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

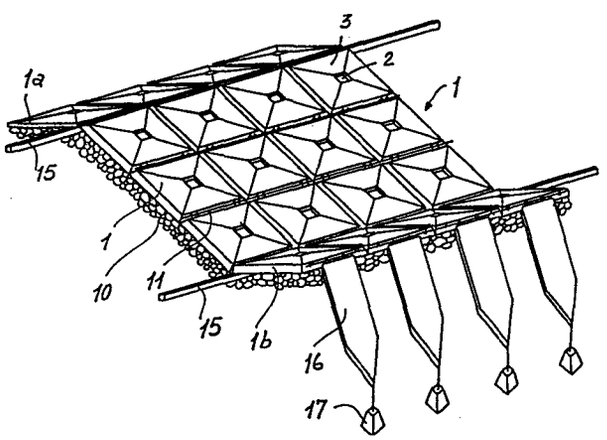
(57) The subject of the present invention is a structure of modular elements for the protection of the edges of canals, ditches and water courses in general, characterised by the fact that it comprises a plurality of slab-like modular elements, preferably made of cast concrete with steel reinforcements. These slab-like elements have a square conformation with a square aperture in their central portion.

The upper faces of the slab-like elements have a slightly frusto-pyramid shape, converging towards an aperture, in such a way as to define a plurality of adjacently disposed trapezoidal projections on the major face.

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

The modular elements (1) are disposed adjacent one another in such a way as to create a cover over the bank (10) of the water course, beneath which can be preliminarily provided a suitable ballast.

The modular elements are joined together by longitudinal connection wires.



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"A Structure of Modular Elements for Protecting the Edges of Canals, Ditches and Watercourses in General"

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 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 courses 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 invention, characterised by the fact that it comprises slab-like elements which can be positioned adjacent one another and joined together, and usable for covering a bank or edge of a water course in such a way that at least one row of slab-like elements is positioned on a bank and at least one row of slab-like elements is positioned on the bottom of a water course or the like.

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 is a plan view and a side view 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 a 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, schematically indicated 11, inserted into the eyelets 4.

As is shown in Figure 1, the modular slab-like elements 1 disposed on the edge, are connected to a row of slab-like

elements, indicated 1a, which are disposed on the bank and with a row of slab-like elements 1b 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 1b 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 inter-engaging 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 ofcast 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.

Claims

1. A structure of modular elements for the protection of the edges of canals, ditches and water courses in general, characterised by the fact it comprises slab-like elements (1) which can be positioned adjacent one another and joined together, the said slab-like elements being positionable to cover an edge of a water course and connected to at least one row of slab-like elements (1a) positioned on a bank and at least one row of slab-like elements (1b) positioned on the bottom of a water course or the like.

2. A structure of modular elements according to Claim 1, characterised by the fact the said slab-like elements (1) have a substantially square shape with a square aperture (2) in their central portion.

3. A structure of modular elements according to Claim 1 or Claim 2, characterised by the fact the said slab-like elements (1,1a, 1b) have on their upper face a truncated pyramid shape which defines trapezoidal protrusions (3) converging at the said square aperture (2).

4. A structure of modular elements according to any preceding claim, characterised by the fact that the said modular elements (1, 1a, 1b) are formed in cast concrete with steel reinforcements.

5. A structure of modular elements according to any

preceding claim, characterised by the fact that the said slab-like elements (1, 1a, 1b) have, on two opposite edges, loops or eyelets (4) which can be engaged by longitudinal connection wires (11).

6. A structure of modular elements according to any preceding claim, characterised by the fact that the said slab-like elements (1, 1a, 1b) are provided on the edges which do not have loops or eyelets (4), with a projection (21) or a recess (22) which can be joined together by means of mutual interfitting engagement.

7. A structure of modular elements according to Claim 6, characterised by the fact that the said projection (21) and recess (22) have a dovetail shape.

8. A structure of modular elements according to any preceding claim, characterised by the fact that it includes foundation elements constituted by an elongate plate (16) connected at one end to the adjacent row (1b) of such slab-like elements and at the other end to an anchoring body (17) which can be embedded in the bottom of the water course.

9. A structure of modular elements according to any preceding claim, characterised by the fact that it includes linear beams (15) which may be prefabricated or cast in situ, disposed in correspondence with the junction region between the edge and the bank and between the bank and the bottom.

10. A structure of modular elements for the protection of the edges of canals, ditches and water courses in general, according to the preceding claims, all as described and illustrated and for the specified object.

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Fig. 3

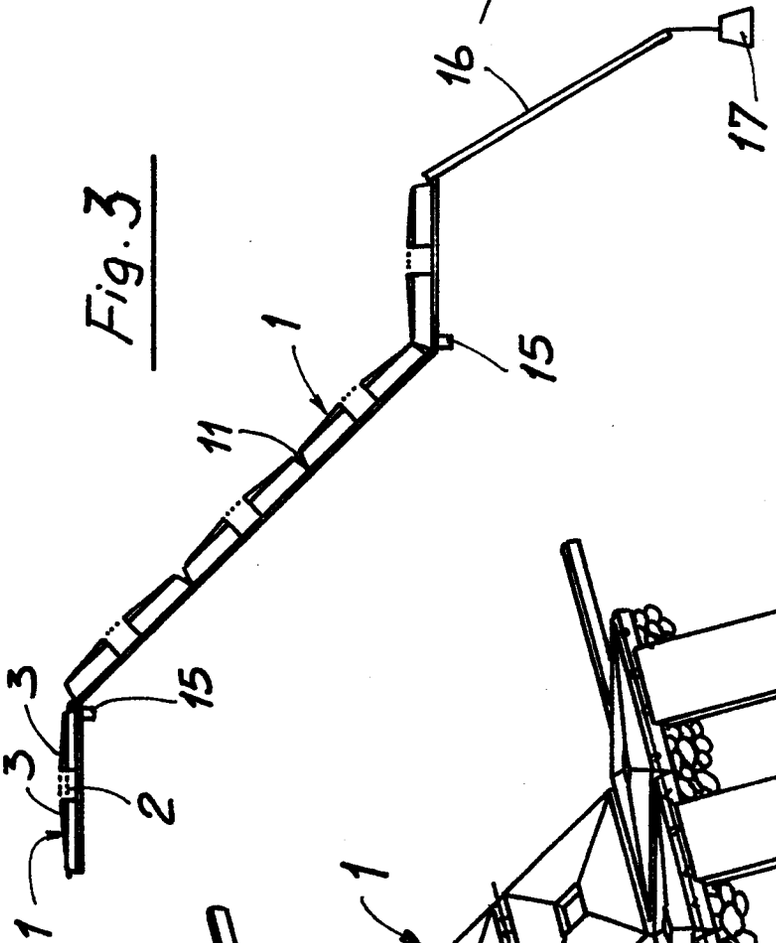
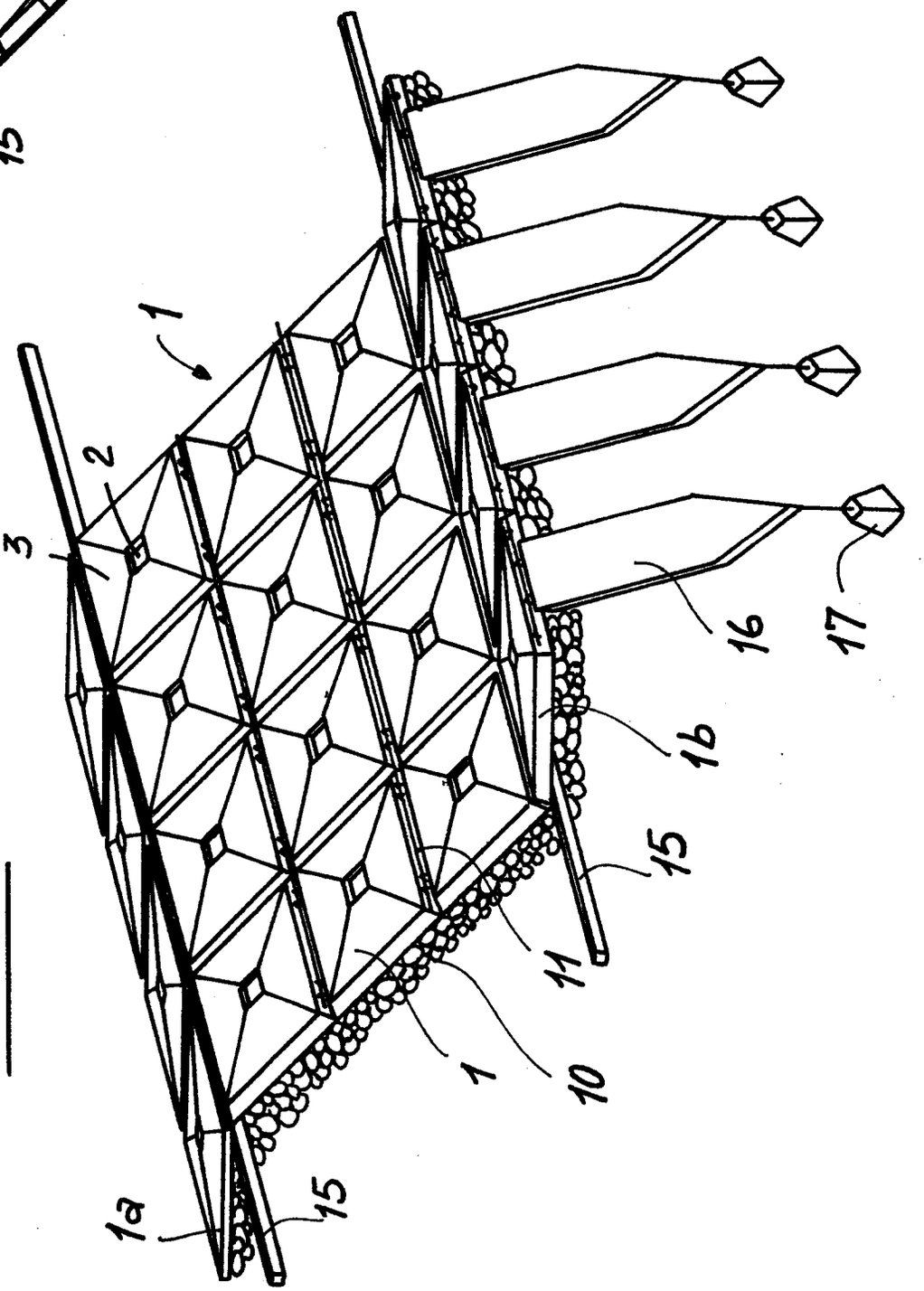


Fig. 1



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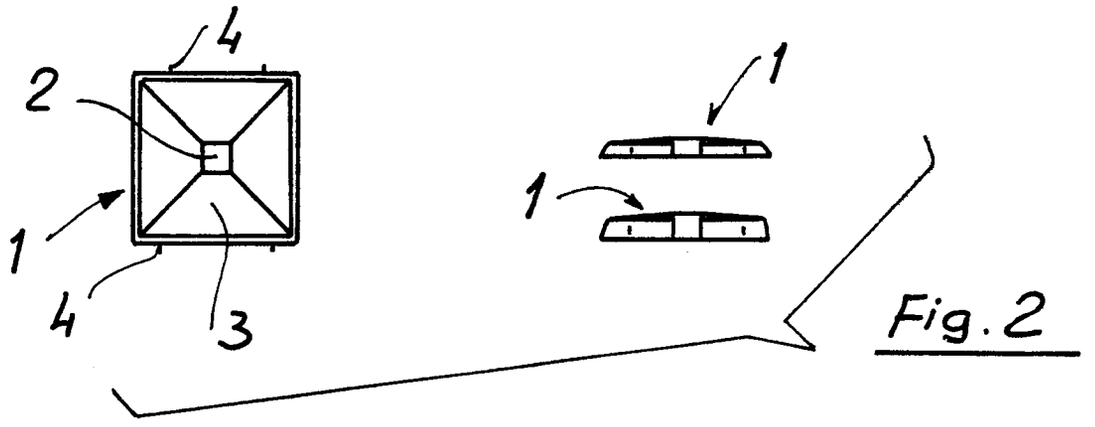

Fig. 2

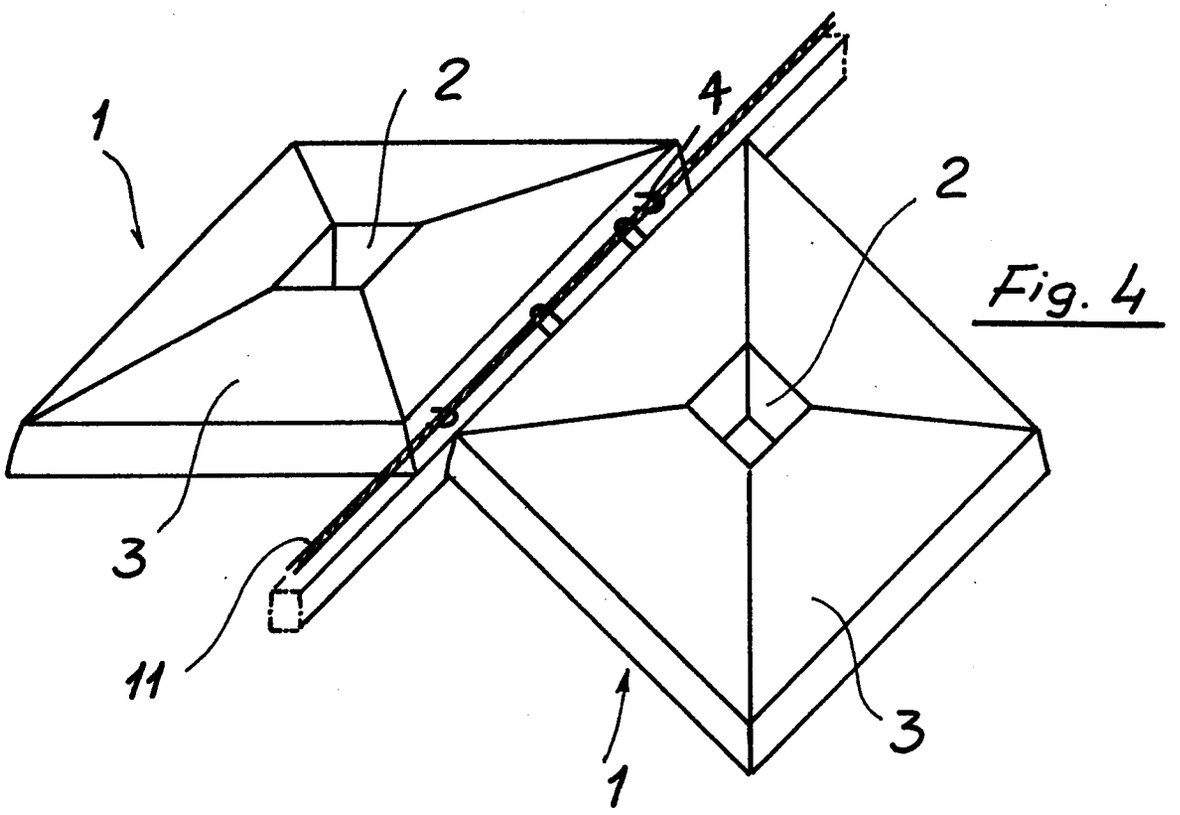

Fig. 4

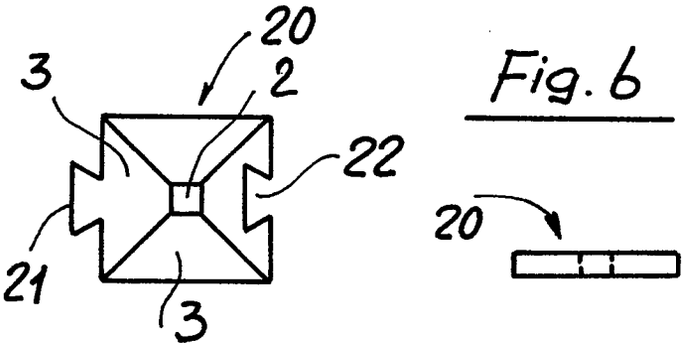

Fig. 6

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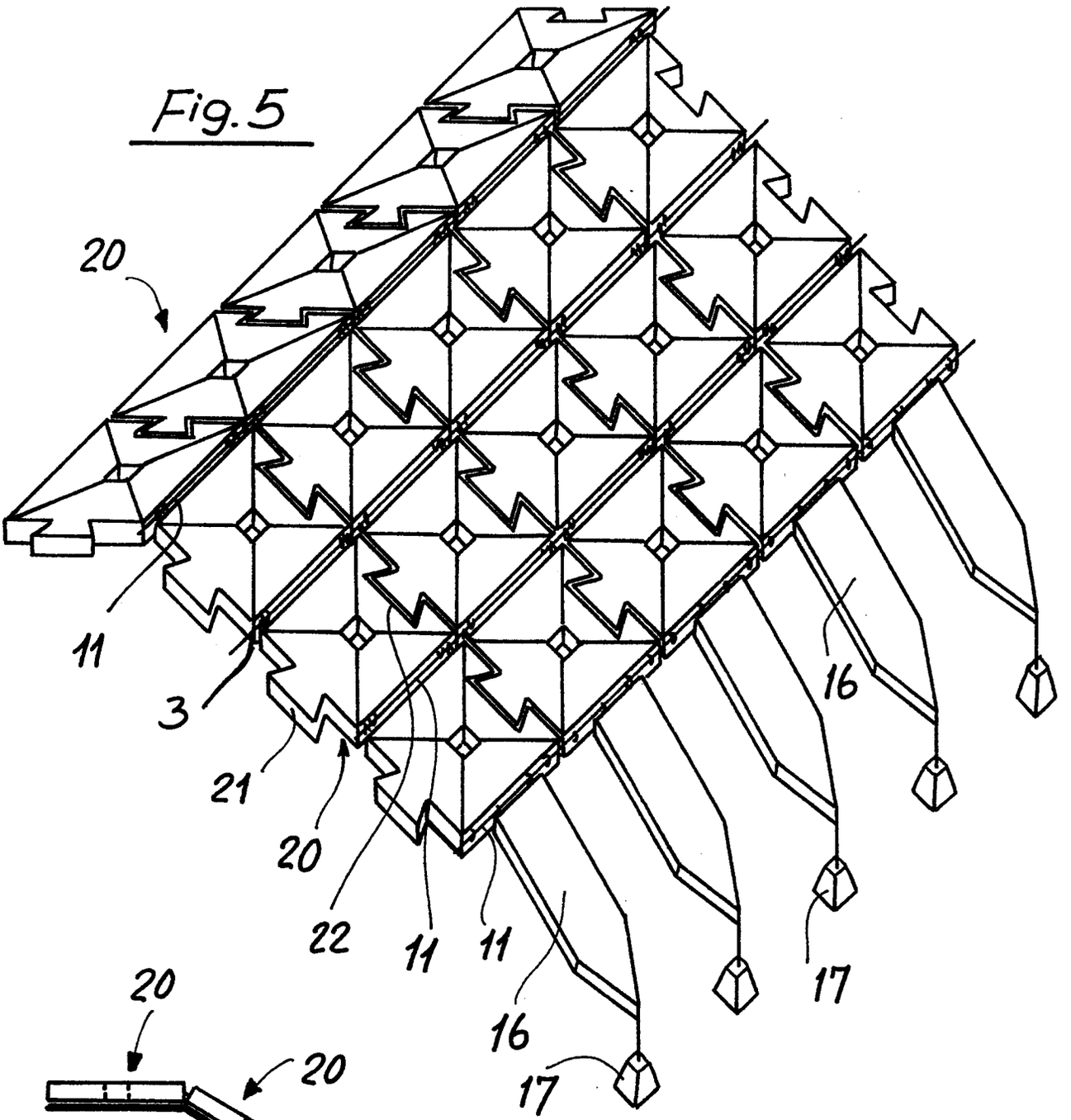
Fig. 5



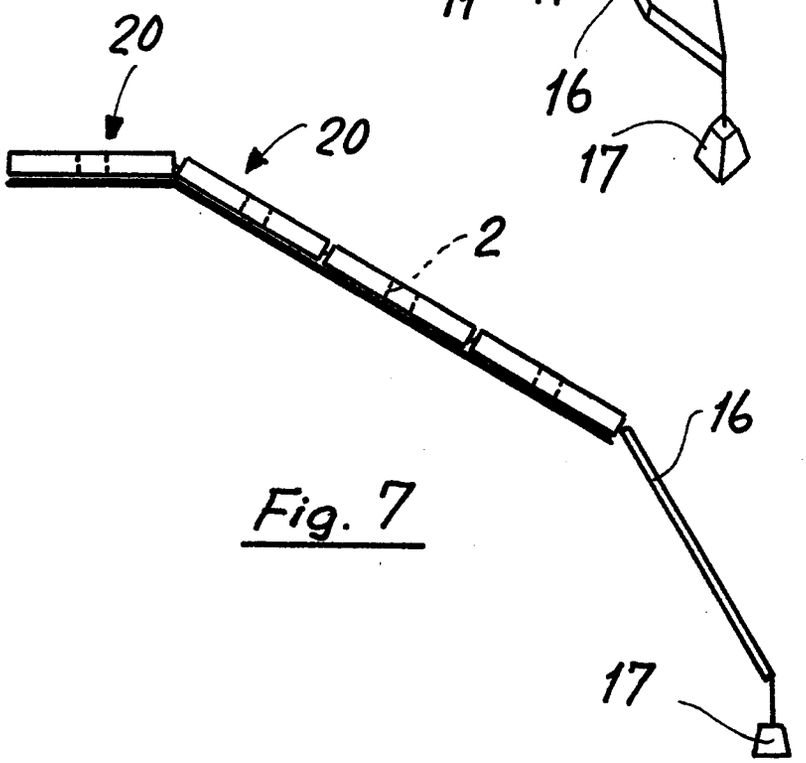


Fig. 7

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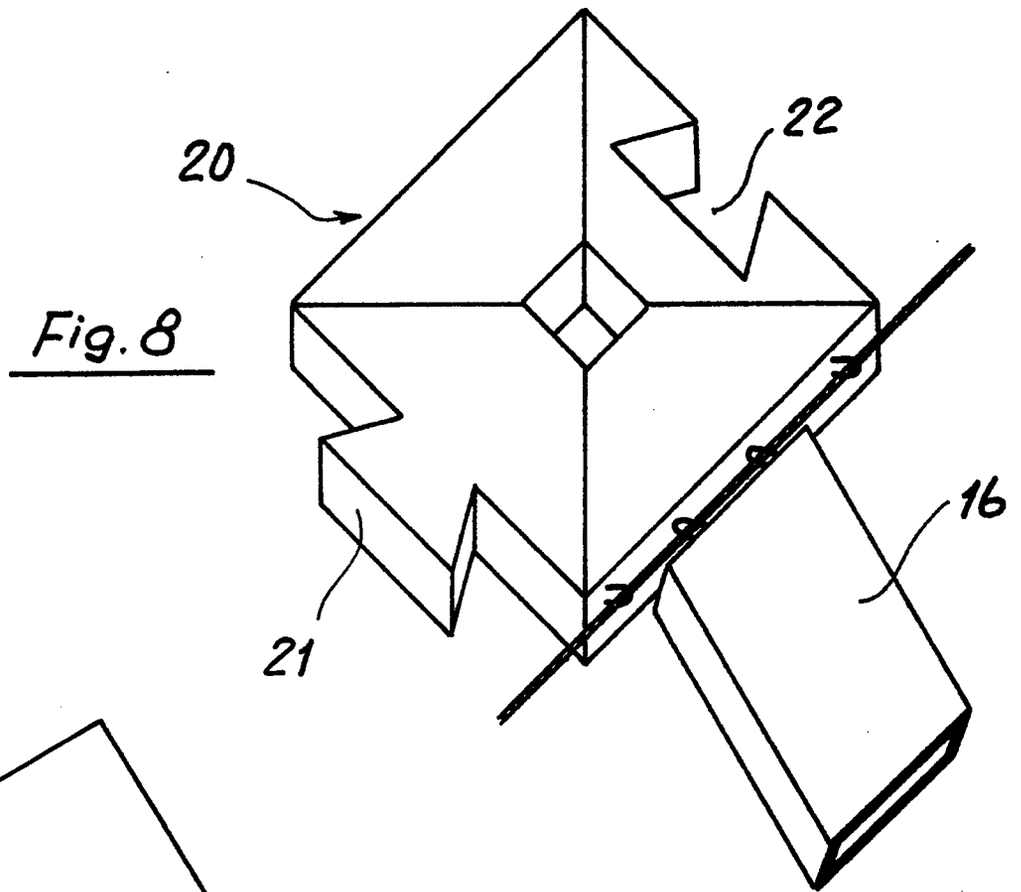

Fig. 8

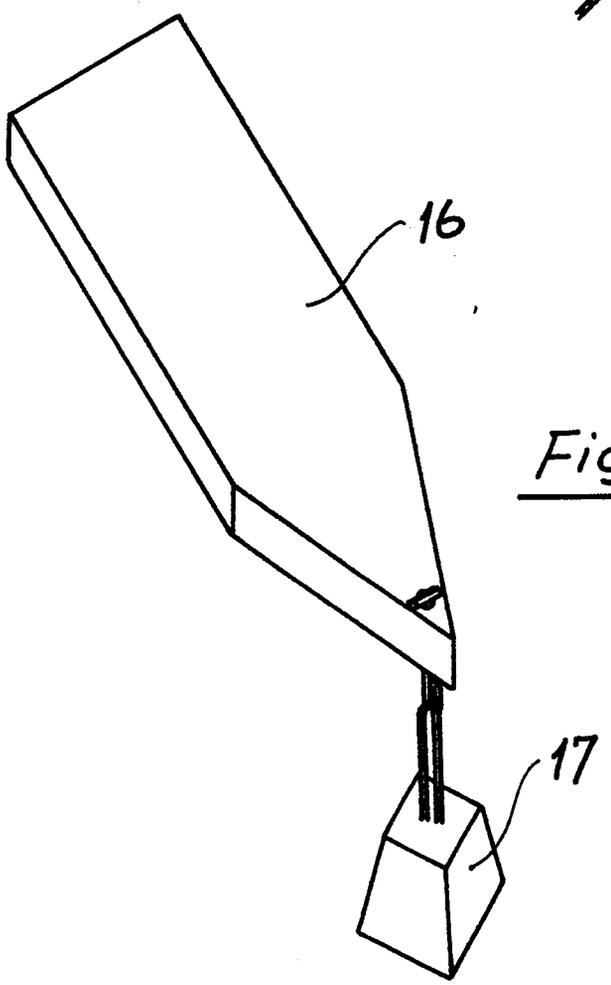

Fig. 9