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(54) Title: JOINING SYSTEM FOR TWO BUILDING ELEMENTS

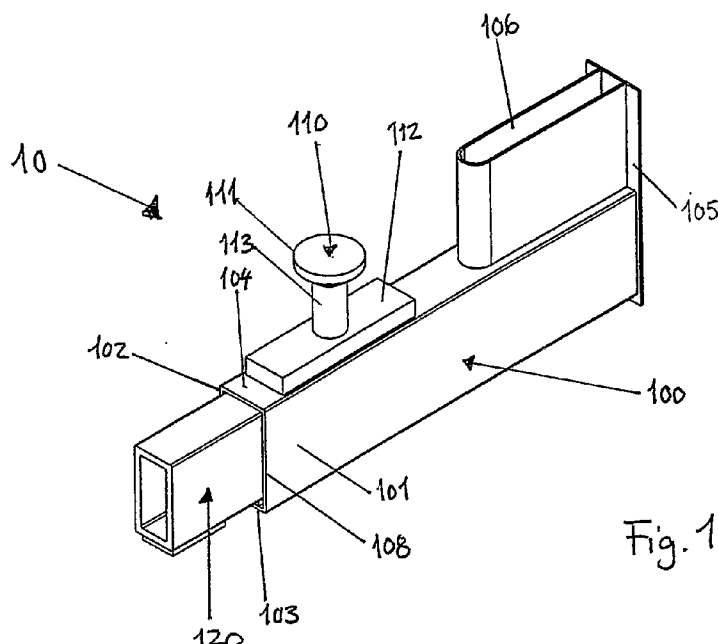


Fig. 1

(57) Abstract: The present invention relates to a joining system for securing a first building element (1) relative to a second building element (2), where a first part (10) comprises a box element (100) adapted to be cast in one of the building elements (1, 2). According to the invention a lifting element (110) is secured to the box element (100), which lifting element (110) comprises an attachment portion (111) adapted for cooperation with lifting equipment, which attachment portion (111) during an installation phase of the joining system is located relatively outside an outer side (3) of one of the building elements (1, 2) comprising the box element (100).

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Joining system for two building elements

The present invention relates to a joining system for joining two building elements where the joining system comprises an attachment device for easy handling of the building elements which have to be joined.

- 5 Such joining systems are normally used for joining a beam to a pillar or alternatively a step element in a staircase, or between two step elements. In a variant the joining system may comprise a box element mounted in the beam with a movable bridge element in the box element, which when the beam is lifted into the required position is guided out to an extended position where the bridge element abuts
10 against an abutment surface in the pillar, holding the beam in place by means of the weight of the beam. The space between beam and pillar can then be grouted.

There are several alternative solutions for joining systems. Another example is a hooking arrangement where the beam comprises a fastening device which is unhooked from a hook secured to the pillar or vice versa.

- 15 In all these solutions attempts will be made to lift a building element in order to position it in relation to the other building element with which it is to be joined. In order to construct large building, a plurality of lifting procedures will be required in order to lift all the building elements into position.

- 20 The object of the present invention is to provide a solution where building elements which have to be lifted in an easy and safe manner can be lifted for positioning relative to the building element with which they have to be joined. Another object is to provide a system which is cost-effective in production and use.

- 25 These objects are achieved with a joining system as indicated in the following independent claims, where further aspects of the invention are indicated in the dependent claims and the description below.

- 30 The joining system according to the invention is employed for joining and securing a first building element relative to a second building element. These two building elements may, for example, be a beam and a pillar or a step element and a staircase or two step elements. A first part of the joining system is mounted in one building element and a second part of the joining system is mounted in the second building element. Which part is mounted in which building element will depend on which building elements have to be joined and the situation in which the joining system is employed.

- 35 According to the invention the first part comprises a box element, preferably cast in one of the building elements, where a lifting element is secured to the first box element, which lifting element comprises an attachment portion which protrudes from an outer side of the building element that has to be lifted. Alternatively, the box

element may be secured to one of the building elements in another way, such as by welding, screwing or the like. In this application an outer side should be considered to be composed of the total surface of a side of the element. This outer side or the total surface may be composed of a main surface and at least one partial surface located inside and/or outside a plane in which the main surface is located, viewed in relation to the rest of the element, with the result that the partial surfaces may be composed of recesses or raised portions. The outer side therefore comprises both the main surface and the partial surfaces.

The attachment portion may be composed of a simple lift eye, a thickening portion, which may for example be spherical, more conically shaped, cube-shaped or be of another shape which may, for example, be a combination of the above or another shape, a hook portion, alternatively it may form a lift eye, thickening portion, hook portion, which is hinged relative to the rest of the lifting element, or alternatively another rapid coupling part for cooperation with an opposite rapid coupling part in the lifting equipment which has to lift the building element. A variant may also be envisaged where a lifting element comprises several attachment portions.

The lifting element may be secured to the box element in several ways, such as for example being welded to the box element before the box element is cast in the building element. Alternatively, the lifting element may be designed so that it is inserted in the box element before being cast in the building element which has to be lifted. In yet another variant, threaded portions may be provided on the box element where the lifting element is provided with interacting threads, thus enabling it to be screwed to the box element. In a variant the lifting element may be secured to a top wall of the box element, and in another variant it may be secured to a side wall of the box element. By having the lifting element secured to the box element before casting, a secure attachment of the lifting element will be achieved, while at the same time good force transfer is obtained from the lifting element via the box element and on into the building element that has to be lifted. It is also conceivable for several lifting elements to be secured to the same box element, where these several lifting elements may be mounted on the same side of the box element or on different sides, or with some on one side and some on another side.

The attachment portion of the lifting element will necessarily be located outside an outer side of the building element that has to be lifted after it has been cast. This can be achieved in several ways, one of which is that the attachment portion protrudes outside a main surface of the building element, in which case the main surface forms the outside of the building element. In another variant this can be achieved by the attachment portion of the lifting element being located in a recessed portion of the building element relative to a main surface of the rest of the building element, whereby it is still located outside an outer side of the building element, while at the same time it is within a surface coinciding with a main surface of the

building element. By grouting the space between the building elements that have to be joined, which is a normal procedure in such joining systems, this recessed portion of the building element can also be grouted, thereby providing a smooth uniform surface for the building element which was lifted. This surface will then normally be located in the same plane as the main surface of the building element. This recessed portion of the building element, which forms a partial surface, may be in the form of a step-down of the building element towards the end facing the other building element to which the first building element has to be attached, or a type of cavity may be envisaged in the main surface of the cast building element. This cavity may have a partly conical shape with the lifting element positioned substantially in the centre of the conical shape. Alternatively, the cavity may be provided with lead-in portions adapted for leading the lifting equipment in towards the attachment portion of the lifting element for easy joining thereof. In an embodiment this may be implemented, for example, if the attachment portion is a fixed ring, where the cavity is composed of two cavity portions leading in towards the hole in the fixed ring. This will guide a hook in towards the attachment portion of the lifting element. The conical shape will also help to guide the lifting equipment into the correct position with the attachment portion.

During use the attachment portion will normally be located at a substantially horizontal side of the building element, which horizontal side faces relatively upwards in relation to the rest of the building element. This facilitates the use of the attachment portion and the interaction of this attachment portion with any lifting equipment, which will often be a lifting crane.

The fact that the attachment portion is located in a relatively recessed portion of the building element also means that during transport the building element has no protruding parts outside a main surface of the building element, which is advantageous.

According to an aspect of the invention the box element has an open end and the first part of the joining system further comprises a travelling bridge element inside the box element, and internally movable between a retracted position substantially arranged inside the box element and an extended position where a portion of the bridge element is located outside the open end of the box element. The box element's open end is preferably arranged with the plane of the open end aligned with an outer surface of one of the building elements, with the result that it does not protrude outside a main surface of this side of this building element. This outer surface, with which the box element is aligned, will normally be a different outer surface of the building element that has to be lifted from the surface where the attachment portion of the lifting element is located. For a concrete beam, this can be done during the casting of the beam. The bridge element is mounted movably inside the box element, preferably in such a manner that in a retracted position it is located completely inside the box element.

According to an aspect of the invention the first part may also comprise an anchor element extending a distance out from an outer end of the bridge element and working in conjunction with a locking element in the second part in order to interlock the parts in a joined condition, thereby providing a tension anchoring of the system.

5 The joining system may furthermore comprise devices for restricting the movement of the bridge element relative to the box element to a maximum extended position, thereby preventing the bridge element from being moved further out than to the stopper device without further manipulation. The joining system may comprise devices on the box element and/or the bridge element which provide easy movement
10 of the bridge element relative to the box element both from a retracted to an advanced position but also from an advanced position to a retracted position. This may be implemented by means of guide rope, openings in the box element, the shape of the bridge element, etc.

The invention also comprises a method for joining two building elements such as,
15 for example, a landing slab in a staircase, where a number of box elements are mounted in the first building element, the landing slab, by casting the landing slab, where an open side of the box elements is arranged in alignment with an edge of the landing slab and where there is access in an upper side of the landing slab to a number of attachment portions of lifting elements secured to the cast box elements. In
20 the second building element, the staircase, there are provided corresponding cut-outs in proportion to the box elements, whereupon bridge elements are mounted in the box elements, the lifting equipment is secured to the attachment portions and lifted for positioning. When the open end of the box elements is located outside the cut-out, the bridge element is moved to an extended position with the result that a
25 portion of the bridge element is located inside the cut-out, and the landing slab is lowered until the bridge element abuts against a surface of the cut-out, whereupon the lifting equipment can easily be released from the stair landing.

The method may furthermore comprise placing a seal in the form of a sealing element along a lower edge and/or upper edge of the gap between landing slab and
30 staircase, and grouting compound is filled in the cavity in the first and second parts of the joining system and the gap and simultaneously in the recessed portion round the attachment portion of the lifting elements, with the result that all cavities in the joining system are filled, forming a smooth surface for the stair landing. A corresponding method will also be employed for, for example, a beam and a pillar. By
35 means of these steps the joining system is anchored against movement in a normally horizontal plane.

The invention will now be explained by a non-limiting embodiment with reference to the attached drawings, in which;

Fig. 1 is a perspective view of a first part for securing to or incorporation in a first building element,

Fig. 2 illustrates the device in fig. 1 viewed from above,

Fig. 3 illustrates the device in fig. 1 viewed from the side,

5 Fig. 4 is a perspective view of the box element in fig 1 alone,

Fig. 5 is a perspective view of the box element in fig. 1 alone,

Fig. 6 is a partial view of two building elements joined by a joining system according to the invention, and

Fig. 7 is a side view of the system in fig. 6.

10 In fig. 6 a joining system according to the invention is illustrated in use for joining a first building element 1 and a second building element 2. The building elements are shown before grouting a space 6 between the elements and a possible recessed portion 4.

15 A first part 10 of the joining system attached in or to the first building element 1 is illustrated in figures 1-3. This first part 10 comprises a box element 100, a lifting element 110 and a bridge element 120. The box element 100 with the lifting element is further illustrated in fig. 4 and the bridge element 120 is shown in fig. 5. The box element comprises a first and a second side wall 101, 102 connected via a bottom wall 103 and a top wall 104, thereby forming an internal cavity 107 in between
20 these walls. This internal cavity 107 has an open end 108 and an end closed by an end plate 105. At the internal end plate 105, moreover, an access opening 106 is provided leading into the internal end of the internal cavity. This access opening is composed of a hole in the top wall 104 which cooperates with an opening plate 109, which is bent into a U-shape where the tops of the U are connected to the end plate
25 105 and an end section of the U connected to the top wall 104, where a second end section of the U will be aligned with a main surface 31 of an outer side 3 of an building element 1.

The lifting element 110 comprises an attachment portion 111 comprising a conical extension 114 and a top flange 115, best illustrated in fig. 3, which conical extension is connected at its end opposite the top flange with a connecting rod 113, where
30 the connecting rod 113 has a smaller cross section than the top flange 115, with the result that the conical extension goes from a smaller cross section at the connecting rod 113 to a larger cross section at the top flange 115. At the end opposite the attachment portion 111, the connecting rod 113 is connected to a fixing plate 112, secured to the top wall 104 of the box element 100.
35

The bridge element 120 is also composed of two side walls 121, 122 and a bottom wall 123 and a top wall 124, as illustrated in fig. 5, thereby forming an internal open cavity 125. The bottom wall 123 is further provided with a first thickening portion 126a and a second thickening portion 126b, arranged with a space 127 along the bottom wall 123 of the bridge element 120. It is also conceivable for this thickening portion to be a whole plate or the like, and it may be a plate of uniform or varying thickness. The bridge element 120 comprises an internal end 128 arranged facing into the box element 100, where a restricting device 130 is mounted at the internal end 128. There is access to this restricting device 130 via the access opening 106 in the box element 100, as illustrated in fig. 2. It can also be seen here that the bridge element 20 illustrated in fig. 5 is rotated 180 degrees about a substantially horizontal axis relative to the bridge element which is depicted joined to the box element in figures 1-3. This restricting device 130 may be a threaded hole for screwing in a stopper element (not shown) which prevents the bridge element 120 from being pulled out beyond a maximum extended position relative to the box element without further manipulation of the elements, such as unscrewing the stopper element again. The bridge element 129 also comprises an outer end 129 located outside the box element 100 in an extended position of the bridge element, but which in a retracted position is located substantially at or inside the open end 108 of the box element 100.

As illustrated in figs. 6 and 7, when the first part 10 is mounted in the first building element 1, the attachment portion 111 of the lifting element 110 will be located outside an outer side 3 of the building element 1. This outer side 3 is composed of a main surface 31 located in an outer plane 30 composed of the building element 1 and a partial surface 32 composed of a recessed portion 4 of the building element 1. This recessed portion 4 therefore forms a cut-out in the main surface 31 of the building element, and this recessed portion 4 may be provided with guide devices 5, such as for example a partly spherical shape of the recessed portion 4. An end section of the opening plate 109 forming the access opening 106 is aligned with the main surface 31 of the building element 1. The open end 108 of the box element 100 is aligned with a side wall 7 of the first building element 1 facing the second building element 2. The bridge element 120 has its outer end 129 arranged inside a cavity 21 composed of the second part 20 of the joining system. In a bottom of this cavity 21 there may be provided a base plate 22. For completion of the joining process, the space 6 between the two building elements 1, 2 will be sealed in the lower edge and grouting compound will be added to the space in order to fill out the cavity 21 and the cavity 125 of the bridge element 120 and the cavity 107 and the access opening 106 of the box element 100, where the recessed portion 104 will also be filled with grouting compound, thereby forming a smooth surface for the building element 1. The access opening may be employed for moving the bridge element from a retracted position to an advanced position.

The invention has now been explained with reference to an embodiment. Many variants of this embodiment may be envisaged within the scope of the invention as defined in the following claims. In one variant the lifting element may comprise a fixing plate that forms a U-shape complementary to the box element's outer shape, where the fixing plate is secured to the box element by U-shaped legs. The lifting element may also be designed without a fixing plate, where the actual connecting rod is secured directly to the box element, to the top wall or, for example, to a side wall of the box element. In this case two lifting elements may also be affixed to the box element, one to each side wall of the box element. These two lifting elements may be arranged in a common recessed portion relative to a main surface of the building element. Variants may also be envisaged where features are employed from some embodiments together with features from other embodiments such as a sleeve-shaped fixing plate with a connecting rod secured to two opposite sides of the sleeve-shaped fixing plate, each with an attachment portion in each recessed portion. In another variant the two connecting rods may be connected to a common attachment portion located in a recessed portion of the building element, thereby forming a loop device as an attachment portion.

CLAIMS

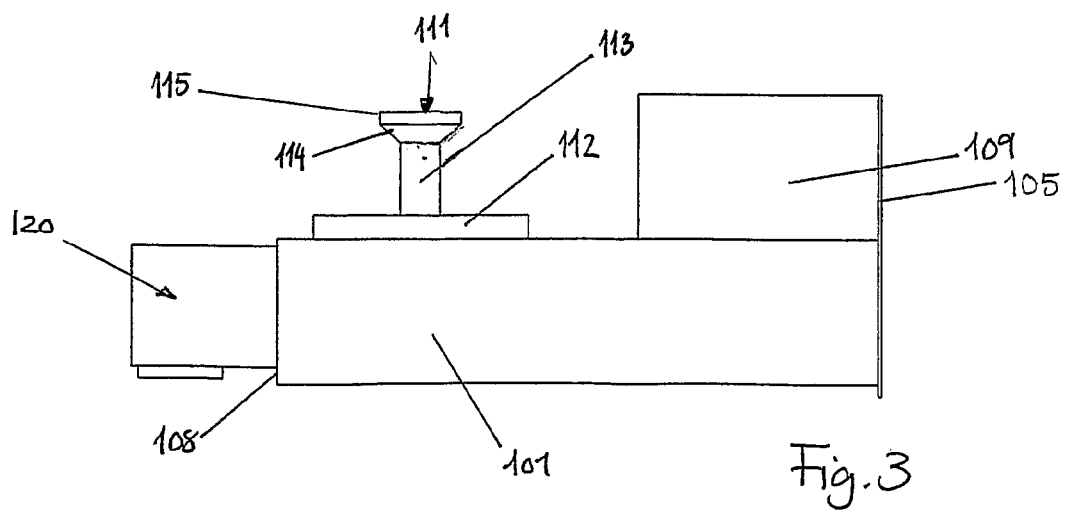
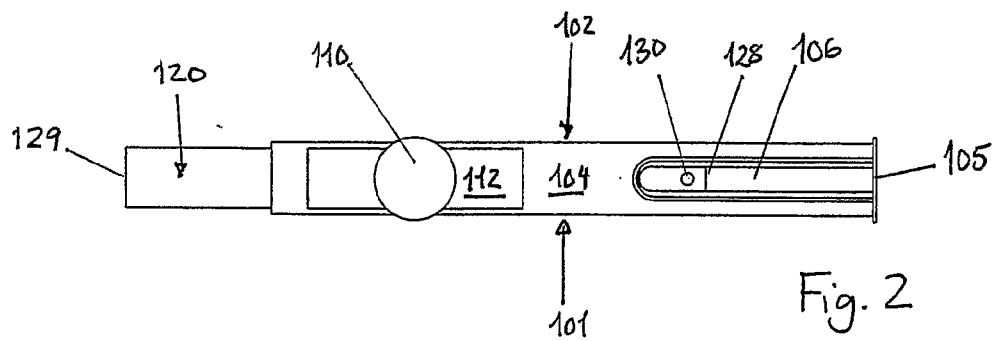
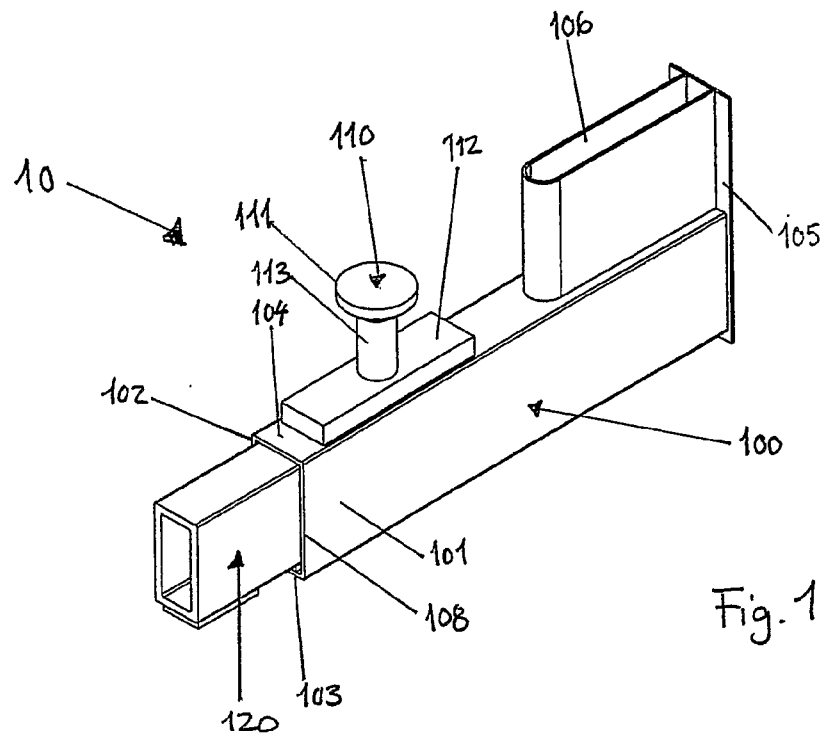
1. A joining system for securing a first building element (1) relative to a second building element (2), where a first part (10) of the joining system is adapted for mounting on one building element (1) and a second part (20) of the joining system is adapted for mounting on the second building element (2), which first part (10) comprises a box element (100) adapted to be cast in one of the building elements (1,2),
characterised in that a lifting element (110) is secured to the box element (100), which lifting element (110) comprises an attachment portion (111) adapted for cooperation with lifting equipment, which attachment portion (111) during an installation phase of the joining system is located relatively outside an outer side (3) of one of the building elements (1, 2) comprising the box element (100).
2. A joining system according to claim 1,
characterised in that the attachment portion (111) comprises devices (114, 115) for rapid coupling with a lifting equipment.
3. A joining system according to claim 1,
characterised in that the lifting element (110) comprises a fixing plate (112), and a connecting rod (113) connected to the outer attachment portion (111), where the fixing plate (112) is secured to the box element (100) and is connected to the connecting rod (113).
4. A joining system according to claim 3,
characterised in that the fixing plate (112) forms a sleeve element, which is arranged round the box element (100).
5. A joining system according to claim 1,
characterised in that in a utilisation condition, the attachment portion (111) is located in a portion (4) of the building element (1) to which it is mounted, which portion is recessed relative to the surface (3).
6. A joining system according to claim 5,
characterised in that the recessed portion (4) comprises devices (5) for guiding lifting equipment into engagement with the attachment portion (111).
7. A joining system according to claim 5,
characterised in that the attachment portion (111) is mounted within a plane (30) aligned with a main surface of the outer side (3) wherein it is located, with the result that the attachment portion (111) does not protrude beyond the building element's outer circumference.

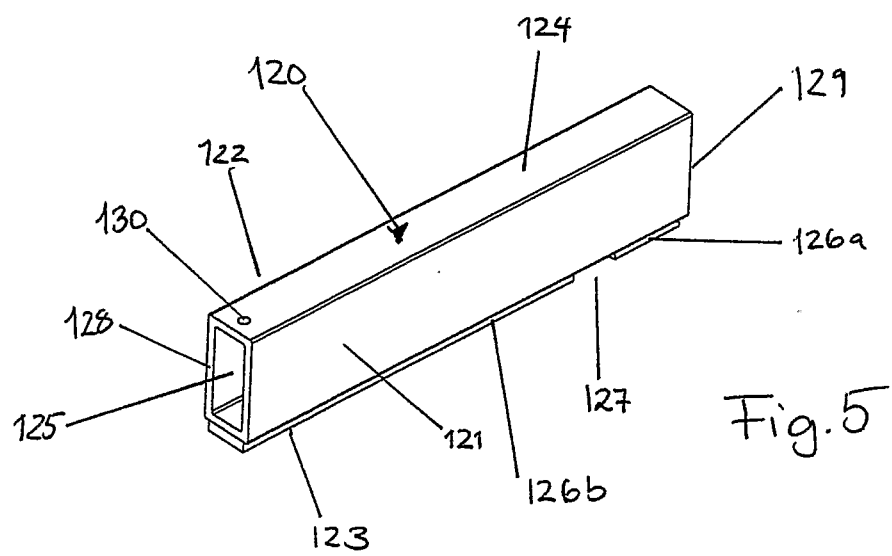
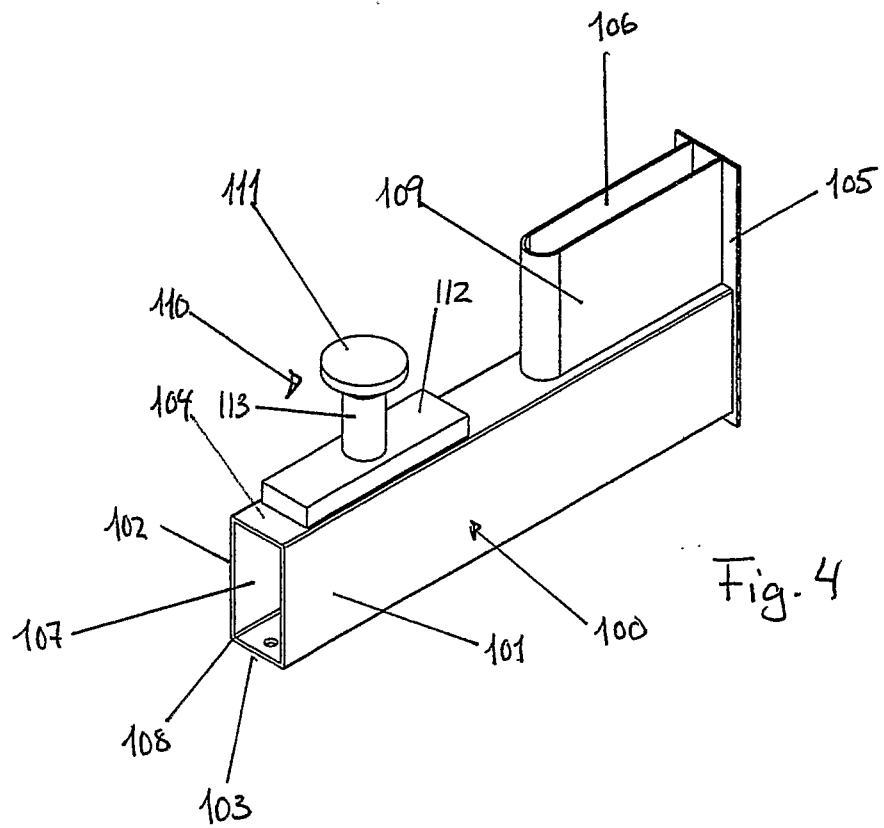
8. A joining system according to one of the above-mentioned claims, characterised in that the box element (100) is a substantially hollow element with an open end (108) aligned with a side (7) of the building element (1) which after mounting will face the second building element (2), where a bridge element (120) is mounted movably internally in the box element (100) from a substantially retracted position where it is located inside the box element (100) to an extended position where a portion of the bridge element is located outside the box element (100) and can go into engagement with a receiving opening (21) in the second building element (2), thereby interconnecting the building elements (1,2).

9. A joining system according to one of the above-mentioned claims, characterised in that the building element (1) comprising the box element (100) and the lifting element (110) is a cast building element (1).

10. A method for joining two building elements (1, 2), whereof at least one building element (1) is a cast element, characterised in that the desired number of box elements (100) is provided, to which the desired number of lifting elements (110) is attached, the box elements (100) with the secured lifting elements (110) are arranged in a casting mould with the result that after casting the attachment portion (111) of the lifting element (110) will be located outside an outer surface (3) of the building element (1), grouting compound is added to the casting mould and the building element (1) is set and brought to the user site, the bridge element (120) is placed in a retracted position inside the box element (100), lifting equipment is secured to the attachment portion (111) of the lifting element (110) and the building element (1) is lifted up to its position and joined by guiding the bridge element (120) to an extended position in engagement with the second building element (2), whereupon the lifting equipment is released from the first building element (1).

11. A method according to claim 10, characterised in that the attachment portion (111) is located in a portion (4) which is recessed relative to the rest of the outer circumference of the building element, which recessed portion (4) is grouted after joining of the building elements (1, 2), thereby forming a smooth outer surface of the building element (1).





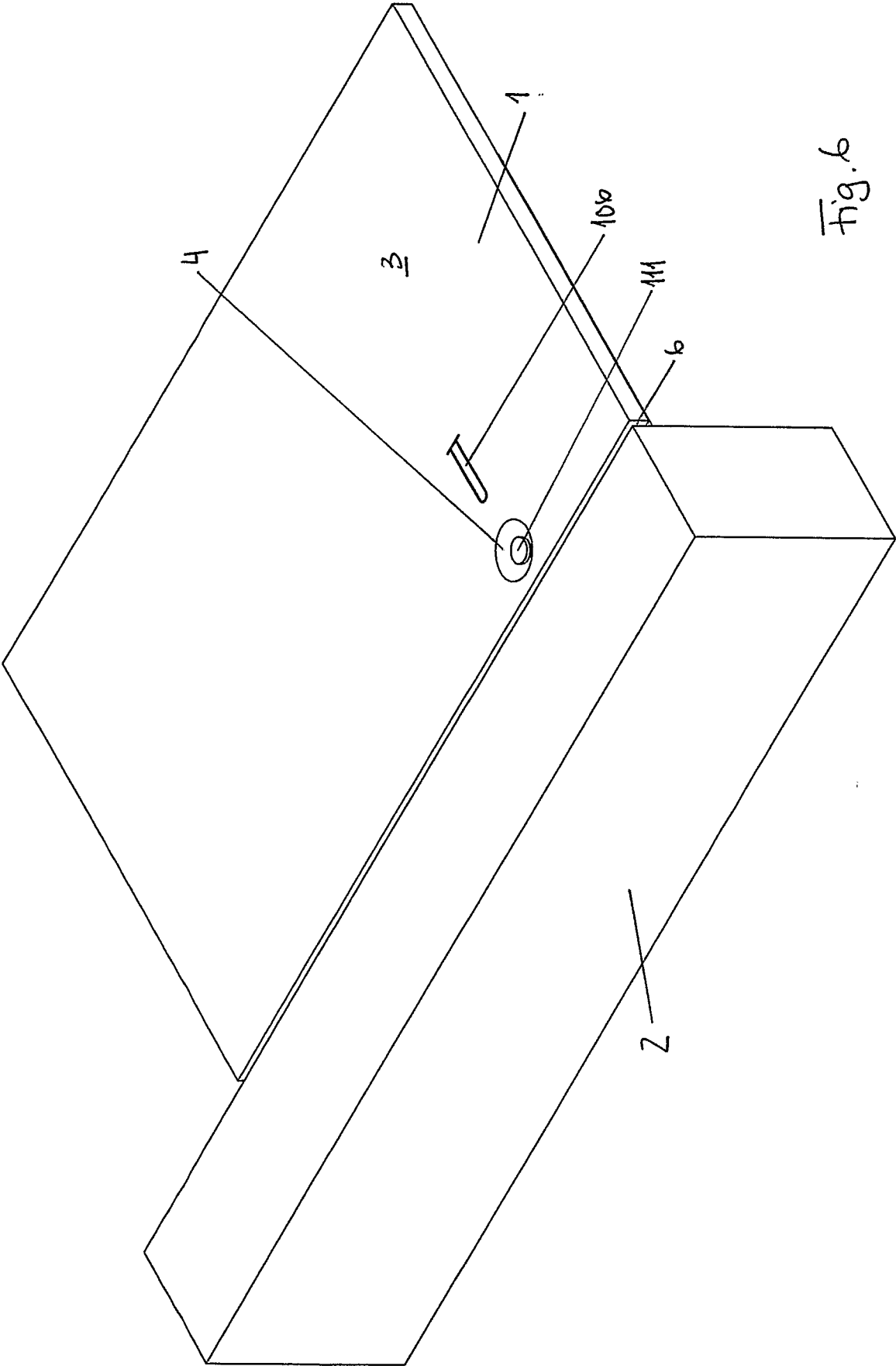


Fig. 6

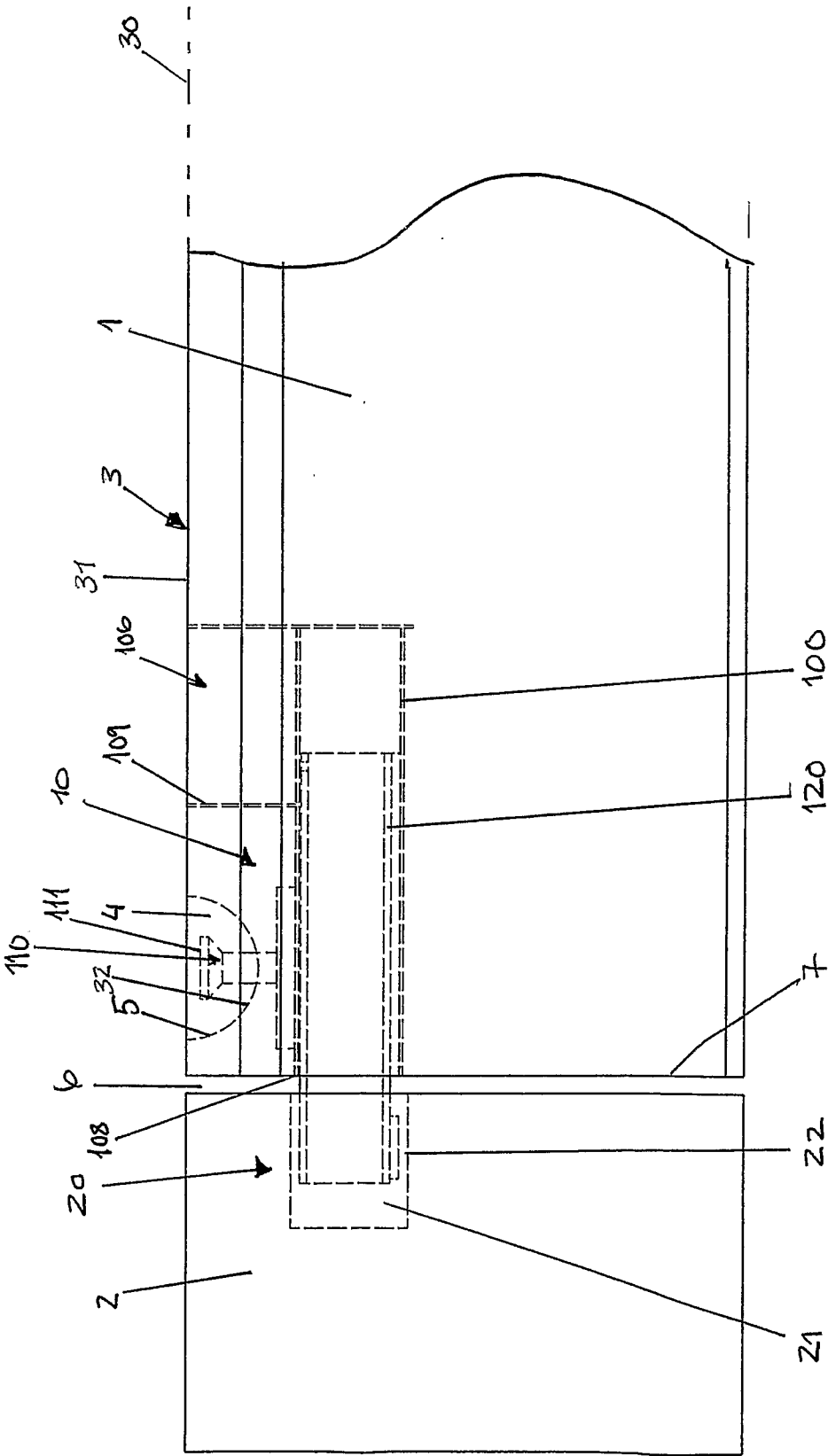


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2008/000269

A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04B, E04G, B28B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 8808059 A1 (OSTENPENN HOLDING A/S), 20 October 1988 (20.10.1988), figures 1-27, abstract --	1-11
A	WO 2007043892 A1 (SB PRODUKSJON AS), 19 April 2007 (19.04.2007), figures 1-6, abstract --	1-11
A	US 3993341 A (C.A. BENTLEY), 23 November 1976 (23.11.1976), figures 1-6, abstract --	1-11
A	EP 0230542 A1 (GEORG PRINZING GMBH & CO. KG BETONFORMEN- UND MASCHINENFABRIK), 5 August 1987 (05.08.1987), figures 1-3, abstract --	1-11

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

24 October 2008

Date of mailing of the international search report

28-10-2008

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO2008/000269

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1138456 A2 (MABA FERTIGTEILINDUSTRIE GMBH), 4 October 2001 (04.10.2001), figures 1-6, abstract -- -----	1-11

International patent classification (IPC)**E04B 1/21** (2006.01)**E04B 1/04** (2006.01)**E04B 1/41** (2006.01)**E04B 1/48** (2006.01)**Download your patent documents at www.prv.se**

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

Information on patent family members

30/08/2008

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