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(54)

Beam structure suitable for supporting a floor or floor element, floor, construction assembly and method for constructing a construction assembly.

(57)

The present invention relates to a beam structure for supporting a floor or a floor element, a floor, a construction assembly and a method for constructing a construction assembly.

The beam structure comprises:

- an upper beam comprising a first contact surface for supporting a floor or a floor element;
- a lower beam in substantially parallel relationship to the upper beam and comprising a second contact surface for supporting a covering panel;
- a load bearing structure connected with the upper beam and the lower beam and providing a distance between said beams.

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Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift wijkt af van de oorspronkelijk ingediende stukken. Alle ingediende stukken kunnen bij NL Octrooi Centrum worden ingezien.

BEAM STRUCTURE SUITABLE FOR SUPPORTING A FLOOR OR FLOOR
ELEMENT, FLOOR, CONSTRUCTION ASSEMBLY AND METHOD FOR
CONSTRUCTING A CONSTRUCTION ASSEMBLY

5

The present invention relates to beams for supporting a floor or floor element. Such beams are used in constructions, such as buildings.

Conventional beams for supporting floor elements are known for use in the construction of buildings, such as houses and offices. These beams can be pre-fabricated and are placed on supporting structures, such as a wall or a portal frame. A floor element is placed over at least two beams to form a floor.

15 A disadvantage of using conventional beams for construction of a floor is that it is not possible to install conduits after construction in the resulting floor comprising beams.

The object of the present invention is to overcome or reduce this disadvantage and to provide a beam which is effective and efficient.

This object is achieved with the beam structure for supporting a floor or floor element according to claim 1.

To form a floor, at least two beam structures are provided on a support structure, such as a wall or portal frame. The beam structures are provided at a distance from each other, i.e. both the upper and lower beams of the at least two beam structures are spaced apart. A floor or floor element is suspended between the at least two upper beams.

25

30 The first contact surface of the beam structure supports the floor or floor element. A covering panel is suspended between the at least two lower beams. The panel is supported by the second contact surface of the beam structure.

By arranging the lower beam at a distance from the upper beam, a space in which conduits can be fitted is created.

5 An even further advantage of the beam structure according to the present invention is that no suspending ceiling is required for installation of conduits and/or cables. Also air treatment units or other appliances can be fitted in the space provided in the floor.

10 Furthermore, conduits, cables, installations etc. can extend through the beams and connect different parts of a construction without requiring holes in a wall, thus ensuring that the strength of the construction is maintained.

15 The load bearing structure provides the distance between the upper beam and lower beam and increases the strength of the beam structure. For example, the load bearing structure comprises a truss or a lattice work.

20 Preferably, the load bearing structure comprises metal bars, for example steel or aluminium bars. By providing a metal load bearing structure, the beam structure has a large constructive strength. Preferably, the load bearing structure comprises a truss comprising a first and second metal beam with metal bars between the upper and lower beams, wherein each pair of successive bars forms a triangle
25 with one of the metal beams. In other words, metal bars are constructed in a zig-zag pattern between the upper beam and lower beam.

A further advantage of the beam structure according to the present invention is that a floor can be constructed
30 without pouring concrete.

Furthermore, the beam structure according to the invention can be detached. If a construction incorporating beam structures according to the invention is disassembled,

the beam structures can be removed from the construction without destroying them. This allows re-using the beam structures in other constructions. This is economic and efficient since the typical lifetime of the beam structure is several hundreds of years, while the typical lifetime of buildings is 35 years.

Furthermore, since no concrete needs to be poured, less additional tools are required and the process of constructing a floor is less messy and requires less time to complete.

According to the invention, both the upper beam and lower beam comprise wood and the load bearing structure comprises metal, such as steel or aluminium. By providing wooden beams and a metal load bearing structure, the beam structure is light-weight and has substantial structural strength.

Preferably, in view of fire safety, the thickness of the wooden beams is chosen depending on the burning rate of the wood. Typically a thickness of 5 - 8 cm is sufficient for fire safety considerations.

According to the invention, the beam structure comprises:

- an upper beam comprising a first contact surface for supporting a floor or a floor element;
- a lower beam in substantially parallel relationship to the upper beam and comprising a second contact surface for supporting a covering panel;
- a load bearing structure connected with the upper beam and the lower beam and providing a distance between said beams, by which a space is created in which conduits can be fitted,

wherein both the upper beam and lower beam comprise wood and the load bearing structure comprises metal.

In a preferred embodiment of the present invention, the upper beam comprises a profile for receiving a floor or floor element having a mating coupling profile.

5 The floor or floor elements are accommodated in the profile of the upper beam, i.e. they can not move.

For example, the profile is a rabbet, a gutter, a ledge or a different recess.

10 Preferably, the profile is dimensioned such that the floor or floor element and the beam structure form a floor having an even surface.

In a preferred embodiment of the present invention, the lower beam comprises a profile for receiving a covering panel.

15 The covering panels are accommodated in the profile of the lower beam, i.e. they can not move.

For example, the profile is a rabbet, a ledge or rails.

Preferably, both the lower and upper beams comprise a profile.

20 Alternatively, the lower beam comprises a profile for receiving a floor or floor element and the upper beam comprises a profile which allows receiving covering panels.

In a preferred embodiment of the present invention, the load bearing structure is adhered to the upper and/or the lower beam.

25 An adhesive, such as glue or concrete, attaches the load bearing structure to the upper and/or lower beams.

30 Preferably, a beam structure comprising a wooden upper and lower beams comprises a load bearing structure which is adhered to said beams. Preferably, the load bearing structure is positioned in recesses in the wooden lower and upper beams and adhered to the beams.

In a preferred embodiment of the present invention, the load bearing structure is formed by reinforcing metal bars extending from the upper and/or lower beams.

When the upper beam and/or lower beam comprise
5 reinforcing metal bars, the load bearing structure and the reinforcing metal bars can be integrated into a unitary metal frame. A part of this frame will reside in the upper and/or lower beams, forming the reinforcement, and another part of this frame will form the load bearing structure. By
10 providing the load bearing structure and the reinforcing metal bars as a single component, the production process is efficient. Furthermore, this provides additional strength to the beam, while requiring less material.

In a preferred embodiment of the present invention, the
15 beam structure comprises a hoisting eye.

By providing a hoisting eye, the beam structure can be lifted conveniently. Furthermore, the beam structure can be positioned accurately. Preferably, the hoisting eye is provided in the space between the upper beam and lower beam.
20 The hoisting eye can remain attached to the beam structure, since it will be hidden from view when covering panels and a floor or floor elements are provided. When the construction is dismantled, the hoisting eye can be used again for lifting the beam structure.

25 The features of the described embodiments according to the present invention can be combined as desired.

The invention further relates to a floor.

The same effects and advantages apply in respect to such a floor as those described with respect to the beam
30 structure.

In a preferred embodiment of the present invention, the floor comprises:

- at least two beam structures as described above;

- at least one floor or floor element provided on the upper beams of the at least two beam structures; and
- at least one covering panel positioned between the lower beams of the at least two beam structures.

5 Preferably, the beam structure forms even surfaces with the covering panel and the floor or floor element.

 Preferably, the covering panels comprise a fire proof material, such as gypsum. This improves safety. The gypsum panels can be combined with beam structures comprising
10 wooden upper and lower beams and with beam structures comprising concrete upper and lower beams.

 Preferably, a floor is provided comprising more than one floor element, wherein the floor elements are coupled with each other. For example, the coupling is realised using
15 a nut and a bolt or a weld. This provides stability to the floor.

 For example, a metal profile is provided at the sides of each floor element. The profiles of two adjacent floor elements are welded together. Alternatively, the profiles
20 are coupled using a bolt and a nut. This ensures the diaphragm action of the resulting floor, which ensures that loads are distributed. This provides structural strength to the constructed floor.

 The invention further relates to a construction
25 assembly comprising a beam structure and/or a floor as described above. The construction may be a building, such as a bungalow, office, shop or house. For example, also a double-layered highway is possible.

 Such an assembly provides the same effects and
30 advantages apply as those described in respect to the beam structure and the floor.

 A further advantage of the construction assembly according to the present invention is that the construction

can be decomposed in its elements, such as the beam structures and floor elements. After deconstruction, a new construction can be built using the same elements, allowing a so-called cradle to cradle approach. Furthermore,
5 construction and deconstruction/demounting the assembly requires relatively little time. Also, minimum storage area for building materials is required on the construction site.

The invention further relates to a method for constructing a construction assembly, such as a building,
10 for which the same effects and advantages apply as those described above for the beam, the floor and the construction assembly.

In a preferred embodiment of the method according to the present invention, the method comprises the steps of:

- 15 - positioning at least two beam structures as described above on a support structure;
- positioning at least one floor or floor element on the upper beams of the at least two beam structures; and
- positioning at least one covering panel between the
20 lower beams of the at least two beam structures.

Preferably, the beam structures are positioned at a distance from each other.

For example, a bungalow may be constructed using the method according to the present invention. A plurality of
25 beam structures is placed between two supporting walls. The walls support the beam structures, for instance by providing on two opposite sides of the upper beams a contact surface which rests on a supporting surface of a wall, i.e. the beam structure is suspended between two walls. Floor elements are
30 placed between each pair of neighbouring beam structures. The upper beams have profiles which mates with corresponding profiles of the floor elements. This produces an even floor. At this point in the construction, the underside of the

floor is open, which allows access to the space between the lower and upper beams. Any conduits which need to be installed are accommodated in this space. The openings are subsequently covered by covering panels. If access to the conduits is desired, the covering panels can be removed easily.

Preferably, the beams and further elements have standardized dimensions. This simplifies reusing the elements and allows for a quick and accurate calculation of costs. Furthermore, this makes it relatively easy to add new elements to an existing construction. The design of a construction assembly to be constructed can be done using software for so-called virtual building. The software comprises virtual copies of the standardized elements, which can be combined to design a construction assembly according to the invention. Quick overviews of the costs and required material amounts are provided by the software.

All the features of the preferred embodiments as described above can be combined as desired.

Further advantages, features and details of the invention are elucidated on the basis of preferred embodiments thereof, wherein reference is made to the accompanying drawings.

Figures 1A-B show side views in cross-section of a floor comprising floor elements.

Figures 2A-B show side views in cross-section of a floor comprising floor elements according to an embodiment according to the invention.

Floor 300 comprises beam structures 302, placed at a distance from each other (figures 1A-B). The beam structures

302 comprise a lower concrete slab 304 and an upper concrete slab 306, distanced apart by truss 308 comprising metal bars 309, 310 and reinforcement metal bars 318, 320, 328, 330.

5 The upper slabs comprise a recess 316 for receiving a concrete floor element 319 having a mating profile. The lower slabs 304 comprise a profile 312 for receiving a panel 311. The panel 311 can be removed to access the space between the lower 304 and upper 306 slab. Optionally, an insulation layer 314 can be placed below panel 311 and
10 attached thereto.

The floor elements are coupled using metal profiles 336. These are coupled by metal coupling plates to form floor 300.

To provide a floor 300, at least two beam structures
15 are positioned on wall 332. The upper beam 306 of the beam structures rest on rabbet 334 of wall 332. Floor elements are provided in recesses 316 of upper beams 306. Conduits and the like are fitted in the space between lower beams 304 and floor elements 319. The openings are closed with
20 covering panels 311. In case additional conduits, cables or the like need to be accommodated, the covering panels 311 can be removed to provide access to the space between lower beams 304 and floor elements 319.

In an embodiment according to the invention, beam
25 structures comprising a wooden upper beam 402 and a wooden lower beam 404 are provided (figures 2A and 2B). The upper and lower beams 402, 404 are spaced apart by metal truss 406. The truss 406 comprises metal beams 422, 424 and metal bars 408, 410. The truss is attached to the lower and upper
30 beam by glueing it in recesses 416.

A floor 414 is positioned on top of upper beams 402. Lower beams 404 support covering panels 412. These panels

412 can be removed easily to obtain access to the space between the lower and upper beams.

The floor 400 is supported by inner leaf 418. The upper beams 402 rest on inner leaf 418. A plate 416 is positioned
5 in between the cavity wall leaf 418 and the upper beam 402. A skirting 420 is positioned on floor 414.

To provide a floor 400, at least two beam structures are provided on inner leaf 418. A floor 414 is positioned on top of upper beams 402. Conduits and such are fitted in the
10 space between lower beams 404 and floor 414. The opening is closed by placing covering panels 412. In case additional conduits, cables or the like need to be fitted, the covering panels 412 can be removed to provide access to the space between lower beams 404 and floor 414.

15 The present invention is by no means limited to the above described embodiments thereof. Many modifications can be envisaged. For example, instead of gypsum, wooden or plastic covering panels can be used.

CONCLUSIES

1. Liggerconstructie voor het ondersteunen van een vloer of vloerdeel, omvattende:

- 5 - een bovenste ligger omvattende een eerste contactoppervlak voor het ondersteunen van een vloer of vloerdeel;
- een in hoofdzaak in parallelle relatie ten opzichte van de bovenste ligger aangebrachte onderste ligger,
- 10 omvattende een tweede contactoppervlak voor het ondersteunen van een afdekpaneel;
- een lastdragende constructie die is verbonden met de bovenste ligger en de onderste ligger en een afstand tussen de liggers verschaft, waardoor een ruimte is
- 15 gevormd voor het plaatsen van leidingen,
- waarin zowel de bovenste ligger als de onderste ligger hout omvat en de lastdragende constructie metaal omvat.

2. Liggerconstructie volgens conclusie 1, waarin de
20 lastdragende constructie metalen staven omvat.

3. Liggerconstructie volgens conclusie 2, waarin de lastdragende constructie een vakwerk omvat.

25 4. Liggerconstructie volgens conclusie 1, 2 of 3, waarin de bovenste ligger een profiel omvat voor het opnemen van een vloer of vloerdeel met een bijpassend koppelprofiel.

5. Liggerconstructie volgens één of meer van de conclusies
30 1-4, waarin de onderste ligger een profiel omvat voor het opnemen van een afdekpaneel.

6. Liggerconstructie volgens één of meer van de conclusies 1-5, waarin de lastdragende constructie aan de onderste ligger en/of bovenste ligger is gekleefd.

5 7. Liggerconstructie volgens één of meer van de conclusies 1-6, waarin de lastdragende constructie is gevormd door metalen wapeningstaven die zich uitstrekken van de bovenste ligger en/of onderste ligger.

10 8. Liggerconstructie volgens één of meer van de conclusies 1-7, waarin de liggerconstructie een hysog omvat.

9. Vloer, omvattende:

- 15 - ten minste twee liggerconstructies volgens één of meer van de conclusies 1-8;
- ten minste één vloer of vloerdeel voorzien op de bovenste liggers van de ten minste twee liggerconstructies; en
- 20 - ten minste één afdekpaneel dat is gepositioneerd tussen de onderste liggers van de ten minste twee liggerconstructies.

10. Constructiesamenstel omvattende een liggerconstructie volgens één of meer van de conclusies 1-8 en/of een vloer
25 volgens conclusie 9.

11. Werkwijze voor het construeren van een constructiesamenstel, omvattende de stappen van:

- 5 – het positioneren van ten minste twee liggerconstructies volgens één of meer van de conclusies 1-8 op een draagconstructie;
- het positioneren van ten minste één vloer of vloerdeel op de bovenste liggers van de ten minste twee liggerconstructies; en
- 10 – het positioneren van ten minste één afdekpaneel tussen de onderste liggers van de ten minste twee liggerconstructies.

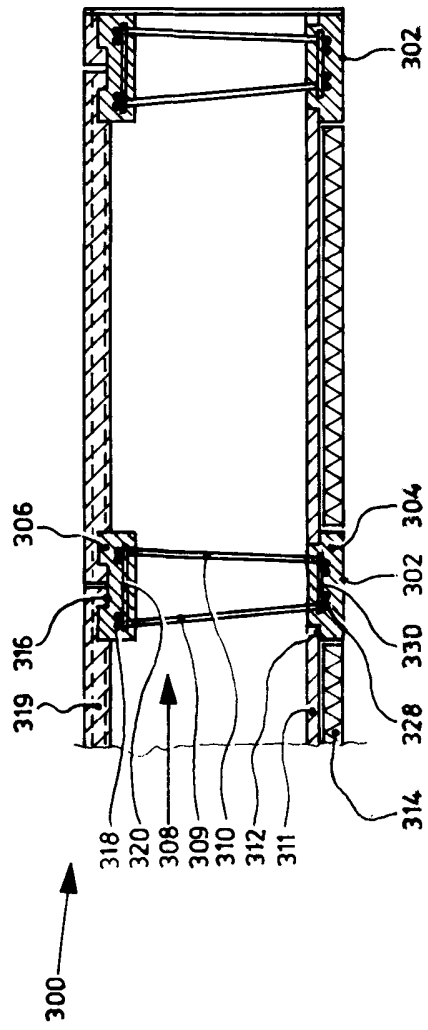


fig. 1A

1/2

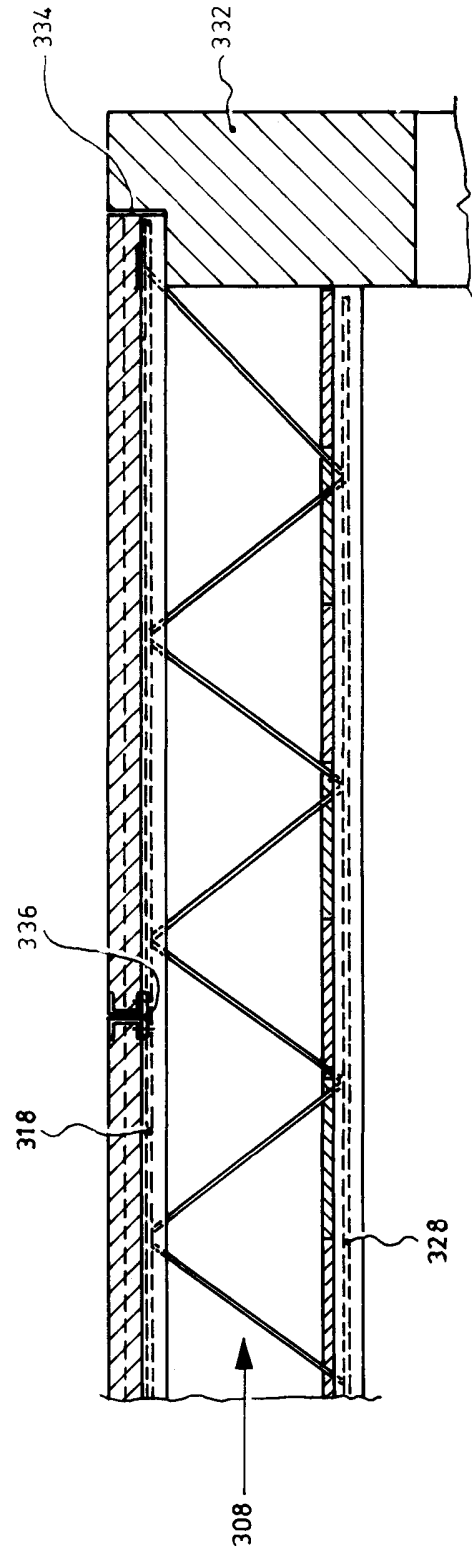


fig. 1B

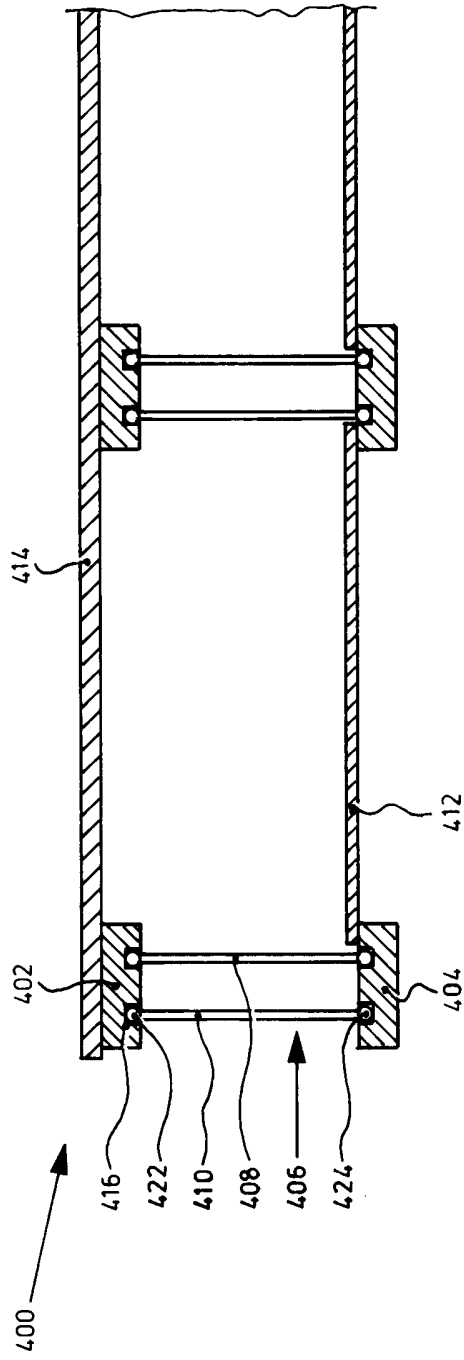


fig. 2A

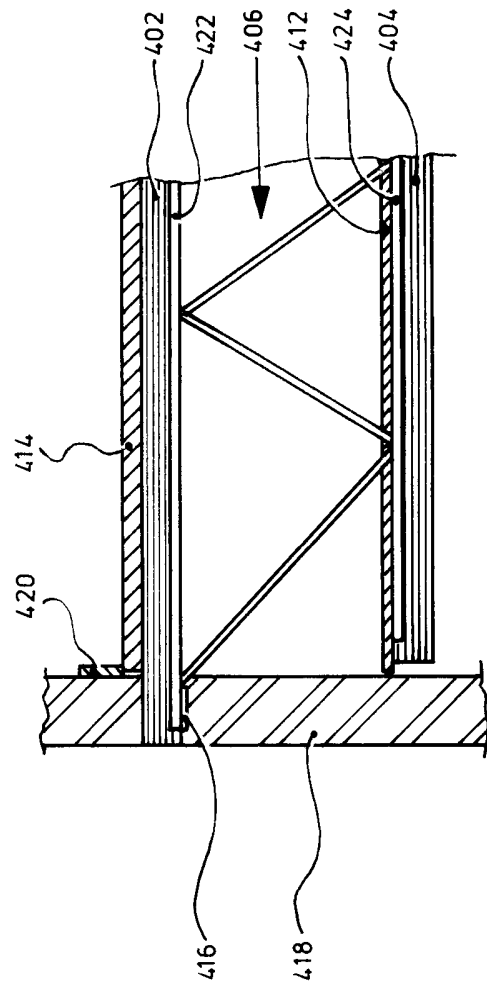


fig. 2B



Agentschap NL
Ministerie van Economische Zaken

Octrooiaanvraag 2006541

RAPPORT BETREFFENDE HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK

Voor octrooiaanvraag NL 2006541 is geen onderzoek naar de stand van de techniek uitgevoerd. Het resultaat van het eerdere onderzoek naar de stand van de techniek dat door het Europees Octrooibureau is uitgevoerd voor de octrooiaanvraag EP 10160079 is namelijk mede van toepassing verklaard op octrooiaanvraag NL 2006541. Het eerdere onderzoeksresultaat is in zijn oorspronkelijke vorm bijgevoegd.

EUROPEAN SEARCH REPORT

Application Number
EP 10 16 0079

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 1 790 789 A1 (BARTOLI NV [AN]) 30 May 2007 (2007-05-30) * paragraph [0024 0026 0032 0033 0045 0046]; figure 1 3 6 *	1-6,8-10	INV. E04B5/10 E04B5/23 E04C3/292 E04C3/293
X	US 4 488 390 A (MULFORD CASS F [US]) 18 December 1984 (1984-12-18) * column 1, lines 9-20; figure 1 5 * * column 2, line 66 - column 3, line 25 *	1-5,9	
X	WO 2008/020179 A1 (NALBORCZYK STEFAN MARTIN [GB]; TURNER MICHAEL JAMES PAUL [GB]) 21 February 2008 (2008-02-21) * page 1, paragraph 1 * * page 3, last paragraph * * page 12, paragraph 2 last sentence * * page 13, paragraph 4; claim 1 12; figure 2 *	1,2,5,9	
X	JP 2007 056468 A (MITSUI HOME KK) 8 March 2007 (2007-03-08) * the whole document *	1-4,9	TECHNICAL FIELDS SEARCHED (IPC) E04B E04C
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 4 November 2010	Examiner Stern, Claudio
CATEGORY OF CITED DOCUMENTS X: particularly relevant if taken alone Y: particularly relevant if combined with another document of the same category A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: earlier patent document, but published on, or after the filing date D: document cited in the application L: document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 10 16 0079

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

04-11-2010

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1790789	A1	30-05-2007	EP 1790791 A2	30-05-2007
			US 2007137133 A1	21-06-2007
US 4488390	A	18-12-1984	NONE	
WO 2008020179	A1	21-02-2008	NONE	
JP 2007056468	A	08-03-2007	NONE	

The examination is being carried out on the **following application documents**

Description, Pages

1-10 as originally filed

Claims, Numbers

1-10 as originally filed

Drawings, Sheets

1, 2 as originally filed

1. The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1: EP-A-1 790 789

D2: US-A-4 488 390

D3: WO-A-2008 020179

D4: JP-A-2007 056468

2. The present application does not meet the requirements of Article 52(1) EPC, because the subject-matter of claim 1 is not new in the sense of Article 54(1) and (2) EPC.

3. **Independent claim 1:**

3.1 Document D1 (the expressions in brackets refer to this document) discloses a beam structure for supporting a floor or a floor element, comprising: - an upper beam (second concrete slab 6) comprising a first contact surface suitable for supporting a floor or a floor element (covering panel 26); - a lower beam (first concrete slab 4) in substantially parallel relationship to the upper beam (6) and comprising a second contact surface suitable for supporting a covering panel (covering panel 26); - a load bearing structure (supporting elements 8a, 8b) connected with the upper beam (6) and the lower beam (4) and providing a distance between said beams.

3.2 Thus, the combination of features of independent claim 1 is entirely disclosed by the device described in D1.

3.3 It should be noted that the combination of features of claim 1 is also disclosed in documents D2, D3 and D4.

4. The additional features of dependent claims 2, 3, 4, 5, 6 and 8 are also known from document D1, so that the subject-matter of this claim is not new. The said claims do therefore also not meet the requirements of Art. 54(1) and 2 EPC.

5. The additional features of dependent claims 2, 3, 4 and 5 are also known from document D2.

6. The additional features of dependent claims 2 and 5 are also known from document D3.

7. The additional features of dependent claims 2, 3 and 4 are also known from document D4.

8. Document D1 also discloses the features of claims 8, 9 and 10.

9. Documents D2, D3 and D4 also disclose the features of claim 9.

10. Inasmuch as the features of dependent claim 7 are not directly known from the documents mentioned in the search report, they obviously concern only minor modifications which lie within the normal practice of the person skilled in the art.

Consequently, said dependent claim 7 does not contain any additional features which, in combination with the features of any claim to which they refer, involve an inventive step (Art. 52(1) and 56 EPC).

11. It is not at present apparent which part of the application could serve as a basis for a new, allowable claim. Should the applicant nevertheless regard some particular matter as patentable, an independent claim should be filed taking account of Rule 43 (1) EPC. The applicant should also indicate how the subject-matter of the new claim differs from the state of the art and the significance thereof.

12. In the event of the continuation of the procedure, the Applicant is invited to take account of the following points:

12.1 In accordance with Rule 137(5) EPC "amended claims may not relate to **unsearched subject-matter** which does not combine with the originally claimed invention or group of inventions to form a single inventive concept" (see also EPO-Guidelines C-VI, 5.2 ii).

12.2 To meet the requirements of Rule 43 (1) EPC, the independent claims should be properly cast in the **two part form**, with those features which in combination are part of the prior art being placed in the preamble.

12.3 **Reference signs in parentheses** should be inserted in the claims to increase their intelligibility; this applies to both the preamble and characterising portion (Rule 43 (7) EPC).

12.4 The description should be brought into conformity with the new claims to be filed; care should be taken during revision, especially of the introductory portion including any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed (Article 123 (2) EPC).

12.5 To meet the requirements of Rule 42 (1) (b) EPC, document **D1** should be identified in the description and the relevant background art disclosed therein should be briefly discussed.

12.6 The definition of the **problem** underlying the invention should be presented in the description in such terms that its solution can be better understood in view of the disclosure of the corresponding closest prior art document (Rule 42 (1) (c) EPC).

12.7 In order to expedite the procedure and to facilitate the examination of the conformity of the amended application with the requirements of Article 123(2) EPC, the applicant is requested to clearly identify all amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and indicate on which passages of the original application each of these amendments is based (see Rule 137(4) EPC of 01.04.2010 and the EPO-Guidelines C-VI, 5.7 and E-II, 1, last sentence).