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(54) A joining system for insulating panels

(57) A joining system (7) for insulating panels (1), of the type comprising a first concrete layer (2) and a second concrete layer (3) between which a layer of insulating material (4) is arranged, is provided with a plurality of connecting pins (8), suitable to pass completely through the layer of insulating material (4) in a direction that is substantially orthogonal to the insulating panel (1) and join said concrete layers (2, 3) and prevent them from moving in relation to the layer of insulating material (4); each connecting pin (8) has a flattened shape between two opposite faces that are substantially flat and parallel, extends along an axis (B) and comprises a narrow central portion, having a substantially constant cross-section, and two end portions, at least a first of which is provided with a tip (9), joined continuously to the central portion and wider laterally with respect to the axis (B) than the central portion so that the connecting pin (8) is self-anchoring.

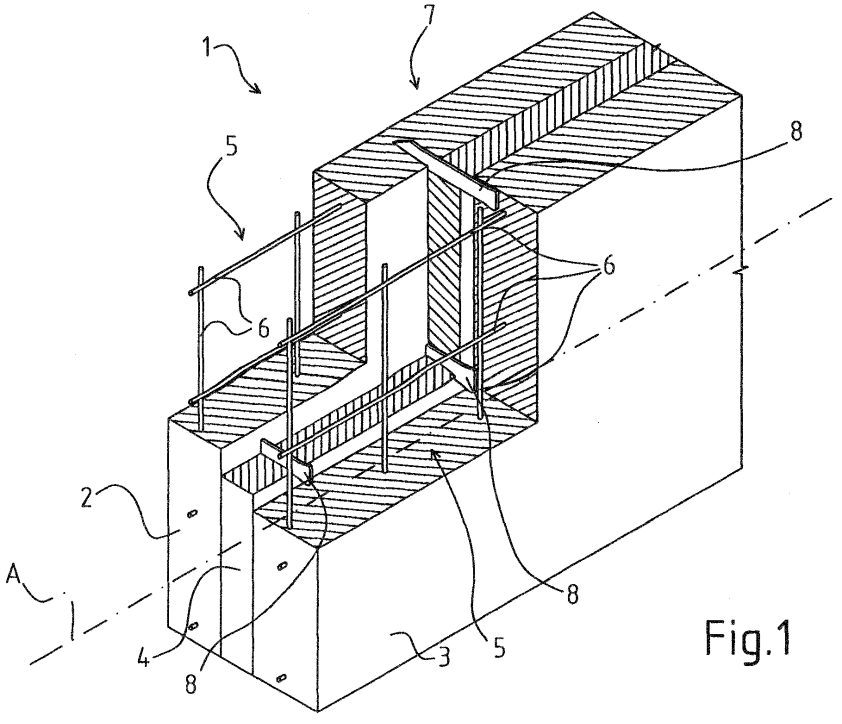

Fig.1

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Description

[0001] The present invention relates to a joining system for insulating panels.

[0002] As known in the building sector, insulating panels (prefabricated or produced directly at the building site) generally comprise a first layer of concrete, also known as the inner crust, and a second layer of concrete, also known as the outer crust, between which a layer of insulating material is arranged. To ensure the correct packing of the layer of insulating material between the two concrete layers, joining systems are used, suitable to join the first concrete layer to the second concrete layer in order to fix the insulating layer.

[0003] The joining systems known in the prior art comprise a plurality of connecting pins suitable for passing completely through the layer of insulating material in a direction that is substantially orthogonal to the insulating panel and join the first concrete layer to the second concrete layer. The connecting pins usually have a threaded cylindrical body, which is pointed at a first end and provided with a flange at a second end, opposite to the first end.

[0004] Joining systems of this type are, however, mostly suitable for predrilled insulating materials, i.e. that have been processed so as to create seats suitable to facilitate the insertion of the connecting pins.

[0005] The need to have a predrilled insulation is clearly disadvantageous in terms of the longer time required to produce the insulating panels and in terms of the cost, since the process devoted exclusively to predrilling the insulating layer involves costs which are not negligible. Moreover, the production of connecting pins of the type described above is a relatively long and complex process, due to the presence of threads and flanges.

[0006] A purpose of the present invention is to provide a joining system for insulating panels that overcomes the drawbacks of the prior art described above; in particular, a purpose of the invention is to produce a joining system for insulating panels that does not necessarily require predrilling of the layer of insulating material and at the same time is easy and cheap to produce. Another purpose of the invention is to provide a joining system for insulating panels that is particularly simple, fast and effective to use.

[0007] In accordance with the aforesaid purposes, the present invention relates to a joining system for insulating panels comprising at least two layers of concrete and at least one layer of insulating material that is arranged between the two concrete layers; said joining system comprising a plurality of connecting pins, suitable for passing completely through the layer of insulating material in a direction that is substantially orthogonal to the insulating panel in order to join said layers; said joining system being characterized in that each connecting pin has a flattened shape between two substantially flat and parallel opposite faces, extends along an axis and comprises a narrow central portion, having a substantially constant cross-section, and two end portions joined continuously to the central portion and wider laterally with respect to the axis than the central portion so that said connecting pin is self-anchoring; at least a first end portion being provided with a pointed end.

[0008] Further characteristics and advantages of the present invention will become clear from the following description of a non-limiting embodiment thereof, with reference to the drawings attached hereto, in which:

- figure 1 is a schematic perspective view, with parts shown in section and parts removed for the sake of clarity, of an insulating panel comprising the joining system according to the present invention;
- figure 2 is a perspective view of a connecting pin that is part of the joining system in figure 1;
- figure 3 is a perspective view of a second embodiment of the connecting pin that is part of the joining system in figure 1; and
- figure 4 is a side view of the connecting pin in figure 3.

[0009] In figure 1 reference number 1 indicates an insulating panel that extends mainly along a longitudinal axis A and comprises a first concrete layer 2, a second concrete layer 3 and a layer of insulating material 4, arranged between the first concrete layer 2 and the second concrete layer 3.

[0010] The first concrete layer 2 and second concrete layer 3 are preferably made of reinforced concrete and thus comprise a reinforcement 5 consisting of steel bars 6 buried in the concrete and appropriately shaped and connected to one another.

[0011] The layer of insulating material 4 preferably consists of a plurality of prefabricated elements (in figure 1 only one element is illustrated) that have not been predrilled and are of a predefined thickness, selected according to the desired level of heat insulation to be obtained with the insulating panel 1. The prefabricated elements of the layer of insulating material 4 are preferably of the ventilated type, i.e. provided with internal ventilation ducts, in order to optimize the level of heat insulation of the insulating panel 1. The layer of insulating material 4 is packed between the first concrete layer 2 and the second concrete layer 3 by means of a joining system 7, which comprises a plurality of connecting pins 8 and is suitable for joining the first concrete layer 2 and the second concrete layer 3.

[0012] Each connecting pin 8 extends substantially along an axis B and is of a length such as to pass completely, in use, through the layer of insulating material 4 in a direction that is substantially orthogonal to the axis A of the insulating panel 1 and to partially engage the first concrete layer 2 and the second concrete layer 3 so as to prevent any movement of one of the concrete layers 2 and 3 with respect to the layer of insulating material 4.

[0013] With reference to figure 2, each connecting pin 8 has an prismatic shape elongated along the axis B and comprises a first end portion 10a, provided with a tip 9,

a second end portion 10b, opposite to the end portion 10a, and a narrow central portion 12 having a substantially rectangular shape and a substantially constant cross-section; the two end portions 10a and 10b are joined continuously without interruption by rounded and/or chamfered profiles to the central portion 12 and are wider laterally with respect to the axis B than the central portion 12 to make the connecting pin 8 self-anchoring; the end portions 10a and 10b diverge from the central portion 12 gradually.

[0014] The connecting pin 8 is flattened between two substantially flat and parallel opposite faces 13, 14 defined respectively by an upper base and a lower base of the connecting pin 8; the faces 13, 14 are pointed towards the end portion 10a, remaining substantially parallel to one another, the thickness of each connecting pin 8 remaining constant along its entire length.

[0015] The faces 13, 14 are joined by two lateral sides 15 having constant height. The sides 15 converge in the end portion 10a to form the tip 9.

[0016] It is, however, understood that the thickness of the connecting pin 8 (distance between the faces 13, 14) may be variable, possibly in the end portions 10a, 10b, in order to meet any particular structural requirements.

[0017] The presence of the narrow central portion 12 and the two wider end portions 10a, 10b, gives the connecting pin 8 a particular self-anchoring characteristic, to ensure the firm anchorage of the concrete layers 2, 3. In particular, the use of a plurality of connecting pins 8 prevents any sliding movements of one or both of the concrete layers 2 and 3 in relation to the layer of insulating material 4 (movement in a direction parallel to the axis A), and separating movements of one of the concrete layers 2 and 3 with respect to the layer of insulating material 4 (movement along a direction orthogonal to the axis A).

[0018] Each connecting pin 8 is provided with at least one graduated scale 16, for example a centimetre scale, arranged visibly on a surface 17 of the connecting pin 8 and extending in a direction that is substantially parallel to the axis B. In the example in figure 2, the graduated scale 16 is arranged on the face 13 (i.e. the surface 17 is part of the face 13), but it is understood that the graduated scale 16 could instead be arranged on the opposite face 14, or on both faces 13, 14, and/or on a side 15.

[0019] The purpose of the graduated scale 16 is to provide the level of penetration of the connecting pin 8 into the layer of insulating material 4, to enable the installer to immediately and accurately gauge the level of penetration of the connecting pin 8 into the layer of insulating material 4.

[0020] The connecting pins 8 are made of a material with low heat conductivity, plastic for example, to guarantee adequate insulation.

[0021] In figures 3 and 4, in which the same reference numbers are used to indicate parts that are similar to or the same as those already described, a second embodiment of the connecting pin 8 that is part of the joining system 7 is illustrated. In this second embodiment, the connecting pin 8 comprises in the central portion 12, preferably near the end portion 10a, a pair of transversal teeth 22 that protrude from the connecting pin 8, for example from respective faces 13, 14 of the connecting pin 8, in a direction that is substantially transversal, and in particular substantially orthogonal, to the axis B of the connecting pin 8 in order to improve the anchorage of the connecting pin 8 inside the layer of insulating material 4.

[0022] The use of the joining system 7 with the connecting pins 8 according to both of the embodiments described above, during the production of the insulating panel 1 is as follows.

[0023] A first concrete casting is performed, preferably of reinforced concrete, in a formwork or containment panel (known in the prior art and not illustrated in the attached drawings) to produce the concrete layer 2; next, with the concrete layer 2 still fresh, the layer of insulating material 4 is placed on the freshly formed concrete layer 2. A plurality of connecting pins 8 are then inserted into the layer of insulating material 4 in a direction that is substantially orthogonal to said layer of insulating material 4 and to the axis A, so that the respective tips 9 penetrate into the prefabricated elements of the layer of insulating material 4. Alternatively, in particular in the case in which prefabricated elements of the ventilated type are used, the connecting pins 8 are inserted between one prefabricated element and the other of the layer of insulating material 4, so that the connecting pins 8 do not interfere with the ventilation ducts inside the prefabricated elements.

[0024] The connecting pins 8 are then pushed, even simply by hand, so as to pass completely through the layer of insulating material 4 so that the end portion 10a protrudes from the layer of insulating material 4 and penetrates the concrete layer 2 until it touches the formwork. The length of the connecting pin 8 is such that, in use, the central portion 12 passes completely through the layer of insulating material 4 and the end portions 10a and 10b respectively engage the concrete layers 2 and 3. The installer can easily verify whether the desired level of penetration has been achieved by using the graduated scale 16 provided on each connecting pin 8. The insertion of the connecting pins 8 into the layer of insulating material 4 may also be performed with the help of a template (known in the prior art and not illustrated), which facilitates the correct spacing between the connecting pins 8.

[0025] Once the connecting pins 8 have been inserted, another layer of concrete is cast, preferably reinforced concrete, on the layer of insulating material 4 to produce the concrete layer 3.

[0026] When the two layers are completely dry, the insulating panel 1 is ready for use.

[0027] The present invention has the following advantages.

[0028] Firstly, the connecting pins 8 of the joining system 7 are self-anchoring thanks to their characteristic

shape, which is however extremely simple and cheap to produce, and overcomes the need for the lengthy and expensive processes that are required in order to produce threaded connecting pins provided with flanges or anchoring means to prevent any movement of the concrete layers.

[0029] Secondly, the pointed shape of the connecting pin 8 facilitates its penetration into the prefabricated elements that make up the layer of insulating material 4 or between one prefabricated element and the other of the layer of insulating material 4, which generally has a relatively high degree of hardness, even if not predrilled; and the rounded and chamfered shape of the connecting pin 8 allows the connecting pin 8 to slide better inside the layer of insulating material 4 once said connecting pin 8 has penetrated (whether inserted into the individual prefabricated elements that make up the layer of insulating material 4 or inserted between one prefabricated element and the other of the layer of insulating material 4).

[0030] The flattened shape with constant thickness of the connecting pin 8 also facilitates its insertion through the layer of insulating material 4 and in particular its insertion between one prefabricated element and the other of the layer of insulating material 4.

[0031] Thirdly, the graduated scale 16 allows the operator to immediately gauge the level of penetration of the connecting pin 8 into the layer of insulating material 4. Said aspect is considerably advantageous for the user and prevents errors in the subjective evaluation of the level of penetration.

[0032] Lastly, the teeth 22, if present, further improve the anchorage of the connecting pin 8 and in particular prevent the connecting pin 8 from coming out of the layer of insulating material 4 engaged by the teeth 22.

[0033] It will be apparent that other changes and modifications may be made to the joining system for insulation panels described and illustrated herein without departing from the scope of the invention in accordance with the claims.

Claims

1. Joining system (7) for insulating panels (1) comprising at least two concrete layers (2, 3) and at least one layer of insulating material (4) arranged between the two concrete layers (2, 3); said joining system (7) comprising a plurality of connecting pins (8), suitable for passing completely through the layer of insulating material (4) in a direction that is substantially orthogonal to the insulating panel (1) in order to join said concrete layers (2, 3); said joining system (7) being **characterized in that** each connecting pin (8) has a flattened shape between two opposite and substantially flat and parallel faces (13, 14), extends along an axis (B) and is provided with a narrow central portion (12), having a substantially constant cross-section, and two end portions (10a, 10b) joined continuously to the central portion (12) and wider laterally with respect to the axis (B) than the central portion (12) so that said connecting pin (8) is self-anchoring; at least a first end portion (10a) being provided with a tip (9).

2. System according to claim 1, **characterized in that** said opposite faces (13, 14) of each connecting pin (8) are pointed towards the first end portion (10a) and substantially parallel to one another.

3. System according to claim 1 or 2, **characterized in that** the end portions (10a, 10b) of each connecting pin (8) are joined to the central portion (12) by rounded and/or chamfered profiles.

4. System according to any of the previous claims, **characterized in that** the central portion (12) of each connecting pin (8) is substantially rectangular in shape and the end portions (10a, 10b) diverge from the central portion (12) gradually.

5. System according to any of the previous claims, **characterized in that** the thickness of each connecting pin (8) remains constant along the entire length thereof.

6. System according to any of the previous claims, **characterized in that** each connecting pin (8) is provided with a graduated scale (16) arranged visibly on a surface (17) of the connecting pin (8) to gauge the level of penetration into the layer of insulating material (4).

7. System according to the previous claim, **characterized in that** the graduated scale (16) extends substantially parallel to the axis (B).

8. Joining system according to claim 6 or 7, **characterized in that** the graduated scale (16) is a centimetre scale.

9. Joining system according to any of the previous claims, **characterized in that** the connecting pins (8) are made of material with low heat conductivity.

10. Joining system according to any of the previous claims, **characterized in that** the central portion (12) of each connecting pin (8) comprises a pair of transversal teeth (22), each of which protrudes from the connecting pin (8) in a substantially transversal direction in relation to the axis (B) of the connecting pin (8).

11. Joining system according to claim 10, **characterized in that** the teeth (22) protrude from respective faces (13, 14) of the connecting pin (8).

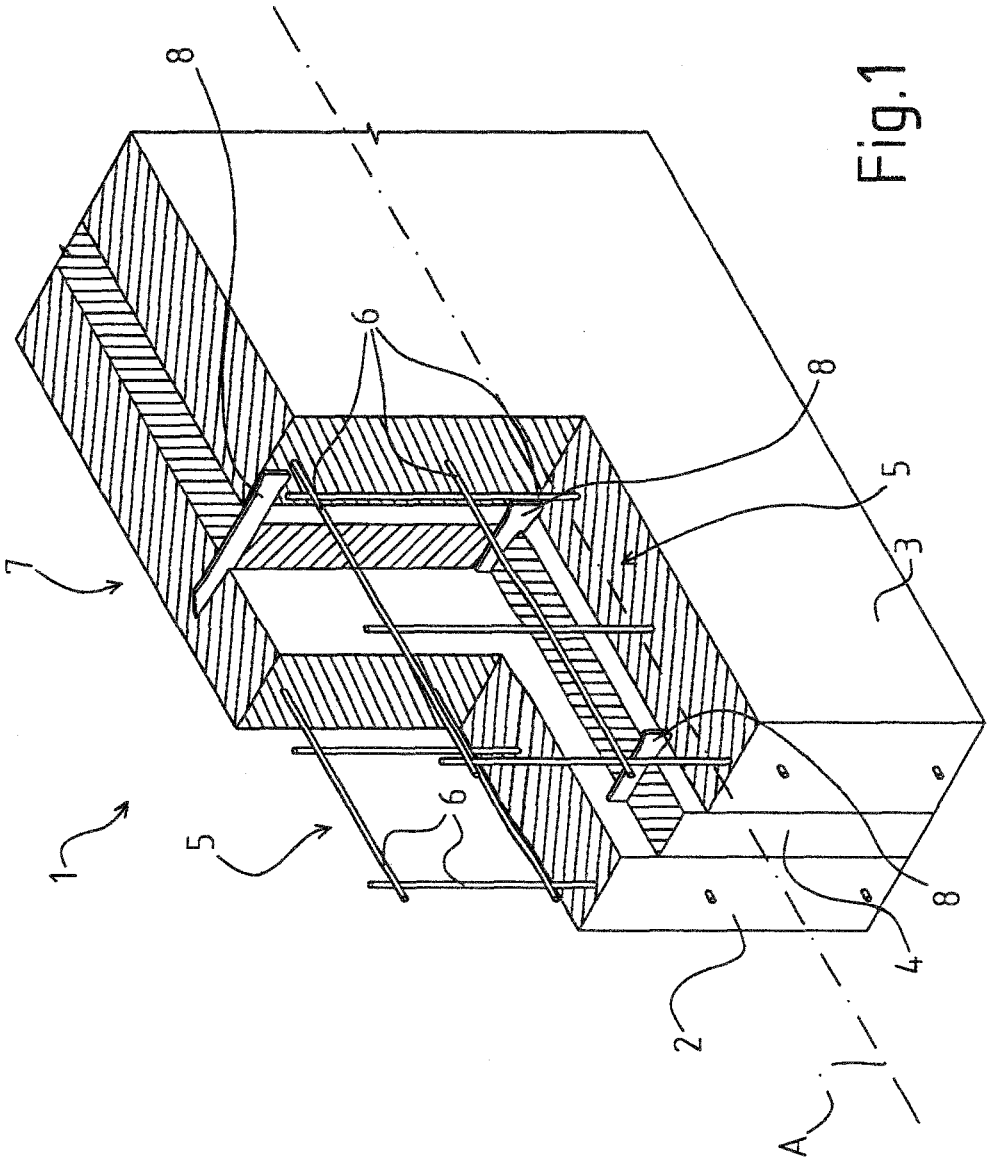

Fig.1

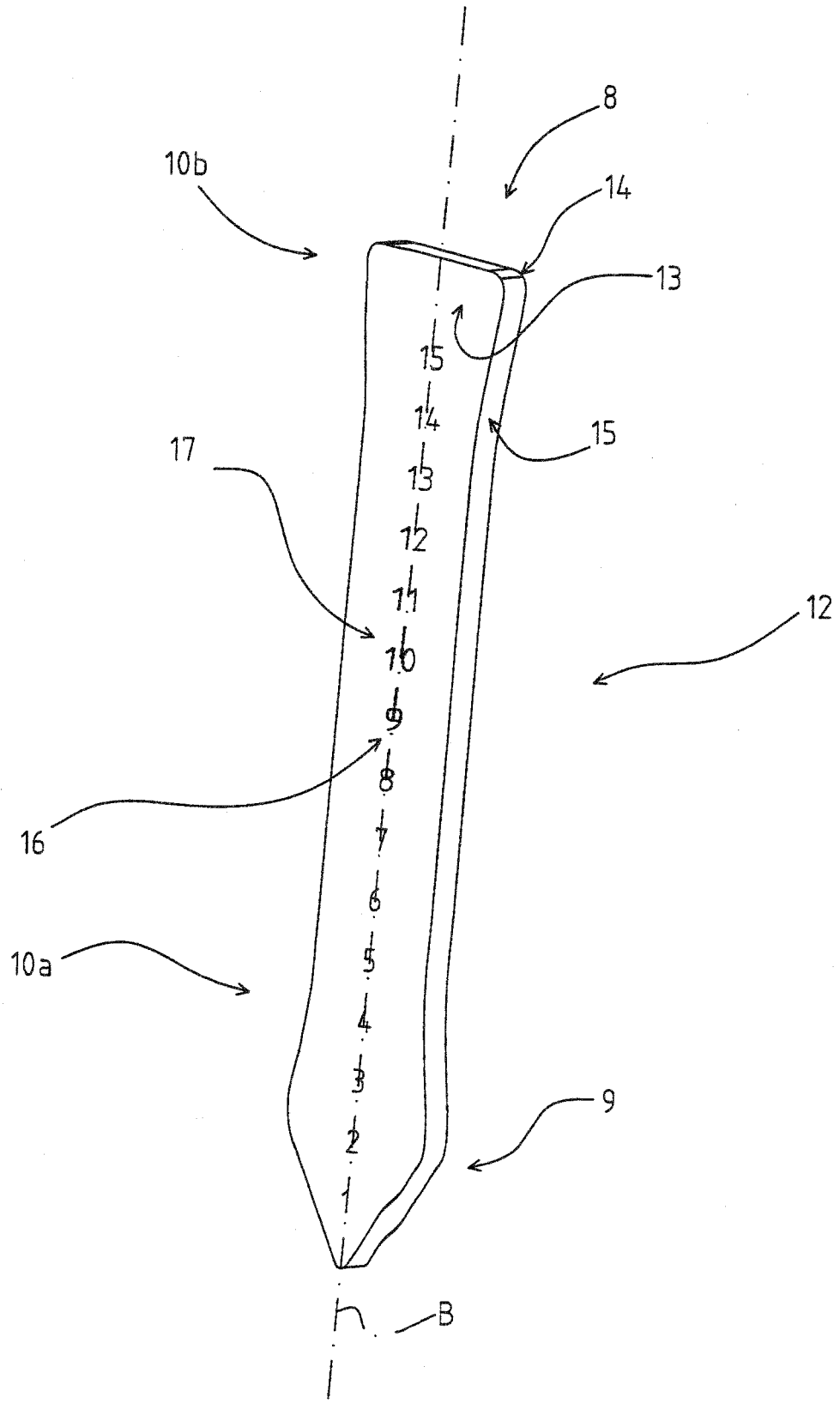

Fig.2

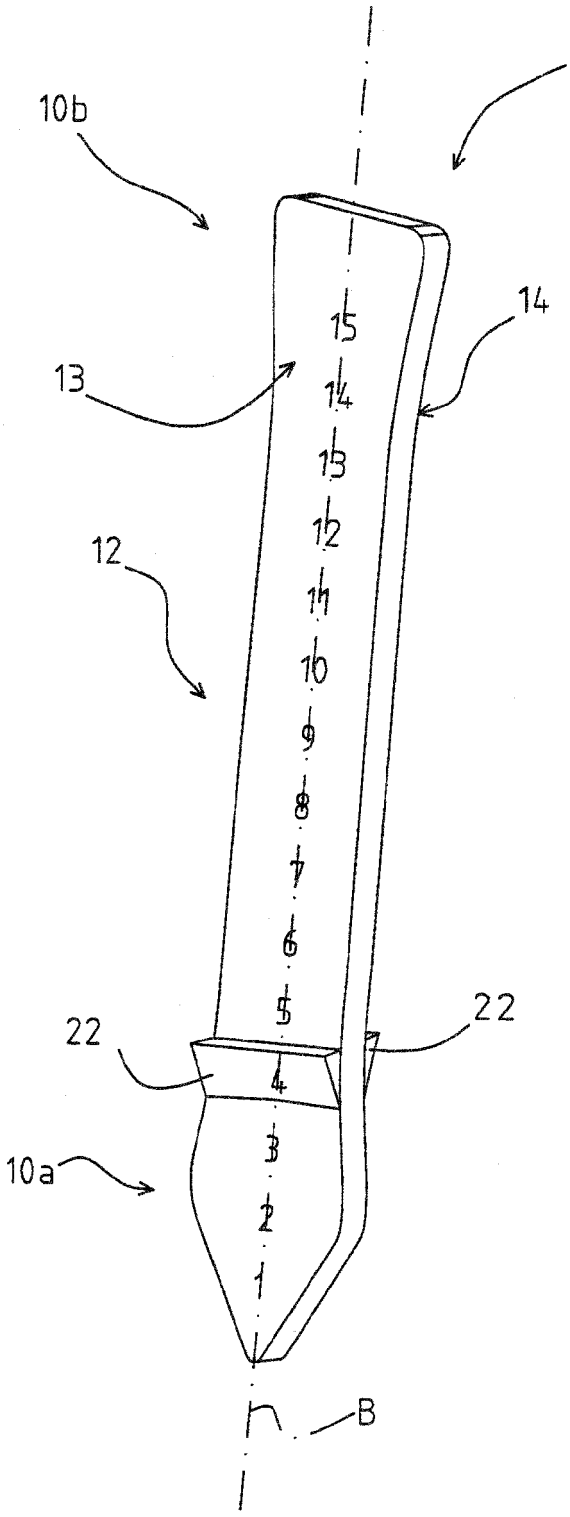
8
10b
14
13
15
14
13
12
11
10
9
8
7
6
5
22
22
4
3
2
1
10a
B

Fig.3

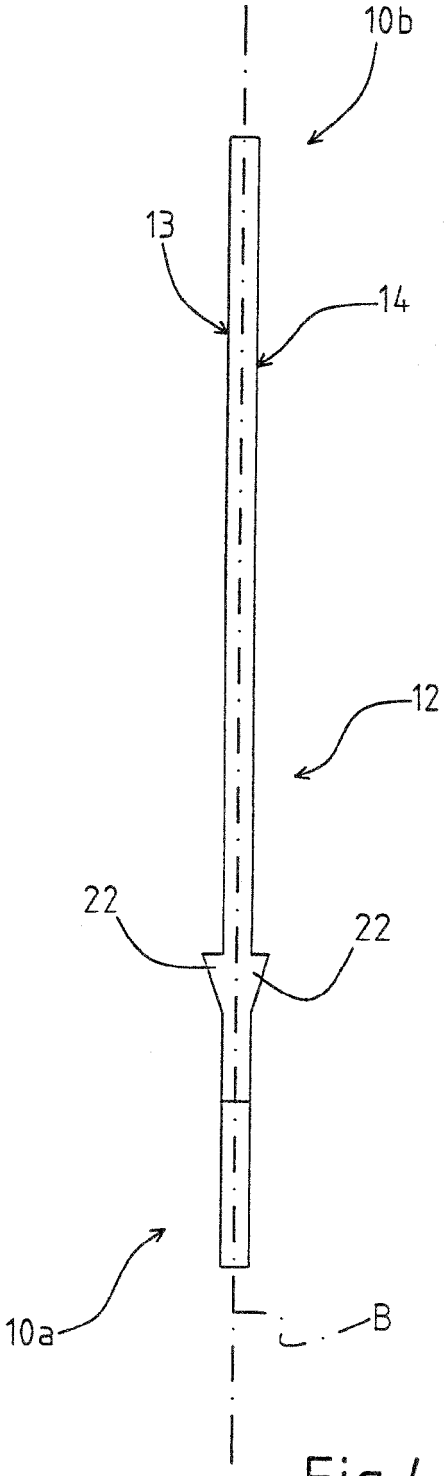
10b
13
14
12
22
22
10a
B

Fig.4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 07 11 8930

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	1 February 2008	Rosborough, John

CATEGORY OF CITED DOCUMENTS

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