in the bottom of the water course, and in that it further comprises linear beams (15) which may be prefabricated or cast *in situ*, disposed at the junction region between the edge and the bank and between the bank and the bottom.

Patentanspruch

Bauweise von masseinheitlichen Formlingen für Randschutzen von Kanäle, wassergräben und Wasserläufen in allgemeinen, einschliessend wesentlich vierkantige Plattelemente, die als Gussbeton mit Stahlverstärkerungen geformt sind und nebeineinanderverbunden angeordnet sind, wobei die obengenannte Plattelemente dem Rand eines Wasserlaufs zu decken angeordnet sein können, und mit wenigstens einer an einem Rand stellbaren Plattelementenreihe (1a) und wenigstens einer am Wasserlaufsgrund stellbaren Plattelementenreiche (1b) verbunden sind, dadurch gekennzeichnet, dass die Obengenannten Plattelemente (1, 1a, 1b) eine pyramidenstumpfförmige obere Seite besitzen, die in einer einzelnen Vierkantigen Öffnung (2) zusammenlaufenden Trapezoberflächen (3) begrenzt, wobei diese Öffnung am mittelerem Teil der obengenannten oberen Seite bestimmt ist, dass die obengenannten Plattelemente auf zwei gegenseitigen Ränder, Schlitze oder Ösen (5) besitzen, die von Longitudinalen Verbindungskabeln (11) engagiert sein können, dass sie Gründungselemente einschliesst, wobei jedes einzelne, aus einer verlängerten Platte (16) besteht, die mit einer Ende an die nebenlaufende Plattelmentenreihe (1b) und mit der anderen Ende an einem am Wasserlaufsgrund einbettbaren Ankerkörper (17) verbunden ist, un dass sie, ausserdem, lineare Träger einschliesst, die *in situ* vorfabriziert oder gegossen sein können und in dem Verbindungsbereich zwischen Rand und Ufer und zwischen Ufer und Grund angeordnet sind.

Revendication

Structure d'élément modulaires pour la protection de bords de cannals, fossses et cours d'eau en général, comprenant éléments (1) en forme de tranche essentiellement carrée, et moulés en béton coulé avec renforcements d'acier, positionnées adjacents et joints l'un l'autre, lesdits éléments tranche étant positionnable pour couvrir le bord d'un cours d'eau et, joints au moins à un rang d'éléments (1a) en forme de tranche pouvant être positionnés le long d'une berge, et au moins à un rang d'éléments en forme de tranche (1b) qui peuvent être positionnés au fond du cours d'eau,

caractérisée en ce que lesdits éléments en forme de tranche (1, 1a, 1b) présentent, sur leur face supérieure, une forme de tronc de pyramide définant des surfaces trapézoïdaux (3) qui convèrgent dans une seule ouverture carrée (2) définie dans la région centrale de ladite face supérieure, en ce que lesdits éléments en forme de tranche présentent, sur deux bords opposés, des fentes ou oeillets (4) qui peuvent être engagés par câbles de jonction longitudinaux (11), en ce qu'elle comprend d'élément de fondation, chacun formé par une tranche allongée (16), jointe par une extrémité au rang adjacent (1b) d'éléments en forme de tranche, et par l'autre éxtrémitée à un corps d'ancrage (17) qui peut être cresusé au fond du cours d'eau, en ce qu'elle comprend, en outre, de poutres linéaires (15) qui peuvent être préfabriquées ou coulées *in situ*, situées dans la région de jonction entre la bord et la berge, et entre la berge et le fond.

Fig. 3

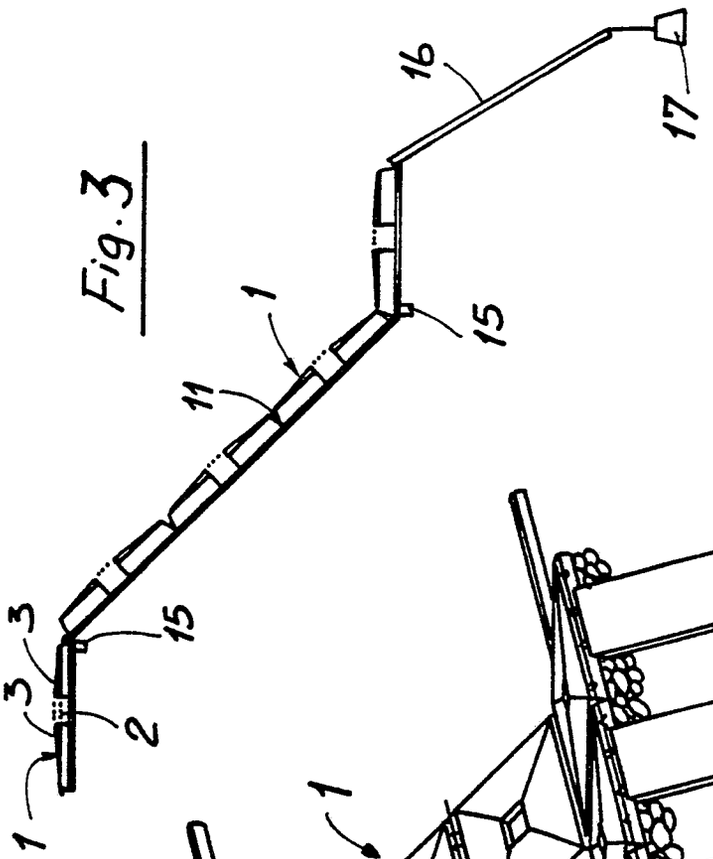
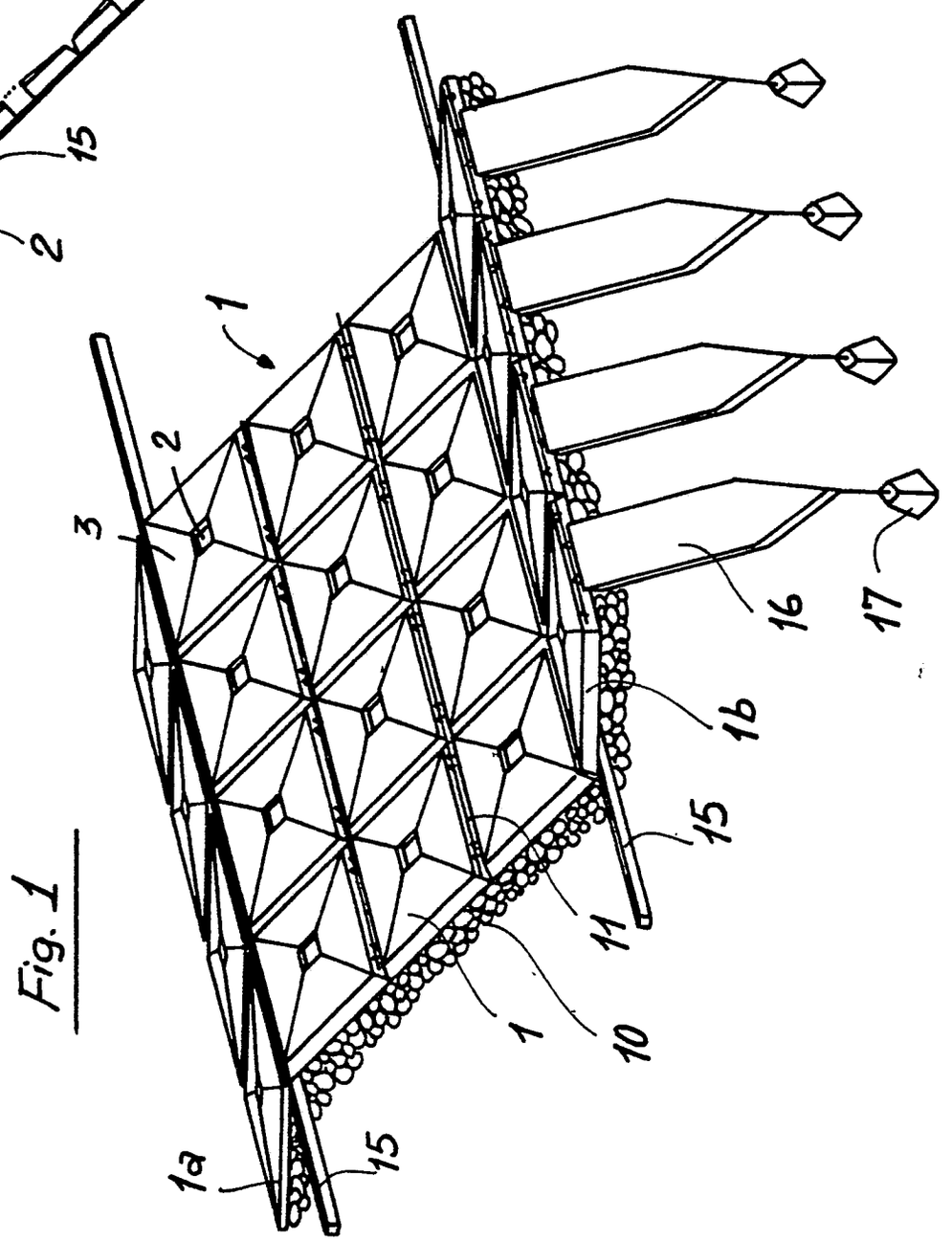


Fig. 1



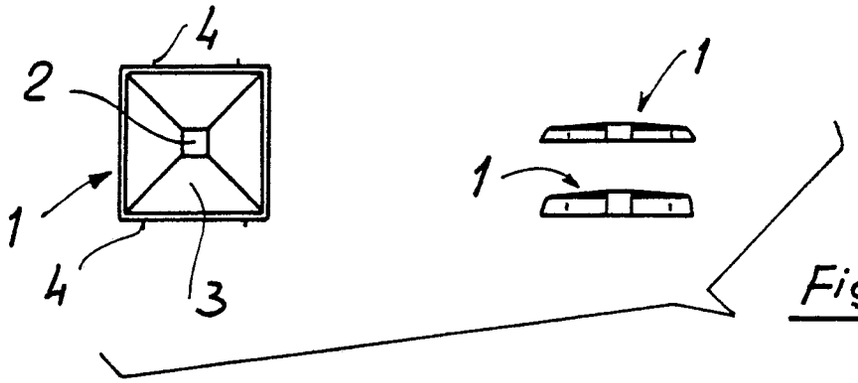


Fig. 2

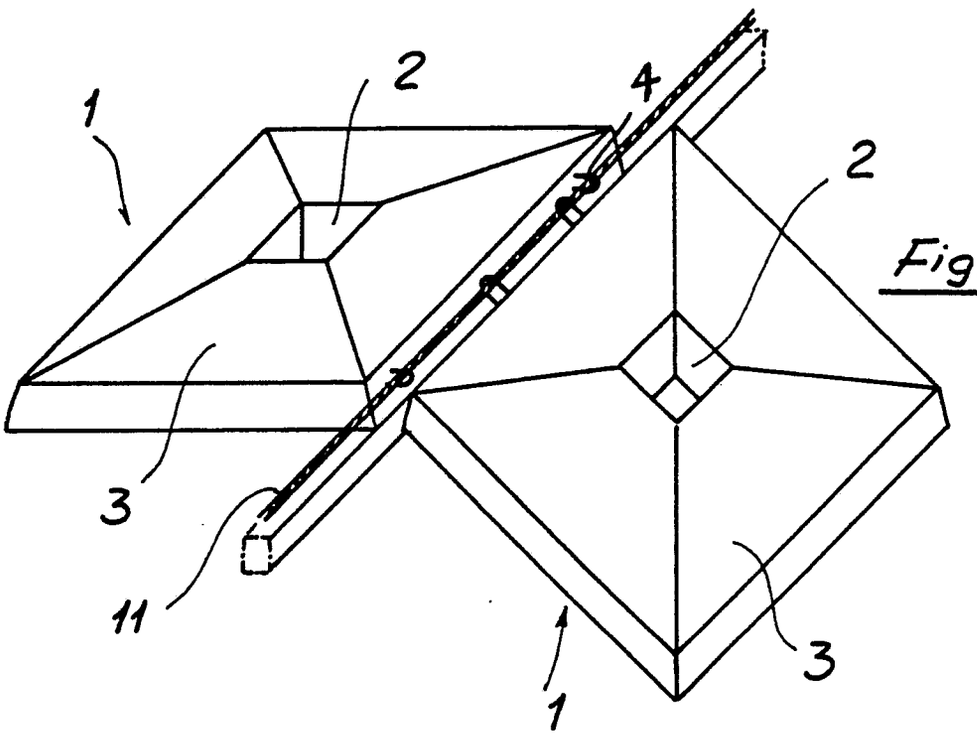


Fig. 4

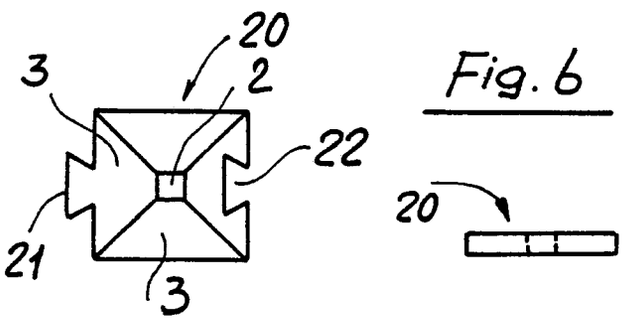
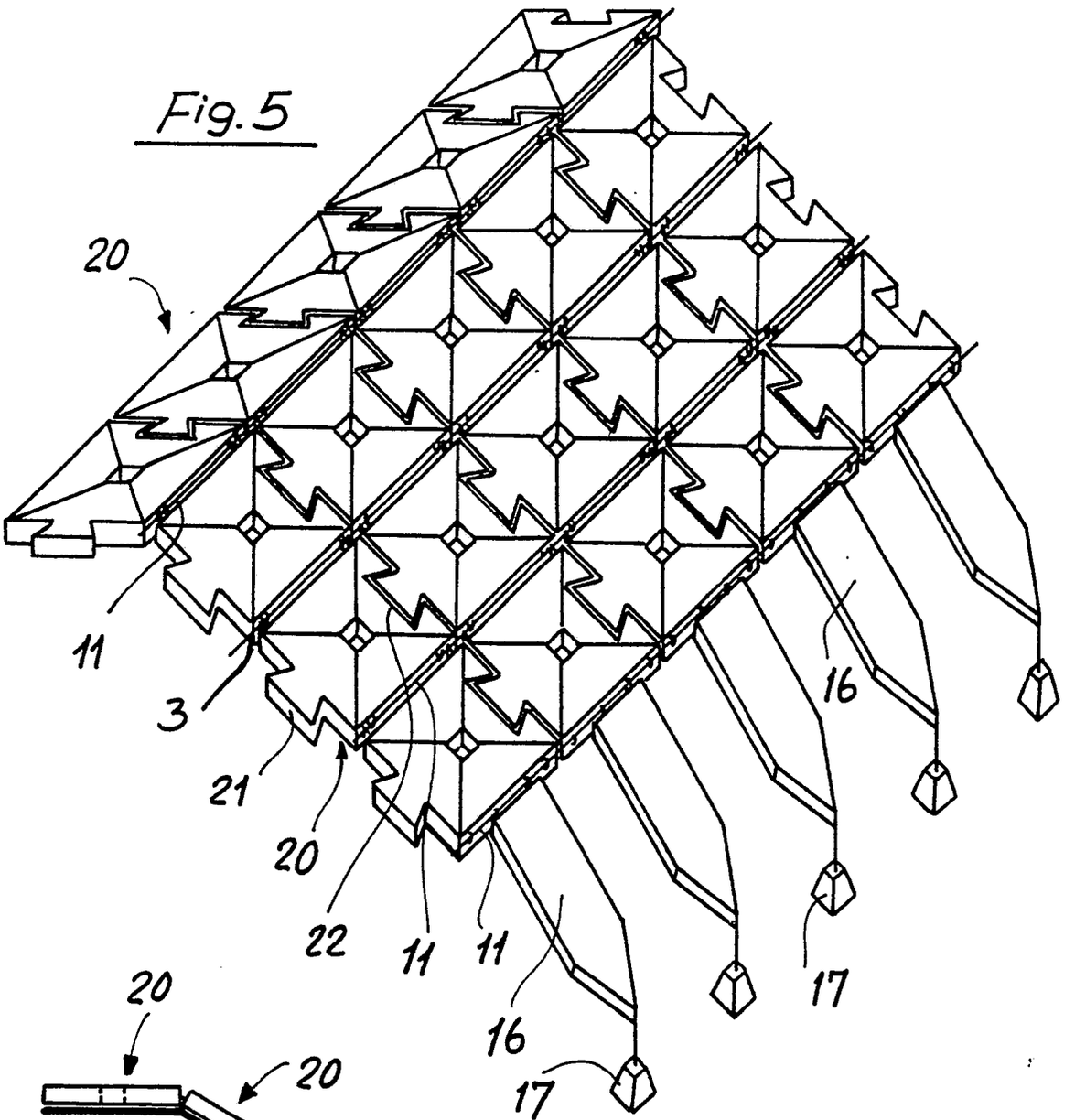


Fig. 6

Fig. 5



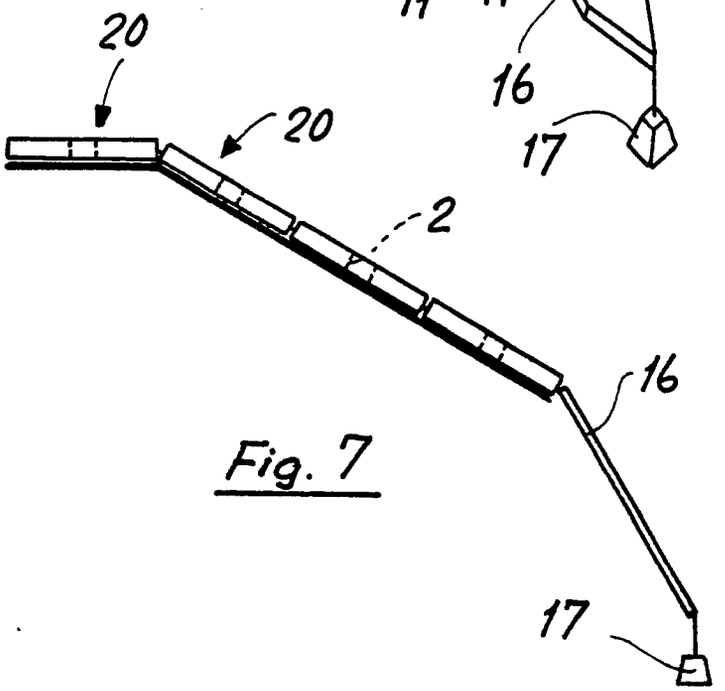


Fig. 7

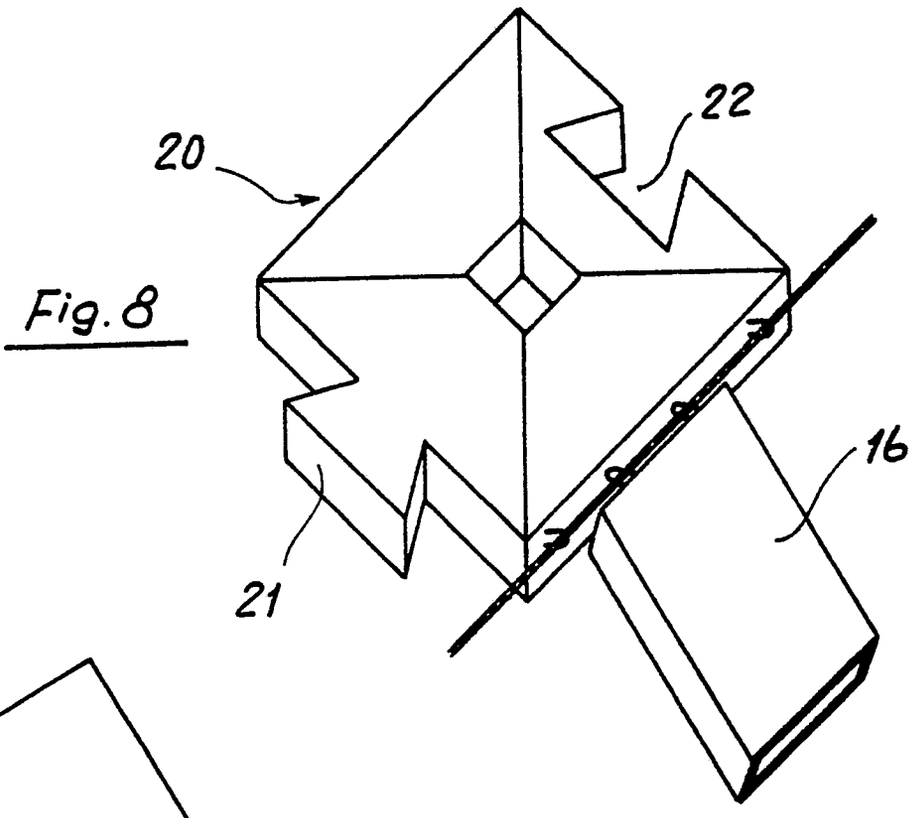


Fig. 8

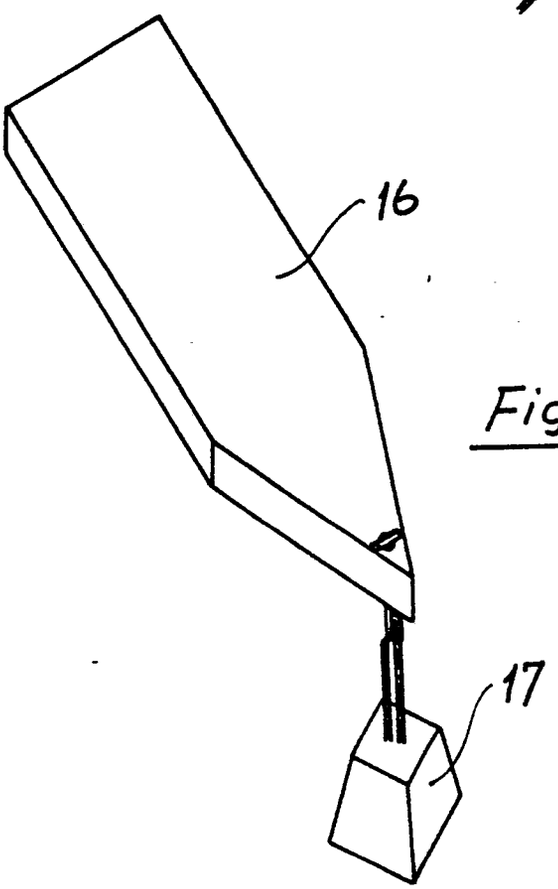


Fig. 9