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(54) **Building element**

Bauelement

Élément de construction

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Description

[0001] The present invention concerns a building element for the construction of a wall or floor structure that is part of a building according to the introductions to claims 1 and 8.

[0002] DE 1927374 U discloses a building element according to the preamble of claim 1.

[0003] Buildings are normally erected according to two methods, as loose timber houses or as block-built houses. The term "loose timber house" denotes buildings where a ground plate is installed as a foundation, on which plate the walls are constructed using a framework that comprises a number of standing supportive beams that are fixed attached to the plate. The distance between the beams is adapted such that insulation of standard dimensions can be placed between the beams. The thickness of the wall, and thus the thickness of the insulation, can be supplemented, if required by the use of the building. Surface covering is then mounted in the form of a building sheet on the inner and outer surfaces of the beams, i.e. the inner and outer surfaces of the wall.

[0004] Floors or floor structures are built up in an equivalent manner through floor joists forming supportive elements, between which insulation is placed after a blind bottom or intermediate joists have been installed against the lower surface of the joists. A surface covering in the form of a building sheet is then placed on top of the joists.

[0005] This construction method requires relatively large amounts of work, and it may, furthermore, become problematical if the weather is poor. In addition, skilled craftsmen are required, since all parts must be installed on site.

[0006] A second type of house is that known as "block-built" or "prefabricated". All parts of the building are built in a factory in a controlled environment in jigs or templates. The building elements are constructed in sizes that allow transport of the parts by lorry to a prepared foundation, and they are relatively cheap when compared with equivalent sections build according to the loose timber principle.

[0007] The building elements are often added in a manner that is similar to the loose timber method described above, i.e. with beams that form the supportive members at a distance from each other forming cavities into which insulation is placed. Surface covering in the form of a building sheet is mounted onto at least one side of the beams, i.e. onto the inner or the outer surface of the wall. The floors are built in element form in an equivalent manner. The side of the floor members in which tension arises can be reinforced by a building sheet of a sheet of metal being attached to the lower surface of the joists.

[0008] One disadvantage of this method of building with respect to wall modules is that the large forces to which the wall elements are subject are absorbed by the wall beams. Large vertical forces arise if several wall elements are stacked onto each other when the building has several storeys, and when the structure is attached

to the walls at each storey. The wall elements, furthermore, are exposed to horizontal forces from the wind. With respect to the floor elements, compressive tension arises in the building sheet and in the section of the floor joists to which the sheet is attached when the floor joists are bent when under load. Tensile forces in the lower parts of the floor joists, i.e. those parts that are furthest away from the building sheet, arise at the same time.

A further disadvantage of this type of relatively light floor joist with high stiffness is that problems arise with the natural frequency and the impulse velocity response of the joist structure. A normal method of overcoming this disadvantage is that of pouring a concrete layer on top of the sheet, or adding mass to the joist structure by another means.

[0009] One aim of the present invention is to achieve a building element that fully or partially removes these disadvantages.

[0010] This aim is achieved through a building element that is built up from I-beams and an outer covering with self-supporting and vibration-damping properties.

[0011] An embodiment selected as an example will be described below with reference to the attached drawings, in which:

Figure 1A shows a sectional view of a building element according to the invention;

Figure 1B shows a sectional view of a second variant of a building element according to the invention;

Figures 1C and 1D show two variants of joining arrangements;

Figure 2A shows a perspective view of a building element;

Figure 2B shows a means of absorbing tensile force, in the form of a wire;

Figure 2C shows an example of a calculation model of a beam; and

Figures 3-6 show cross-sections of a beam with variants of the location of a means of absorbing tensile forces.

[0012] A building element 1 according to the invention comprises, as shown in Figures 1A and 2A, a framework 2 in the form of several extended I-beams 3 that extend in the longitudinal direction of the building element 1 essentially parallel and separated from each other. It is an advantage if the distance between the beams is adapted to common building standards, but it may be larger or smaller depending on the field of application and the load to which the element will be subjected. The I-beams 3 are attached by at least one edge to a surface element 4 in the form of a sheet element of sandwich design that forms an outer wall surface, an inner wall surface, or a floor surface, when the element 1 is used for the construction of a wall beam structure or floor joist structure. The I-beams 3 comprise an extended web 5 that demonstrates at its edges a first 6 and a second 7 longitudinal flange. It is an advantage if the flanges 6, 7 are manu-

factured from solid wood, laminated wood, wood-fibre material or a combination of these. The term "solid wood" is used in this respect to denote wooden flanges produced from one piece or from several pieces, for example, waste pieces from the trimmer in a saw mill, which are often joined end to end in a longitudinal direction using finger joints or another method.

[0013] The term "laminated wood" is used to denote plywood, i.e. relatively thin sheets of wood veneer, several of which have been glued together with the fibre directions crossing each other. A further type of laminated wood is that known as "LVL" sheets, which is a plywood in which the veneer sheets have been glued together with the directions of the fibres aligned in the same direction, i.e. parallel to each other. LVL sheets can be manufactured also in a manner in which the majority of the fibres are directed in the same direction, and this has been given the reference symbol "B" in Figure 1B. The term "majority" in this case is taken to denote that one or several, but not more than half, of the directions of fibres of the total number of layers of the layers that are components of the sheet are directed transverse to the direction of the remainder of the fibres, with the aim of stabilising the sheet with respect to changes in its shape. A further variant of laminated wood is glulam, where a number of solid pieces of wood are glued to each other to form a piece of wood.

[0014] The term "wood-fibre material" is here used to denote fibreboard, OSB (oriented strand board), chipboard, and similar sheets that have been formed by the wood being finely divided to various degrees, after which the finely divided material is compressed together, in the presence in certain cases of a binding agent, to form sheets. It is an advantage if the webs of the I-beams are manufactured from any one of these said wood-fibre materials, but it is possible to use also other types of material, such as metal or composite materials.

[0015] The flanges of the I-beam will in the description below be denoted as "pressure flange 6" and "tensile flange 7". The pressure flange 6 is that flange that absorbs the pressure forces that arise in the flange when the beam 3, according to a known calculation model that is shown as an example in Figure 2C, rests with one 6 of its flanges on a support at its ends and is loaded from above on the second flange 7 and with the building element 1 oriented in the manner shown in Figure 1. The tensile flange 7 is thus the flange in which tensile forces arise when the beam 3 is loaded according to the example described above, i.e. the tensile flange 7 is the flange onto which the beam rests against the support, and the pressure flange 6 is the flange onto which the load is directed. A supplementary means 8 of absorbing tensile force may be arranged at the tensile flange 7 in the event of high tensile forces, as will be described in more detail below.

[0016] The pressure flanges 6 of the I-beams 3 are attached to a surface element 4 in the form of a sheet element of sandwich design, as shown in Figures 1A and

2A. It is an advantage if the surface element 4 is glued to the pressure flanges 6 of the beams 3, but it can be attached by other methods such as gluing and screwing. The core 9 of the surface element 4 comprises a number of pieces 10 of timber in the form of planks or boards laying in edge-to-edge contact with each other. The pieces of timber can be of the complete length, or they may be of several pieces joined together in the longitudinal direction by, for example, finger joints, to form the complete length. The pieces of timber are glued together or joined together by another method to form a sheet-formed core 9, after which the two plane surfaces 11 of the core are covered with a surface material 12 in the form of a sheet of wood-fibre material of the type that has been described above that is glued, screwed, or in a similar manner attached to the plane surfaces 11 of the core 9. It is an advantage if the surface material 12 comprises a wood-fibre sheet.

The surface element 4 may also comprise a sheet of LVL material B as shown in Figure 1B, as has been described above. Furthermore, the surface element may comprise also a hay-based or straw-based fibre sheet. The surface element 4 may also be arranged at both flanges of the I-beams.

[0017] The building elements 1 formed from the I-beams 3 and the surface element 4 are manufactured in sizes that allow their transport on a lorry. It is intended that the building element 1 be used for at least one of wall construction and floor construction. When the element is to be used as a wall element, the building element is arranged essentially vertically, whereby the advantage is achieved that the vertical forces to which the wall is subjected are absorbed by both the I-beams 3 and the surface element 4. The stiffness of the surface element 4 ensures that also horizontal forces such as wind forces are efficiently absorbed.

[0018] When the building element 1 is to be used as a floor element or a floor joist element the building element 1 is placed in an essentially horizontal position as shown in Figure 2A. In most cases, the end parts of the element rest on support points or supports A whereby the surface element 4 is intended to constitute the surface of the floor. When the surface element 4 is loaded by a weight, the extreme case of which is when the sheet is loaded centrally between the support points A on which the element is resting, the beams 3 are bent downwards by the weight. The compressive forces that are formed as a result of the load arise in the plane 13 of the surface element 4 and in the pressure flange 6 at the beam 3. The timber 10 in the form of planks or boards in the core 9 of the surface element 4 is, for this reason, arranged with the fibres oriented in a direction that coincides with the direction of the beams 3. The pressure forces can in this way be efficiently absorbed since wood has a greater strength, particularly with respect to compressive forces, in the longitudinal direction of the fibres than in the transverse direction. The compressive forces, furthermore, are absorbed also in the pressure flanges 6 of the I-

beams, but the forces remain lower in the pressure flanges 6 than the compressive forces that the beams absorb in conventional building elements, since the surface element 4 absorbs a large part of the forces. Also a second element (not shown in the drawings) may, if required, be attached to the tensile flanges 7 of the I-beams 3, forming an inner ceiling for the storey that lies below the current storey in the building.

[0019] The compressive forces C arise, when a force F exerts a load as specified by the example described above and shown in Figure 2C, above the central point M of the beam. Tensile forces T arise at the same time in the tensile flange.

[0020] The second flanges 7, the tensile flanges, of the I-beams are thus subject to tensile forces. In order to absorb these forces more effectively, the tensile flanges 7 can be provided with a means that absorbs tensile forces that extends along the complete flange, as can be seen in different embodiments in Figures 3-6. The tensile flange 7 is provided in Figure 3 with a recess or a groove 14 that has been milled out in the edge of the flange 7 that is located furthest away from the surface element 4. A means 8 of absorbing tensile forces in the form of a strip, wire or extended plate of a material with high tensile strength is attached in the groove 14. Examples of such materials are metals and fibre composites. A strip of carbon fibre has been used in the embodiment that is shown in Figure 3, but it should be realised that also other fibre composite material, such as glass fibre, can be used.

[0021] In a further embodiment that is shown in Figure 4, an extra layer of wood 15 may be placed over the groove 14 after the means 8 of absorbing tensile forces has been placed into the groove 14. In a further embodiment shown in Figure 5, at least the tensile flange 7 comprises laminated wood 16, while also the pressure flange 6 may comprise laminated wood, whereby the means 8 of absorbing tensile forces may constitute one layer of the laminate. The means of absorbing tensile forces may also be glued or by another method attached directly to the edge of the tensile flange that is located farthest away from the sheet, as shown in Figure 6.

[0022] In a further embodiment that is shown in Figure 2B, the means 8 of absorbing tensile forces is a wire 8:1 that is attached to a pair of holders 8:2 in association with the two ends of the pressure flange 6. The wire runs from its first attachment point at the pressure flange 6 obliquely over the web 5 to the tensile flange 7. The tensile flange 7 is arranged with running wheels or running paths 8:3 into which the wire is fixed in a manner that allows guided displacement along its longitudinal direction. The running paths are arranged a certain distance in from the ends of the tensile flange 7, one at each end, suitably at a location that gives the wire a gradient of between 20-60° from the tensile flange, depending on the span of the beam. The wire 8:1 runs from the tensile flange 7 obliquely over the web 5 back again to the pressure flange 6 and its second attachment point. It is appropriate that the wire is attached to the holders with a

nut 8:4, and that a washer 8:5 is arranged between the nut and the holder. The washer 8:5 may be of a vibration-damping material. The wire and thus the I-beam can be placed under pretension with the nuts.

[0023] The design of the surface element 4, with a core 9 of solid wood and surface material 12 of wood-fibre sheet, together with the design of the I-beams 3, ensure that also the vibration or "give" that is normally experienced with wooden structures are avoided. The weight of the surface element 4 ensures that the building element 1 has an inertia that damps the said vibrations. What are known as "nogging pieces" 18 of I-beams can be mounted between the I-beams as shown in Figure 1, in order to strengthen the construction further and in order to facilitate the manufacture of the element. The nogging pieces may also comprise normal wooden beams, without webs, cut to suitable lengths.

[0024] Joining pieces 19 are arranged at the edges 20 of the element forming a male element and a female element, when joining several building elements 1 together. The joining piece 19 in one embodiment is constructed as a stair seen in cross-section, as shown in Figure 1D. This stair form is formed transverse to the direction of the fibres of the edges 20 of the surface element 4 through the edges being provided with rebates 21. One side of the surface element 4, when the surface element is viewed from above as is shown in Figure 2, is arranged with a female element 22 designed as an upwardly facing rebate that forms a resting plane surface at its upper surface. The opposite side of the surface element 4 is provided with a corresponding recess in the form of a male element with a downwardly facing rebate with its downwardly facing surface forming a contact surface. When two building elements are located in essentially the same plane and are to be joined, the contact surface of the first building element is thus placed onto the resting plane surface of the second building element, i.e. one rebate is placed into the other, whereby a joint is formed. It is an advantage if a fixing agent, such as glue or jointing mastic, is placed onto one of the rebates before the joining sections are placed in contact with each other and subsequently joined together with joining means, for example nails or screws.

[0025] The joining takes place in a further embodiment through shape-defined locking as shown in Figure 1C. The two joining sections are located in the same manner as that described above, but the rebates are designed such that a wedging effect is achieved. The rebate of one of the pieces is designed as a male element with a wedged tip 24 facing downwards. The opposite side of the surface element 4 is provided with an equivalent recess that forms a female element with an open wedged groove 25 facing upwards. When two building elements are to be joined, one building element is thus placed with the female element of the joining section with the open wedged groove 25 facing upwards, after which the second building element with the male element of the joining section with the downwardly facing wedge 24 is intro-

duced into the open wedged groove. This gives a joint that when placed under load by its own weight presses the building elements 1 in a direction towards each other. It should be realised that the joints with wedging effect can be turned in the other direction, i.e. the wedge 24 facing upwards and the wedged groove 25 facing downwards. It should also be realised that also other types of joint are possible, such as, for example, in the form of a tongue and groove arranged at the edges of the surface element.

[0026] The joining sections may be arranged also along the direction of the fibres in the core of the surface element, and they may be arranged also at all edges of the surface element, i.e. both along and across the direction of the fibres, of one or a combination of the joining methods described above.

[0027] The present invention is not limited to what has been described above and shown in the drawings: it can be changed and modified within the scope of the innovative concept specified in the attached patent claims.

Claims

1. A building element (1) for the construction of a wall or floor structure that belongs to a building, comprising a framework (2) in the form of several I-beams (3) that extend in the longitudinal direction of the building element (1) where each I-beam (3) demonstrates a web (5) with a first (6) and a second (7) flange that extend along the edges of the web (5), and a flat surface element (4) to which one flange (6) of each I-beam is attached, wherein the flat surface element (4) is of sandwich design comprising a core (9) of a material with fibres, **characterised in that** the majority of said fibres are oriented along the longitudinal direction of the I-beams (3).
2. The building element according to claim 1 whereby the webs (5) of the I-beams (3) are arranged perpendicular to the surface element (4).
3. The building element according to any one of the preceding claims, whereby the core (9) of the surface element (4) comprises several pieces of wood (10) in the form of planks or boards joined together edge-to-edge along the longitudinal direction of the building element (1).
4. The building element according to claim 3, whereby the pieces of wood (10) are joined together by gluing.
5. The building element according to any one of the preceding claims, whereby the surface of the surface element (4) that is adjacent to the flanges (6) of the I-beams (3) are arranged with a surface material (12) in the form of a wood-fibre sheet.
6. The building element according to any one of the preceding claims, whereby the two surfaces of the surface element (4) are arranged with a surface material (12) in the form of a wood-fibre sheet.
7. The building element according to any one of the preceding claims, whereby the web (5) of the I-beams (3) and the flanges (6, 7) comprise wooden material or wood-fibre material, or both.
8. The building element (1) according to claim 1 for a floor structural element, **characterised in that** one of the flanges (6, 7) of the I-beam (3) is arranged with a means (8) of absorbing tensile forces in order to absorb tensile forces in the flange.
9. The building element according to claim 8, whereby the fibres of the core (9) are oriented along the longitudinal direction of the I-beams (3).
10. The building element according to claim 8, whereby the means (8) of absorbing tensile forces is arranged at the flange (7) that is located farthest away from the surface element (4).
11. The building element according to any one of claims 8-10 whereby the means (8) of absorbing tensile forces is recessed into the flange (7).
12. The building element according to any one of claims 8-11 whereby the means (8) of absorbing tensile forces is attached to the flange (7) by an adhesive.
13. The building element according to any one of claims 8-12 whereby the means (8) of absorbing tensile forces comprises a metal strip or metal wire.
14. The building element according to claim 13 whereby the wire (8:1) or the metal strip is fixed in a manner that allows adjustment to the ends of the pressure flange (6) and is attached in a means that allows guided displacement to sections (8:3) of the tensile flange (7).
15. The building element according to any one of claims 8-12 whereby the means (8) of absorbing tensile forces comprises a strip of fibre composite.
16. The building element according to claim 15, whereby the fibre composite comprises carbon fibre or glass fibre.
17. The building element according to any one of claims 8-16 whereby the means of absorbing tensile forces extends along the complete flange (6, 7) and coincides with the direction of the tensile force.
18. The building element according to any one of claim

8-17 whereby the means (8) of absorbing tensile forces is arranged at the two flanges (6, 7) of the I-beam (3).

19. The building element according to either of claim 1 or 8, whereby at least two of the edges (20) of the surface element (4) are provided with joining sections (19) for the joining of two building elements (1) to each other.
20. The building element according to claim 19, whereby the joining sections (19) comprise rebates (21) that fit into each other, one inside the other.
21. The building element according to claims 19-20 whereby the joining sections (19) extend across the direction of the fibres in the core (9) of the surface element (4).
22. The building element according to any one of claims 19-21 whereby the joining sections (19) extend along the direction of the fibres in the core (9) of the surface element (4).
23. The building element according to any one of claims 19-22, whereby the joining takes place through shape-defined locking.

Patentansprüche

1. Bauelement (1) zur Konstruktion einer zu einem Gebäude gehörenden Wand- oder Bodenstruktur, umfassend eine Rahmenkonstruktion (2) in Form mehrerer I-Balken (3), welche sich in der Längsrichtung des Bauelements (1) erstrecken, wobei jeder I-Balken (3) eine Bahn (5) mit einem ersten (6) und einem zweiten (7) Flansch darstellt, welche sich entlang den Rändern der Bahn (5) erstrecken, und ein flaches Oberflächenelement (4), an welchem ein Flansch (6) jeweils eines I-Balkens befestigt ist, wobei das flache Oberflächenelement (4) eine Sandwich-Bauweise umfassend einen Kern (9) aus einem Fasermaterial aufweist, **dadurch gekennzeichnet, dass** die Mehrheit der Fasern entlang der Längsrichtung der I-Balken (3) ausgerichtet sind.
2. Bauelement nach Anspruch 1, wobei die Bahnen (5) der I-Balken (3) senkrecht zum Oberflächenelement (4) angeordnet sind.
3. Bauelement nach einem der vorgehenden Ansprüche, wobei der Kern (9) des Oberflächenelements (4) mehrere Stücke aus Holz (10) in Form von Bohlen oder Brettern umfasst, welche von Kante zu Kante entlang der Längsrichtung des Bauelements (1) miteinander verbunden sind.
4. Bauelement nach Anspruch 3, wobei die Stücke aus Holz (10) durch Kleben miteinander verbunden sind.
5. Bauelement nach einem der vorgehenden Ansprüche, wobei diejenige Oberfläche des Oberflächenelements (4), die sich an die Flansche (6) der I-Balken (3) angrenzend befindet, mit einem Oberflächenmaterial (12) in Form einer Schicht aus Holzfasern angeordnet ist.
6. Bauelement nach einem der vorgehenden Ansprüche, wobei die beiden Oberflächen des Oberflächenelements (4) mit einem Oberflächenmaterial (12) in Form einer Schicht aus Holzfasern angeordnet sind.
7. Bauelement nach einem der vorgehenden Ansprüche, wobei die Bahn (5) der I-Balken (3) und die Flansche (6, 7) Holzmaterial oder Holzfasermaterial oder beides umfassen.
8. Bauelement (1) nach Anspruch 1 für ein Bodenstrukturelement, **dadurch gekennzeichnet, dass** einer der Flansche (6, 7) des I-Balkens (3) mit einem Mittel (8) zur Aufnahme von Zugkräften versehen ist, um Zugkräfte in dem Flansch zu absorbieren.
9. Bauelement nach Anspruch 8, wobei die Fasern des Kerns (9) entlang der Längsrichtung der I-Balken (3) ausgerichtet sind.
10. Bauelement nach Anspruch 8, wobei das Mittel (8) zur Aufnahme von Zugkräften an demjenigen Flansch (7) angeordnet ist, der von dem Oberflächenelement (4) am weitesten entfernt liegt.
11. Bauelement nach einem der Ansprüche 8-10, wobei das Mittel (8) zur Aufnahme von Zugkräften in den Flansch (7) vertieft eingelassen ist.
12. Bauelement nach einem der Ansprüche 8-11, wobei das Mittel (8) zur Aufnahme von Zugkräften durch einen Klebstoff an dem Flansch (7) befestigt ist.
13. Bauelement nach einem der Ansprüche 8-12, wobei das Mittel (8) zur Aufnahme von Zugkräften einen Metallstreifen oder einen Metalldraht aufweist.
14. Bauelement nach Anspruch 13, wobei der Draht (8:1) oder der Metallstreifen in einer solchen Weise befestigt ist, die eine Justierung in Bezug auf die Enden des Druckflansches (6) erlaubt, und in einem Mittel befestigt ist, welches einen geführten Versatz auf Abschnitte (8:3) des Zugflansches (7) erlaubt.
15. Bauelement nach einem der Ansprüche 8-12, wobei das Mittel (8) zur Aufnahme von Zugkräften einen Streifen aus einem Faserverbundwerkstoff aufweist.

16. Bauelement nach Anspruch 15, wobei der Faserverbundwerkstoff Kohlefaser oder Glasfaser aufweist.
17. Bauelement nach einem der Ansprüche 8-16, wobei sich das Mittel zur Aufnahme von Zugkräften entlang dem gesamten Flansch (6, 7) erstreckt und mit der Richtung der Zugkraft zusammenfällt.
18. Bauelement nach einem der Ansprüche 8-17, wobei das Mittel (8) zur Aufnahme von Zugkräften an den beiden Flanschen (6, 7) des I-Balkens (3) angeordnet ist.
19. Bauelement nach Anspruch 1 oder 8, wobei mindestens zwei der Ränder (20) des Oberflächenelements (4) mit Verbindungsabschnitten (19) zur Verbindung zweier Bauelemente (1) miteinander versehen sind.
20. Bauelement nach Anspruch 19, wobei die Verbindungsabschnitte (19) Falze (21) aufweisen, die zueinander ineinandergreifend passen.
21. Bauelement nach den Ansprüchen 19-20, wobei sich die Verbindungsabschnitte (19) quer zur Richtung der im Kern (9) des Oberflächenelements (4) enthaltenen Fasern erstrecken.
22. Bauelement nach den Ansprüchen 19-21, wobei sich die Verbindungsabschnitte (19) entlang der Richtung der im Kern (9) des Oberflächenelements (4) enthaltenen Fasern erstrecken.
23. Bauelement nach einem der Ansprüche 19-22, wobei das Verbinden durch eine formdefinierte Verriegelung erfolgt.

Revendications

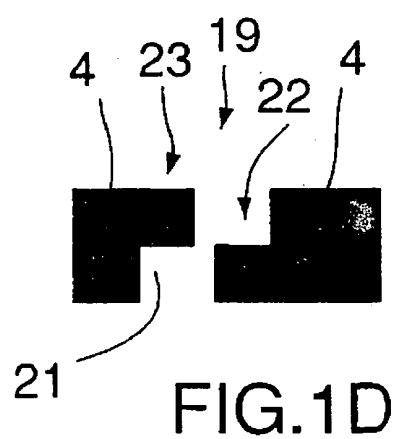
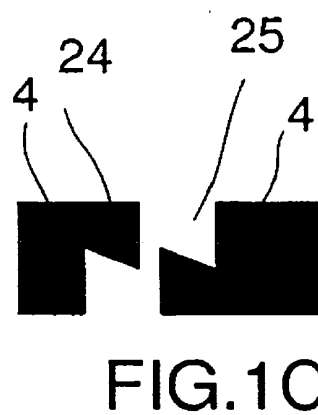
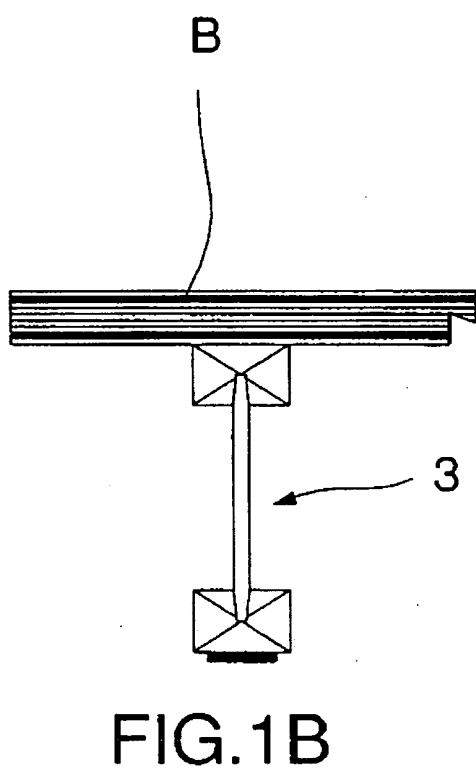
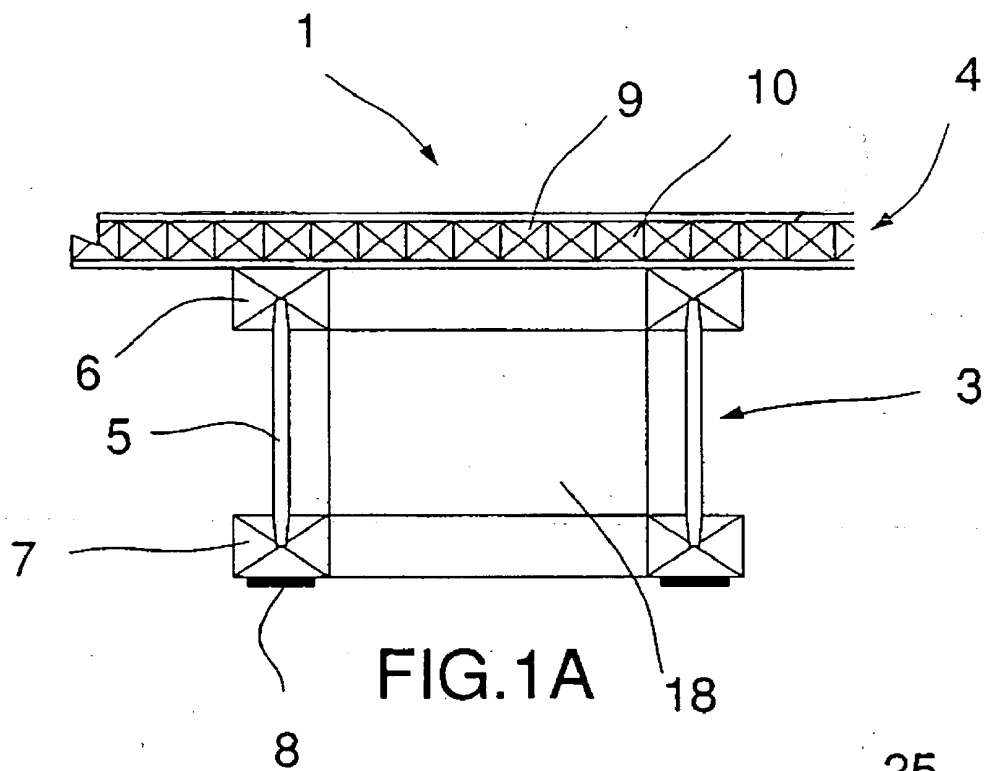
1. Élément de construction (1) pour la construction d'une structure de paroi ou de plancher appartenant à un bâtiment, comprenant un cadre (2) sous la forme de plusieurs poutres en I (3) qui s'étendent dans la direction longitudinale de l'élément de construction (1), chaque poutre en I (3) présentant une bande (5) avec une première (6) et une deuxième (7) bride qui s'étendent le long des bords de la bande (5), et un élément de surface plan (4) auquel une bride (6) de chaque poutre en I est fixée, l'élément de surface plan (4) étant d'une construction en sandwich comprenant une âme (9) d'un matériau de fibres, **caractérisé en ce que** la majorité desdites fibres sont orientées le long de la direction longitudinale des poutres en I (3).
2. Élément de construction selon la revendication 1, dans lequel les bandes (5) des poutres en I (3) sont

disposées perpendiculairement à l'élément de surface (4).

3. Élément de construction selon l'une quelconque des revendications précédentes, dans lequel l'âme (9) de l'élément de surface (4) comprend plusieurs pièces de bois (10) sous la forme de planches ou panneaux assemblés les uns aux autres bord à bord le long de la direction longitudinale de l'élément de construction (1).
4. Élément de construction selon la revendication 3, dans lequel les pièces de bois (10) sont assemblées entre elles par collage.
5. Élément de construction selon l'une quelconque des revendications précédentes, dans lequel la surface de l'élément de surface (4) qui est adjacente aux brides (6) des poutres en I (3) est pourvue d'un matériau de surface (12) dans la forme d'une feuille de fibre de bois.
6. Élément de construction selon l'une quelconque des revendications précédentes, dans lequel les deux surfaces de l'élément de surface (4) sont pourvues d'un matériau de surface (12) dans la forme d'une feuille de fibre de bois.
7. Élément de construction selon l'une quelconque des revendications précédentes, dans lequel la bande (5) des poutres en I (3) et les brides (6, 7) comprennent un matériau en bois ou un matériau en fibres de bois, ou les deux.
8. Élément de construction (1) selon la revendication 1 pour un élément de structure de plancher, **caractérisé en ce que** l'une des brides (6, 7) de la poutre en I (3) est pourvue d'un moyen (8) d'absorption des forces de traction afin d'absorber des forces de traction dans la bride.
9. Élément de construction selon la revendication 8, dans lequel les fibres de l'âme (9) sont orientées le long de la direction longitudinale des poutres en I (3).
10. Élément de construction selon la revendication 8, dans lequel le moyen (8) d'absorption des forces de traction est disposé à la bride (7) qui se trouve plus éloignée de l'élément de surface (4).
11. Élément de construction selon l'une quelconque des revendications 8 à 10, dans lequel le moyen (8) d'absorption des forces de traction est encastré dans la bride (7).
12. Élément de construction selon l'une quelconque des revendications 8 à 11, dans lequel le moyen (8) d'absorption des forces de traction est attaché à la bride

(7) par un adhésif.

13. Élément de construction selon l'une quelconque des revendications 8 à 12, dans lequel le moyen (8) d'absorption des forces de traction comporte une bande métallique ou un fil métallique. 5
14. Élément de construction selon la revendication 13, dans lequel le fil (8:1) ou la bande métallique est fixé (e) d'une manière qui permet l'ajustement aux extrémités de la bride de pression (6) et est attaché(e) dans un moyen qui permet un déplacement guidé à des sections (8:3) de la bride de traction (7). 10
15. Élément de construction selon l'une quelconque des revendications 8 à 12, dans lequel le moyen (8) d'absorption des forces de traction comporte un composite de fibres. 15
16. Élément de construction selon la revendication 15, dans lequel le composite de fibres comprend des fibres de carbone ou des fibres de verre. 20
17. Élément de construction selon l'une quelconque des revendications 8 à 16, dans lequel le moyen d'absorption des forces de traction s'étend le long de la bride intégrale (6, 7) et coïncide avec la direction de la force de traction. 25
18. Élément de construction selon l'une quelconque des revendications 8 à 17, dans lequel le moyen (8) d'absorption des forces de traction est arrangé aux deux brides (6, 7) de la poutre en I (3). 30
19. Élément de construction selon l'une ou l'autre de la revendication 1 ou 8, dans lequel au moins deux des bords (20) de l'élément de surface (4) sont pourvus de sections de jonction (19) pour la jonction de deux éléments de construction (1) l'un à l'autre. 35
40
20. Élément de construction selon la revendication 19, dans lequel les sections de jonction (19) comprennent des feuillures (21) qui s'insèrent l'une dans l'autre, l'une à l'intérieur de l'autre. 45
21. Élément de construction selon les revendications 19 à 20, dans lequel les sections de jonction (19) s'étendent à travers la direction des fibres dans l'âme (9) de l'élément de surface (4). 50
22. Élément de construction selon les revendications 19 à 21, dans lequel les sections de jonction (19) s'étendent le long de la direction des fibres dans l'âme (9) de l'élément de surface (4). 55
23. Élément de construction selon l'une quelconque des revendications 19 à 22, dans lequel la jonction a lieu à travers le verrouillage défini par la forme voulue.



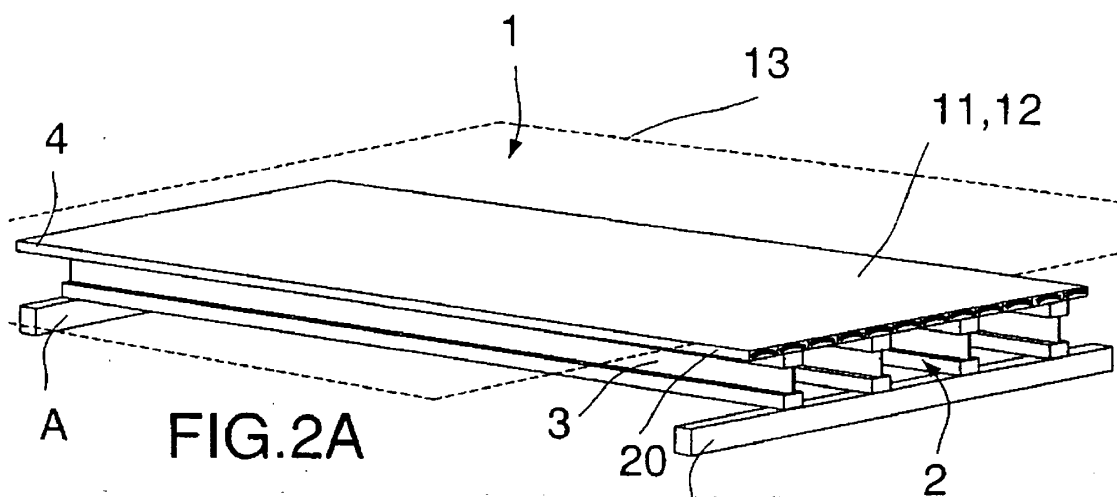


FIG. 2A

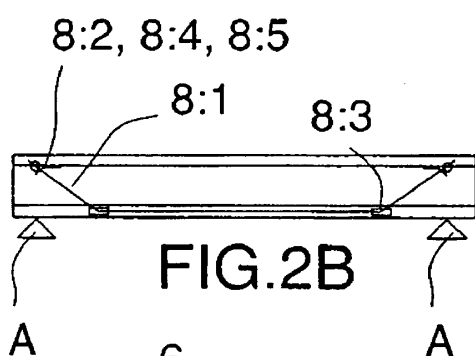


FIG. 2B

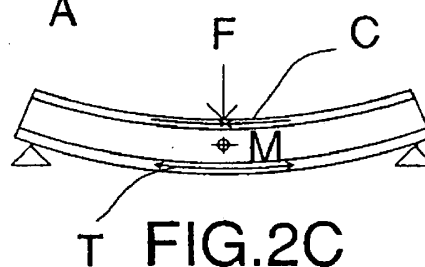


FIG. 2C

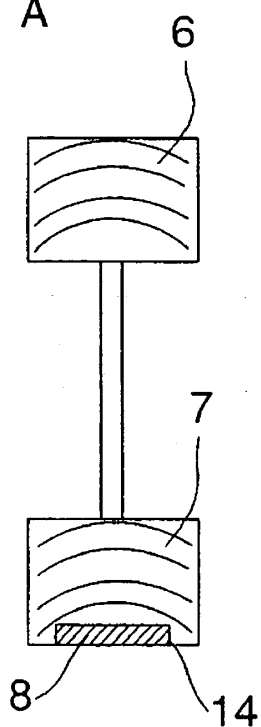


FIG. 3

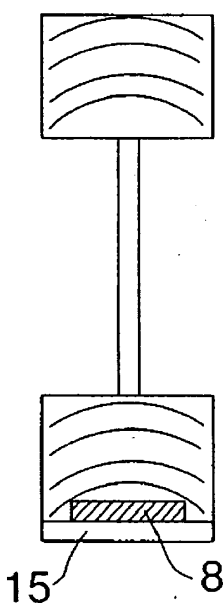


FIG. 4

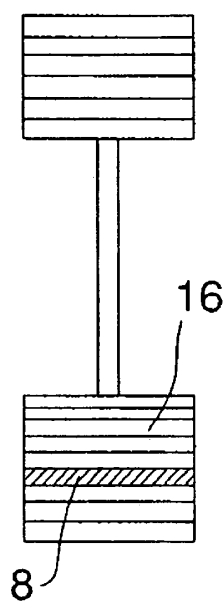


FIG. 5

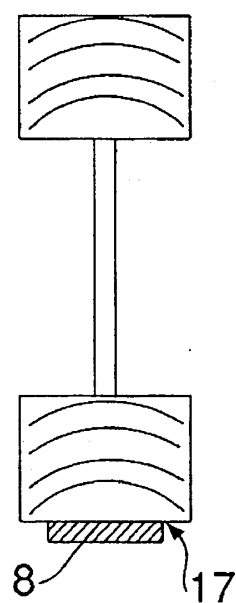


FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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