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(54) **FIXING ARRANGEMENT**

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(57) **ABSTRACT**

A fixing arrangement in the edge region of a building element of, for example, concrete, has a close-to-edge anchoring in the building element, and a fiber reinforcement is attached to the building element by a bonded connection, for example by adhesive bonding, in the region of the anchoring. Preferably, the reinforcement extends over an edge onto an edge face of the building element.

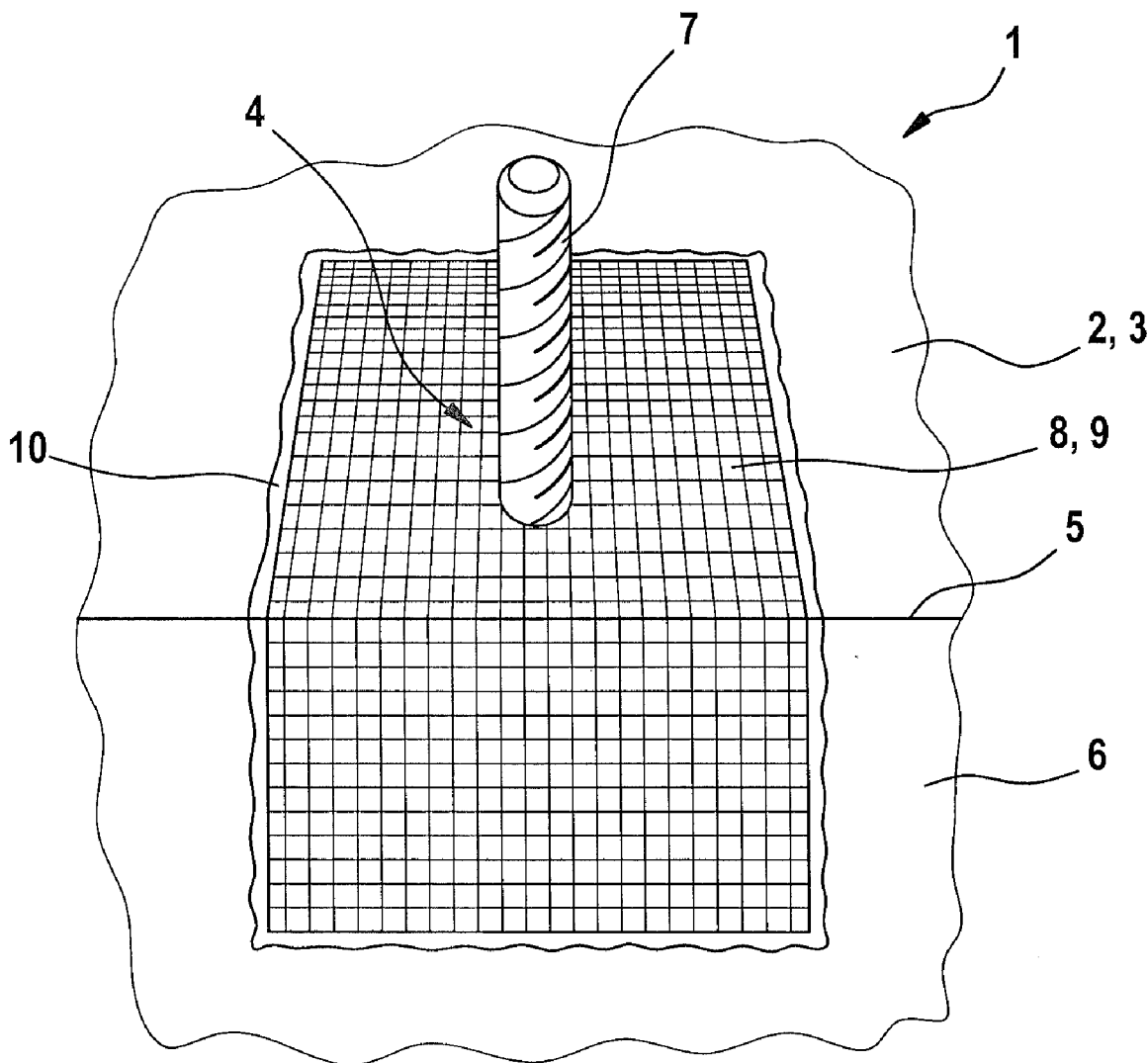
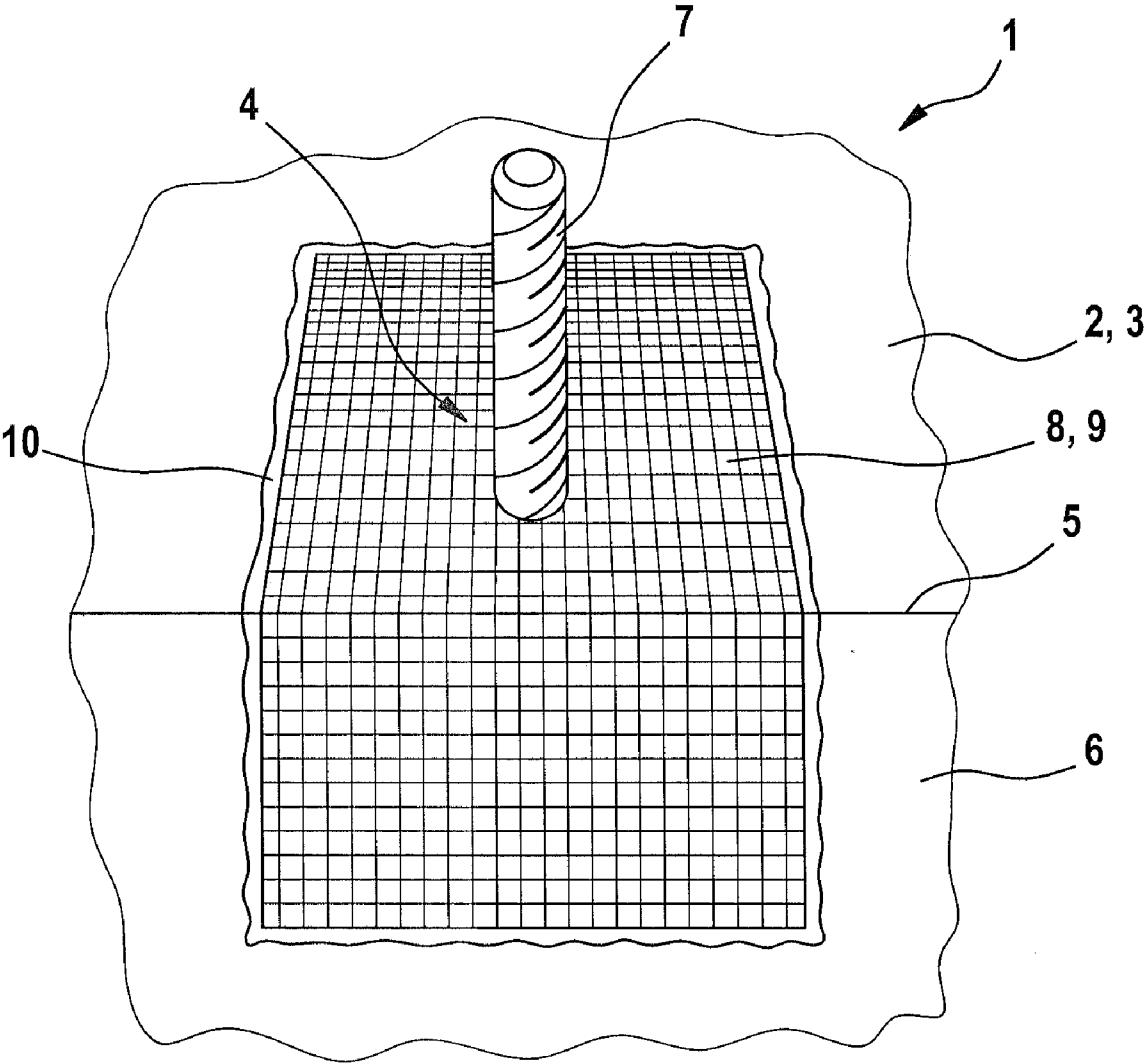


Fig. 1



FIXING ARRANGEMENT

CROSS-REFERENCE TO A RELATED APPLICATION

[0001] The invention described and claimed hereinbelow is also described in German Patent Application DE 10 2006 008 658.9 filed on Feb. 24, 2006. This German Patent Application, whose subject matter is incorporated here by reference, provides the basis for a claim of priority of invention under 35 U.S.C. 119(a)-(d).

BACKGROUND OF THE INVENTION

[0002] The invention relates to a fixing arrangement in the edge region of a stone-like building element and to a method of producing such a fixing arrangement.

[0003] The term "stone-like" is to be understood as meaning a material made of stone, brick, concrete, including aerated concrete, and the like. The material is especially concrete. The term "building element" means that the fixing is used on a building. The invention is described with reference to concrete but the invention is not limited to that material.

[0004] It is known to fix building components in a drilled hole in a building element, which is to say to anchor them in the building element, using, for example, fixing plugs or anchors. In the event of the anchoring's being subjected to transverse stress, a possible mode of failure is cracking of the building element. Particularly in the case of a close-to-edge anchoring, the risk of the building element's cracking is high. If the anchoring is spaced a sufficient distance from the edge, the risk of failure caused by cracking of the building element is avoided or in any case reduced. The risk of the building element's cracking is especially high when the anchoring is effected with expansible fixing plugs based on expansion force. Expansion-pressure-free anchorings are more advantageous but are generally more expensive. A typical application for a close-to-edge anchoring subject to high transverse force is the anchoring of railings.

SUMMARY OF THE INVENTION

[0005] The problem underlying the invention is to propose a fixing arrangement that reduces the risk of failure caused by cracking of the building element in the case of a close-to-edge anchoring.

[0006] The fixing arrangement according to the invention has a reinforcement which is attached to the building element by a bonded connection, for example by adhesive bonding, in the region of the anchoring. The reinforcement absorbs tensile forces of the building element which come into effect as a result of transverse forces acting on the anchoring and possibly as a result of an expansion action of the anchoring in the building element. The tensile stresses in the building element and accordingly the risk of cracking are reduced. The bonded connection between the reinforcement and the building element distributes the transmission of the forces acting in the building element to the reinforcement and vice versa by way of the surface of the reinforcement and is therefore regarded as advantageous for the force transmission. In addition, the reinforcement can be attached without drilling or other weakening of the building element. It will be understood that the fixing arrangement according to the invention can also be used in the region of a corner of a building element where two edges meet.

[0007] One construction in accordance with the invention provides a fiber reinforcement as reinforcement. For example, a fiber mat (scrim, woven fabric, mesh fabric, knitted fabric etc.) is adhesively bonded to the building element. Especially, a fiber direction transverse to the edge of the building element is used. As a result of the fiber reinforcement, the reinforcement has a high tensile load capacity. In addition, the fiber reinforcement adapts itself to the surface of the building element.

[0008] Preferably, the reinforcement extends in a direction from the anchoring as far as the edge of the building element and/or extends in the other direction towards the inside away from the edge of the building element. A reinforcement that has a large surface area and extends a considerable way towards the inside reduces the risk of the building element cracking. In a further development of the invention, the reinforcement extends over an edge in the edge region of the building element onto an edge face that adjoins an anchoring surface. The anchoring surface is the surface in which the anchoring is mounted. When the reinforcement is also attached to the edge face and extends onto the anchoring surface, the risk of the building element cracking is further reduced.

[0009] In the method according to the invention the reinforcement is attached to the building element by a bonded connection, for example by adhesive bonding, in a region surrounding the anchoring, and the anchoring is mounted in the reinforcement in the building element. Preferably, but not necessarily, first the reinforcement and then the anchoring is mounted.

[0010] The novel features which are considered as characteristic for the present invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The single FIGURE shows a perspective view of a fixing arrangement according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012] The fixing arrangement 1 according to the invention shown in FIG. 1 is arranged in the edge region of a building element 2. The building element 2 consists of concrete, which may be reinforced. The building element 2 can be, for example, a balcony slab or terrace slab or the transition from a roof surface to a wall surface. To explain the invention, the upper side of the building element 2 is designated the anchoring surface 3 hereinbelow, because an anchoring 4 is mounted therein according to the invention. A face of the building element 2 that adjoins via an edge 5 is referred to hereinbelow as edge face 6. The edge 5 and the edge face 6 constitute an edge region of the anchoring surface 3 and of the building element 2.

[0013] The anchoring 4 has an anchor 7 in the form of a threaded rod. The anchor 7 is anchored, that is to say fixed by a bonded connection, in a drilled hole (not visible in the drawing) in the building element 2 by means of a synthetic resin mortar. In principle, some other kind of anchoring

using, for example, an (expansible) fixing plug or an undercut anchor is also possible (not shown). The anchoring is arranged close to the edge, which is to be understood as being a spacing from the edge of about from 30 mm to 50 mm. The fixing arrangement according to the invention is possible also with a larger (or a smaller) edge spacing.

[0014] "Close-to-edge" in the sense of the invention is to be understood less as an absolute spacing from the edge and more as being determined by the risk of the building element's 2 cracking in the event of transverse stress being applied to the anchor 7, that is to say by the risk of a fragment's breaking away from the building element 2 together with the anchor 7 as a result of transverse stress with the anchor 7. Where the spacing from the edge is large, that risk does not arise or is in any case very low.

[0015] In the region of the anchoring 4, a reinforcement 8 is attached to the building element 2 by a bonded connection. The reinforcement 8 is a fiber reinforcement; it has a fiber mat (fiber scrim) 9. The fibers can be, for example, glass fibers, carbon fibers, plastics fibers or metal fibers. The fiber mat 9 surrounds the anchoring 4; it extends over the edge 5 and is applied to the edge face 6 of building element 2. On the anchoring surface 3, the fiber mat 9 extends from the edge 5, that is to say from the edge region of the building element 2, beyond the anchoring 4 towards the inside. The fiber mat 9 is impregnated with the synthetic resin mortar 10 and is thereby bonded to the building element 2. If the anchoring 4 is located in the region of a corner of the building element 2, the reinforcement 8 is extended from the anchoring surface 3 and is applied to both adjacent edge faces forming the corner and adhesively bonded thereto (not shown).

[0016] The anchoring 4 is used, for example, for fixing a railing (not shown); it can be subjected to transverse stress directed transversely relative to the edge region or away from the edge region. The reinforcement 8 reduces the risk of the building element's 2 cracking in the event of the anchoring 4 being subjected to such transverse stress; the anchoring 4 can be arranged relatively close to the edge of the building element 2.

[0017] According to the invention the fixing arrangement 1 is produced by adhesively bonding the fiber mat 9 to the anchoring surface 3 and the edge face 6, drilling a hole for the anchor rod 7 and anchoring the anchor rod 7 in the drilled hole with a synthetic resin mortar. Conversely, it is also possible first to make the anchoring 4 and then to attach the reinforcement 8 to the building element 2 by adhesive bonding. A fiber direction is preferably so chosen that fibers

of the reinforcement 8 run approximately at right angles to the edge 5, that is to say to the edge region of the building element 2.

[0018] It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of constructions differing from the type described above.

[0019] While the invention has been illustrated and described as embodied in a fixing arrangement, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

[0020] Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims:

1. A fixing arrangement provided in an edge region of a stone-like building element, comprising a close-to-edge anchoring provided in the building element; a reinforcement attached in a region of said anchoring; and bonding connection means attaching said reinforcement in said region of said anchoring.

2. A fixing arrangement as defined in claim 1, wherein said reinforcement has a fiber reinforcement.

3. A fixing arrangement as defined in claim 1, wherein said reinforcement is configured so that it extends as far as the edge region of the building element.

4. A fixing arrangement as defined in claim 1, wherein said reinforcement is configured so that it extends as far as an edge face of the building element that adjoins an anchoring surface in which said anchoring is mounted.

5. A fixing arrangement as defined in claim 1, wherein said reinforcement extends, from said anchoring, away from the edge region of the building element.

6. A method of producing a fixing arrangement in an edge region of a stone-like building element, comprising the steps of providing a close-to-edge anchoring in the building element; and attaching a reinforcement to the building element by a bonded connection in a region of the anchoring.

7. A method as defined in claim 6; and further comprising mounting the anchoring in the building element close to an edge.

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