



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
13.05.2015 Bulletin 2015/20

(51) Int Cl.:
E04B 1/00 (2006.01)

(21) Application number: **14187432.1**

(22) Date of filing: **02.10.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **Gustavsson, Erik**
288 32 Vinslöv (SE)
• **Lörup, Yngve**
283 41 Osby (SE)

(30) Priority: **02.10.2013 SE 1351163**

(74) Representative: **Hansson, Anders Max**
Awapatent AB
P.O. Box 45086
104 30 Stockholm (SE)

(71) Applicant: **E G Bygg AB**
288 21 Vinslöv (SE)

(54) **Building structure comprising an energy efficient foundation structure and a method of forming a foundation structure**

(57) The present invention relates to a building structure (1) comprising an energy efficient foundation structure (2) for reducing heat losses in said building structure (1), said building structure (1) having at least an outer wall structure (3). The foundation structure (2) comprises a number of foundation elements (4), adapted to support said outer wall structure (3) of said building structure (1), and being arranged at least partly along said outer wall structure (3), a layer of aggregate (5) covering a base area extending between said foundation elements (4),

and a layer of floor heat insulation (6) arranged to rest partly on said layer of aggregate (5) and partly on said foundation elements (4), wherein said foundation elements (4), said layer of aggregate (5) and said a layer of insulation (6) act as a foundation structure (2), adapted to support said building structure (1). The present invention further relates to a method of forming an energy efficient foundation structure (2) for such a building structure (1).

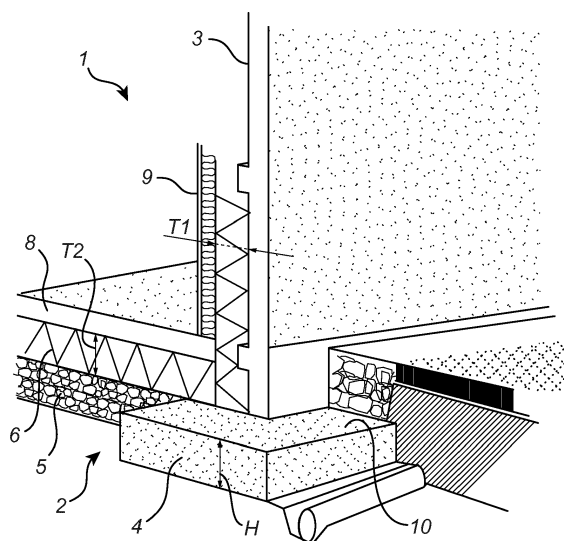


Fig. 1

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a building structure comprising an energy efficient foundation structure and a method of forming an energy efficient foundation structure for a building structure according to the independent claims.

BACKGROUND OF THE INVENTION

[0002] Many building structures utilize a concrete footing and/or foundation to provide a suitable substrate to support the structure and anchor the structure to the ground. The preparation of the foundation, however, is a time consuming process which adds a significant amount of expense to the building structure. Generally, the foundation is prepared using board forms and stakes to define the contours of the foundation. Once the preparation work for the foundation is completed, the concrete slab of the structure must be poured and the wall structure elements must be secured to the completed foundation. After the concrete is in place and has cured sufficiently, the framing members are secured to the foundation. For a slab foundation, the framing members are typically secured directly to the concrete, such as by bolt, nails or other means as is known in the art.

[0003] Such conventional methods have significant drawbacks, e.g. wasted materials required to construct the forms, wasted labor to construct the forms and to check geometry of the forms. Furthermore, when building during the cold winter months, it is more expensive to pour concrete outdoors due to the extra cost of maintaining the concrete at the desired temperature.

[0004] Energy efficiency of the completed foundation is also a concern and there are various motivations to improve energy efficiency. Reducing energy use reduces energy costs and may for example result in financial cost savings to consumers.

[0005] In the field of energy efficient buildings, also known as green buildings, new technologies are constantly being developed to complement current practices in creating greener structures. The common objective is that green buildings are designed to reduce the overall impact of the built environment, on human health, and the natural environment. One known way of creating greener structures is to reduce heat losses in buildings.

[0006] An example disclosed in EP 2317021 A1 is mainly concerned with reduction of heat losses in buildings. For the achievement of this purpose, building structures are surrounded with continuous heat insulation and the wall structure consists of two separated structures, an inner wall structure and outer wall structure with heat insulation in-between. The inner wall structure and the outer wall structure are load-bearing structures, and the building is provided with forced ventilation. Introduction of the invention may limit the need for heating energy of

an energy-efficient building up to 40 kWh/m².

[0007] A further example is known from EP1317587 B1, which discloses a building comprising sheets of wooden material with external walls, internal walls, floor and/or roof boards each made of wooden sheets and of a double- or multi-skinned form, thus comprising at least one inner sheet and at least one outer sheet which are separated by spacer elements and connected to each other by the same. Cavities are provided between the sheets. The sheets forming the inner walls, the outer walls, the floor or roof boards are, at least in one direction, in one piece throughout.

[0008] In WO9735079 A a building structure is disclosed which is formed from a plurality of prefabricated wall panels and a plurality of prefabricated floor slabs, a lower wall panel being shown interconnected with an outer floor slab and mounted on a support beam of an arrangement forming part of the building foundation constructed on site. The wall panel has a precast concrete component and a layer of rigid insulation bonded to one face thereof over a liquid impermeable flexible membrane which extends to such a height as to define a suitable damp proof course. The building method eliminates many of the steps currently performed on site in adverse conditions and enables those steps to be carried out in a controlled factory environment.

[0009] The inventors of the present invention have identified a need for an improved energy-effective building which is less expensive, easy and straightforward to manufacture and which provides reduced over all heat losses and quick installation on site.

[0010] Thus, an object of the present invention is to provide a building structure, and in particular a foundation for a building, which provides reduced heat losses.

[0011] A further object is to provide an alternative method of forming a foundation, which method is more cost effective, and which method facilitates the construction and decreases the time needed for total construction when forming foundations during the cold winter months.

SUMMARY OF THE INVENTION

[0012] The above-mentioned objects are achieved by the present invention according to the independent claims.

[0013] Preferred embodiments are set forth in the dependent claims.

[0014] According to a first aspect of the present invention, the building structure comprises an energy efficient foundation structure for reducing heat losses in said building structure. The building structure has at least an outer wall structure. The foundation structure comprises a number of foundation elements, adapted to support said outer wall structure of said building structure, and are arranged at least partly along said outer wall structure. The foundation structure further comprises a layer of aggregate covering a base area extending between said foundation elements, and a layer of floor heat insu-

lation arranged to rest partly on said layer of aggregate and partly on said foundation elements, wherein said foundation elements, said layer of aggregate and said layer of insulation acts as a foundation structure, i.e. a base plate, adapted to support said building structure. Said aggregate is preferably a stone material, wherein the stone material is e.g. crushed into suitable sizes.

[0015] In other words, the foundation structure consists of the foundation elements, the layer of aggregate and the layer of insulation, i.e. the foundation elements, the layer of aggregate and the layer of insulation forms, or constitutes or acts as, a base plate for the building structure, which base plate distributes in particular the vertical loads from the building structure. The foundation elements are preferably arranged directly on the ground and are preferably arranged one at each corner of the building structure, i.e. under the outer wall structure, such that the foundations elements support the outer wall structure. The aggregate, which e.g. may be a coarse stone material, is arranged between the supporting foundation elements. Thus, the foundation elements and the aggregate are preferably covering the complete base area under the building structure, i.e. which corresponds to the area enclosed by the outer wall structure.

[0016] The foundation structure is advantageous in that the foundation may be constructed also when there is cold weather outside, even below -10 degrees Celsius, without the total time of construction being affected. Compared to conventional concrete foundations, such as a heated concrete slab foundations, the foundation structure according to the present invention is further advantageous in that heat losses through the foundation structure is reduced, in particular heat losses along the sides of the foundation structure is reduced. This, in particular because the floor heat insulation is arranged to meet the wall heat insulation, such that cold bridges in said structure are reduced. Preferably, the floor heat insulation meets the wall heat insulation in its entire thickness. This contributes to the reduction of heat losses in the building.

[0017] In one embodiment, said number of foundation elements are pre-fabricated or cast, wherein the outer wall structure is supported by said number foundation elements. Thus, the prefabricated foundation elements support the outer wall structure in a number of places. Pre-fabricated foundation elements are advantageous in that the total construction time at the site is reduced, i.e. the time for erecting the building.

[0018] In one embodiment, a foundation element is arranged at each corner of the building structure.

[0019] According to another embodiment, foundation elements are also arranged at element joints in the building.

[0020] In another embodiment, the foundations elements may be arranged to be continuous, such that the foundations elements extend continuously under and along the outer wall structure. Continuously arranged foundation elements, plastic moulded or pre-fabricated, are advantageous to use for two floor buildings, as the

loads are greater.

[0021] In one embodiment, the outer wall structure abuts against said number of foundation elements. Thus, the outer wall structure is in direct contact with the foundation elements. Furthermore, the outer wall structure are preferably anchored or mounted in the foundation elements.

[0022] In one embodiment, the outer wall structure is provided with a layer of wall heat insulation at an inner side of said outer wall structure. This provides for reduces heat losses in the building.

[0023] In one embodiment, an inner floor structure is arranged above said layer of floor heat insulation, wherein said inner floor structure is enclosed by said outer wall structure. Thus, the inner floor structure is arranged on top of said layer of floor heat insulation and is in direct contact with the layer of floor heat insulation. The inner floor structure being enclosed by said outer wall structure is advantageous in that said outer wall structure, being provided with a layer of wall heat insulation on an inner side, reduces heat losses through the foundation structure, and in particular through the sides of the foundation structure.

[0024] In one embodiment, the inner floor structure is mounted in a floating manner. Thus, the inner floor structure is arranged to be floating on the layer of floor heat insulation. Advantageously, the cold bridges transferring heat in particular to the outer wall structure is then reduced.

[0025] In one embodiment, the outer wall structure is separated from said inner floor structure with said layer of wall heat insulation. Thus, direct contact between the outer wall structure and the inner floor structure is avoided, wherein cold bridges, transferring heat from the inner floor structure to said outer wall structure, are reduced.

[0026] In one embodiment, the layer of wall heat insulation has a thickness T1 and said layer of floor heat insulation has a thickness T2, said thicknesses T1, T2 being essentially equal, and wherein said insulations meet in essentially their whole thickness around the circumference of said building structure. Advantageously, the heat loss through the foundations structure and surrounding parts of the building structure is then reduced.

[0027] In one embodiment, an inner wall structure, separated from said outer wall structure by said layer of wall heat insulation, rests on said inner floor structure. Thus, the inner wall structure is arranged on, and is supported by, the inner floor structure, which is arranged on said foundation structure, or base plate. The foundation structure, i.e. the base plate, consists of foundation elements, which are pre-fabricated or cast, the layer of aggregate, i.e. the stone material, and the layer of floor heat insulation.

[0028] In one embodiment, said number of foundation elements is between 1 and 20, preferably 4, and even more preferred 12 to 20. Advantageously, the number of foundation elements may be adapted to, e.g. the quality of soil and the size of the building structure. The founda-

tion elements are preferably arranged approximately with equal distances from each other under the building, i.e. if the number of foundation elements is 12 to 20, then 3 to 5 foundation elements are arranged under each outer wall side.

[0029] In one embodiment, the layer of aggregate and said foundation elements are arranged such that the layer of aggregate, i.e. the stone material, is flush with an upper surface of said foundation elements. The prefabricated foundation elements and the layer of aggregate, i.e. the stone material, then form a stable foundation structure, which gives sufficient support to the building structure.

[0030] In another aspect, the present invention relates to a method of forming an energy efficient foundation structure for a building structure. The method comprises arranging said foundation elements on a ground area such that said foundation elements are arranged to support said outer wall structure of said building structure, arranging an aggregate to cover a base area between said foundation elements, arranging a layer of floor heat insulation partly on said aggregate and partly on said foundation elements, such that said foundation elements, said layer of aggregate, i.e. stone material, and said a layer of insulation act as a foundation structure, supporting said building structure.

[0031] Advantageously, the foundation structure may be constructed also when it is cold weather outside, i.e. even below -10 degrees Celsius, without the total time of construction being affected. This provides for a more energy efficient building procedure. The foundation elements, the layer of aggregate and the layer of insulation form or act as, a base plate, i.e. a foundation structure for the building structure which base plate distributes in particular the vertical loads from the building structure. The foundation elements are preferably prefabricated, which means that they are manufactured in, e.g. a factory, and then transported to the building-site. This provides quick installation of the foundation structure, and consequently the complete building structure, on site. The prefabricated foundation elements are preferably made from concrete. As an alternative embodiment, the foundation elements may be plastic moulded.

[0032] The outer wall structure and the inner wall structure preferably also comprises prefabricated elements, i.e. prefabricated wall elements, being manufactured in a factory and subsequently transported to the building-site. Naturally, this also provides for quick and energy efficient installation of the building structure on site. Bearing intermediate walls are preferably prefabricated.

[0033] In one embodiment, the method further comprises arranging said outer wall structure to be supported by said number of foundation elements. The outer wall structure is then preferably anchored or mounted in said foundation elements, and the foundation elements aid in distributing the vertical loads from the outer wall structure, and thus the complete building structure.

[0034] In one embodiment, the method further com-

prises arranging an inner floor structure above said layer of floor heat insulation such that said inner floor structure is enclosed by said outer wall structure. The outer wall structure is preferably mounted before the inner floor structure and said layer of floor heat insulation is arranged on said layer of aggregate, i.e. stone material. Thus, the building structure may be closed, i.e. by arranging the outer wall structure in place and providing the building structure with a roof structure or similar, such that the inner parts of the building structure becomes essentially a dry place, before the inner floor structure and the layer of wall heat insulation is arranged in place.

[0035] In one embodiment, the method further comprises arranging said inner floor structure in a floating manner. Advantageously, thermal bridges, i.e. cold bridges, transferring heat from the inner side of the building structure to the outer side of the building structure are avoided or reduced.

[0036] The invention will now be described in detail with reference to the drawings.

SHORT DESCRIPTION OF THE APPENDED DRAWINGS

[0037]

Figure 1 shows a partly cross sectional view of a part of a building structure comprising an energy efficient foundation structure, according to one embodiment of the present invention.

Figure 2 shows a part of building structure comprising an energy efficient foundation structure, the foundation structure comprising four foundation elements, according to one embodiment of the present invention.

Figure 3 shows a top view of one of the corners of a building structure comprising an energy efficient foundation structure, according to one embodiment of the present invention.

Figure 4 shows a part of a building structure comprising an energy efficient foundation structure, the foundation structure comprising foundation elements extending continuous along a side of the building structure, according to one embodiment of the present invention.

Figure 5 shows a block diagram schematically illustrating the method of forming an energy efficient foundation structure for a building structure, according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE EMBODIMENTS OF THE INVENTION

[0038] Throughout the application the word "above" or

"on top of" refers to the part located furthest away with respect to the ground or soil, and the word "below" or "under" refers to the part located closest in respect of the ground or soil. Figure 1 shows a partly cross sectional view of a part of a building structure 1 comprising an energy efficient foundation structure 2, according to one embodiment of the present invention. The building structure 1 has an outer wall structure 3. Naturally, the building structure 1 may further comprise, e.g. a roof structure (not shown in Figure 1). The foundation structure 2 comprises a number of prefabricated or plastic moulded foundation elements 4, adapted to support the outer wall structure 3 of the building structure 1, and being arranged partly along the outer wall structure 3. In the embodiment shown in Figure 1, a foundation element 4 is arranged at each corner of the building structure 1. The foundation structure further comprises a layer of aggregate 5 covering a base area extending between the prefabricated or plastic moulded foundation elements, i.e. under the building structure 1, and a layer of floor heat insulation 6 arranged to rest partly on the layer of aggregate 5 and partly on the prefabricated or plastic moulded foundation elements 4, wherein the prefabricated or plastic moulded foundation elements 4, the layer of aggregate 5 and the a layer of floor heat insulation 6 acts as a foundation structure 2, adapted to support the building structure 1.

[0039] As further seen in Figure 1, the outer wall structure 3 is supported by the prefabricated or plastic moulded foundation elements 4. The outer wall structure 3 abuts against the prefabricated or plastic moulded foundation elements 4. Thus, the outer wall structure 3 is preferably arranged in direct contact with said foundation elements 4.

[0040] Furthermore, the outer wall structure 3 is provided with a layer of wall heat insulation 7 at an inner side of the outer wall structure 3, and an inner floor structure 8 is arranged above the layer of floor heat insulation 6, and wherein the inner floor structure 8 is enclosed by the outer wall structure 3. The inner floor structure 8 may be mounted in a floating manner. The floor heat insulation 6 and the wall heat insulation 7 may be made from e.g. cellular plastic insulation.

[0041] As further illustrated in the embodiment shown in Figure 1, the outer wall structure 3 is separated from the inner floor structure 8 with the layer of wall heat insulation 7. The layer of wall heat insulation 7 has a thickness T1 and the layer of floor heat insulation 6 has a thickness T2, the thicknesses T1, T2 being essentially equal, and wherein the insulations 6, 8 meet in essentially their whole thickness T1, T2 around the circumference of the building structure 1. The thickness T1 of the wall heat insulation 7 is preferably approximately 320 mm, and the thickness T2 of the floor heat insulation 6 is preferably approximately 300 mm. Furthermore, an inner wall structure 9, separated from the outer wall structure 3 by the layer of wall heat insulation 7, rests on the inner floor structure 8.

[0042] In the embodiment shown in Figure 1, the

number of prefabricated foundation elements is 4. However, the number of prefabricated foundation elements may be between 1 and 20, preferably 12 to 20, and preferably depends on the type of building structure 1 it is adapted to support, e.g. the number of floors in the building, and the quality of the soil.

[0043] As further shown in Figure 1, the layer of aggregate 5 and the foundation elements 4 are arranged such that the layer of aggregate 5, i.e. the stone material, is flush with an upper surface 10 of the foundation elements 4. Thus, the upper surface 10 of the foundation elements 4 and the layer of aggregate 5, i.e. stone material, together forms a supporting surface adapted to support the layer of floor heat insulation 6 at a predetermined level. The foundation element 4 preferably has a height H of approximately 100 to 800 mm, preferably 200 mm.

[0044] Figure 2 shows a part of a building structure 1 comprising an energy efficient foundation structure 2, the foundation structure 2 comprising four foundation elements 4, according to one embodiment of the present invention. In the Figure only two foundation elements 4 can be seen. Furthermore, the layer of aggregate, i.e. stone material, has been omitted for sake of simplicity. In the embodiment illustrated in Figure 2, the building structure 1 comprises a roof structure 11, which rests on the outer wall structure 3. Figure 2 further illustrates that the floor heat insulation 6 and the wall heat insulation 7 meets each other and thus forms a continuous layer of insulation extending from the foundation structure 2 to and along the outer wall structure 3 around the circumference of the building structure 1.

[0045] Figure 3 shows a top view of one of the corners of the building structure 1 comprising the energy efficient foundation structure 2, according to one embodiment of the present invention. As seen in Figure 3, the outer wall structure 3 is supported by the upper surface 10 of the foundation element 4. The outer wall structure 3 and the inner wall structure 9 are separated from each other by the layer of wall heat insulation 7. In the embodiment, shown in Figure 3, the foundation element 4 is essentially square shaped. However, the foundation elements 4 may have any other suitable shape such as rectangular or circular.

[0046] Figure 4 shows a part of the building structure 1 comprising the energy efficient foundation structure 2, the foundation structure 2 comprising foundation elements 4 extending continuous along a side of the building structure 1, according to one embodiment of the present invention. In the figure only one foundation element 4 can be seen. Furthermore, the layer of aggregate has been omitted for sake of simplicity. The building structure 1 is a two floor building structure 1, and one single foundation element 4 is arranged to extend continuously under and along each side of the outer wall structure 3. A roof structure 11 is supported by the outer wall structure 3.

[0047] In a further aspect, the present invention relates

to a method of forming an energy efficient foundation structure 2 for a building structure 1.

[0048] In one embodiment, as illustrated in Figure 5, the method comprises:

- arranging the foundation elements 4 on a ground area such that the foundation elements 4 are arranged to support the outer wall structure 3 of the building structure 1;
- arranging a layer of aggregate 5 to cover a base area between the foundation elements 4;
- arranging a layer of floor heat insulation 6 partly on the layer of aggregate 5 and partly on the foundation elements 4, such that the foundation elements 4, the layer of aggregate 5 and the layer of floor heat insulation 6 acts as a foundation structure 2, supporting the building structure 1.

[0049] In another embodiment the method further comprises:

- providing prefabricated or plastic moulded foundation elements and arranging the outer wall structure 3 to be supported by the number of foundation elements 4.

[0050] In another embodiment the method further comprises:

- arranging an inner floor structure 8 above the layer of floor heat insulation 6 such that the inner floor structure 8 is enclosed by the outer wall structure 3.

[0051] In another embodiment the method further comprises:

- arranging the inner floor structure 8 in a floating manner.

[0052] The present invention is not limited to the above-described preferred embodiments. Various alternatives, modifications and equivalents may be used. Therefore, the above embodiments should not be taken as limiting the scope of the invention, which is defined by the appending claims.

Claims

1. Building structure (1) comprising an energy efficient foundation structure (2) for reducing heat losses in said building structure (1), said building structure (1) having at least an outer wall structure (3), said foundation structure (2) comprising:

- a number of foundation elements (4), adapted to support said outer wall structure (3) of said building structure (1), and being arranged at

least partly along said outer wall structure (3);
- a layer of aggregate (5) covering a base area extending between said foundation elements (4);

- a layer of floor heat insulation (6) arranged to rest partly on said layer of aggregate (5) and partly on said foundation elements (4), wherein said foundation elements (4), said layer of aggregate (5) and said a layer of floor heat insulation (6) act as a foundation structure (2), adapted to support said building structure (1).

2. Building structure according to claim 1, wherein said number of foundation elements (4) are prefabricated or plastic moulded, and wherein said outer wall structure (3) is supported by said number of foundation elements (4).

3. Building structure according to any of claims 1-2, wherein said outer wall structure (3) abuts against said number of foundation elements (4).

4. Building structure according to any of claims 1-3, wherein said outer wall structure (3) is provided with a layer of wall heat insulation (7) at an inner side of said outer wall structure (3).

5. Building structure according to any of claims 1-4, wherein an inner floor structure (8) is arranged above said layer of floor heat insulation (6), and wherein said inner floor structure (8) is enclosed by said outer wall structure (3).

6. Building structure according to claim 5, wherein said inner floor structure (8) is mounted in a floating manner.

7. Building structure according to any of claims 5-6, wherein said outer wall structure (3) is separated from said inner floor structure (8) with said layer of wall heat insulation (7).

8. Building structure according to claim 8, wherein said layer of wall heat insulation (7) has a thickness T1 and said layer of floor heat insulation (6) has a thickness T2, said thicknesses (T1, T2) being essentially equal, and wherein said insulations (6, 7) meet in essentially their whole thickness (T1, T2) around the circumference of said building structure (1).

9. Building structure according to claim 5, wherein an inner wall structure (9), separated from said outer wall structure (3) by said layer of wall heat insulation (7), rests on said inner floor structure (8).

10. Building structure according to any of claims 1-9, wherein said number of foundation elements (4) is between 1 and 20, preferably between 12 and 20.

11. Building structure according to any of claims 1-10, wherein said layer of aggregate (5) and said foundation elements (4) are arranged such that the layer of aggregate (5) is flush with an upper surface (10) of said foundation elements (4). 5
12. Method of forming an energy efficient foundation structure (2) for a building structure (1) according to any of claims 1-11, said method comprising: 10
- arranging said foundation elements (4) on a ground area such that said foundation elements (4) are arranged to support said outer wall structure (3) of said building structure (1); (a) 15
 - arranging a layer of aggregate (5) to cover a base area between said foundation elements (4); (b) 20
 - arranging a layer of floor heat insulation (6) partly on said layer of aggregate (5) and partly on said foundation elements (4), such that said foundation elements (4), said layer of aggregate (5) and said layer of floor heat insulation (6) act as a foundation structure (2), supporting said building structure (1). (c) 25
13. Method of forming a foundation structure according to claim 12, said method comprising:
- providing prefabricated or plastic moulded foundation elements (4), and arranging said outer wall structure (3) to be supported by said number of foundation elements (4). 30
14. Method of forming a foundation structure according to claim 13, said method comprising: 35
- arranging an inner floor structure (8) above said layer of floor heat insulation (6) such that said inner floor structure (8) is enclosed by said outer wall structure (3). 40
15. Method of forming a foundation structure according to claim 14, said method comprising:
- arranging said inner floor structure (8) in a floating manner. 45

50

55

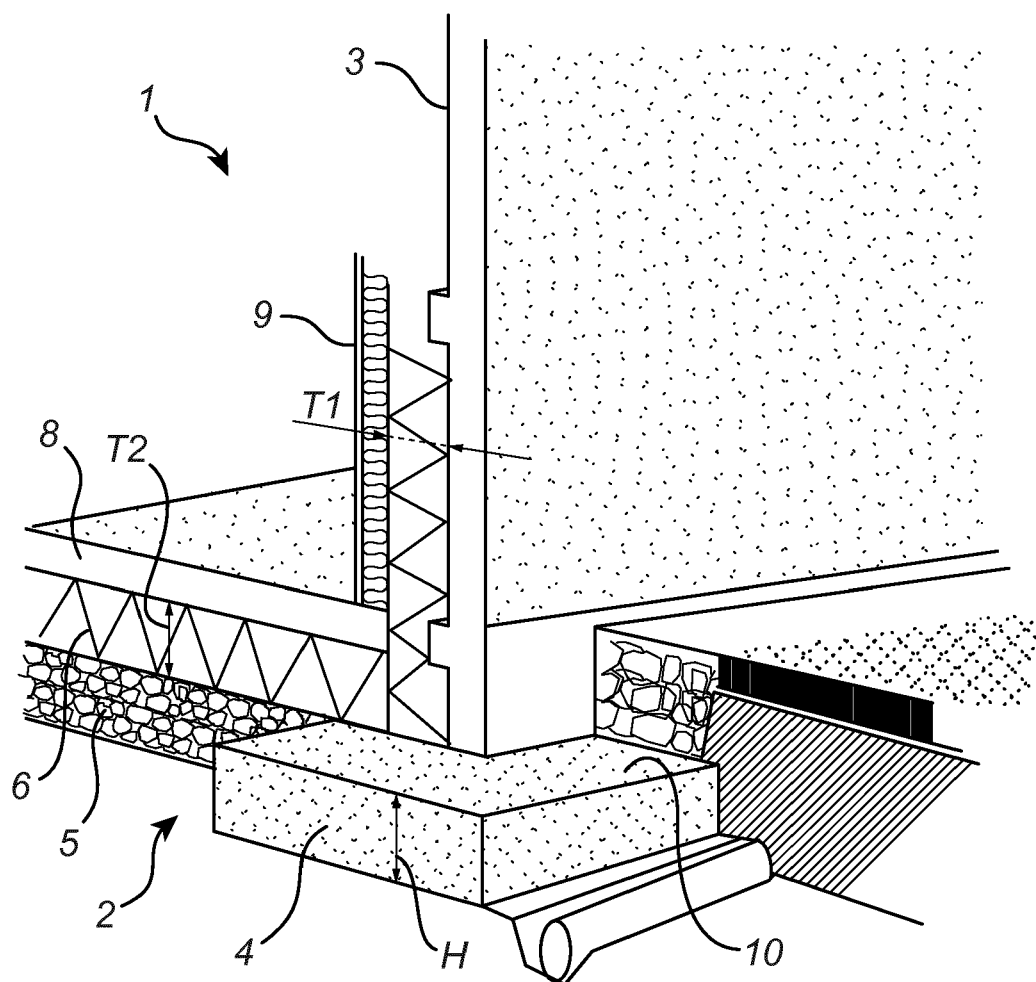


Fig. 1

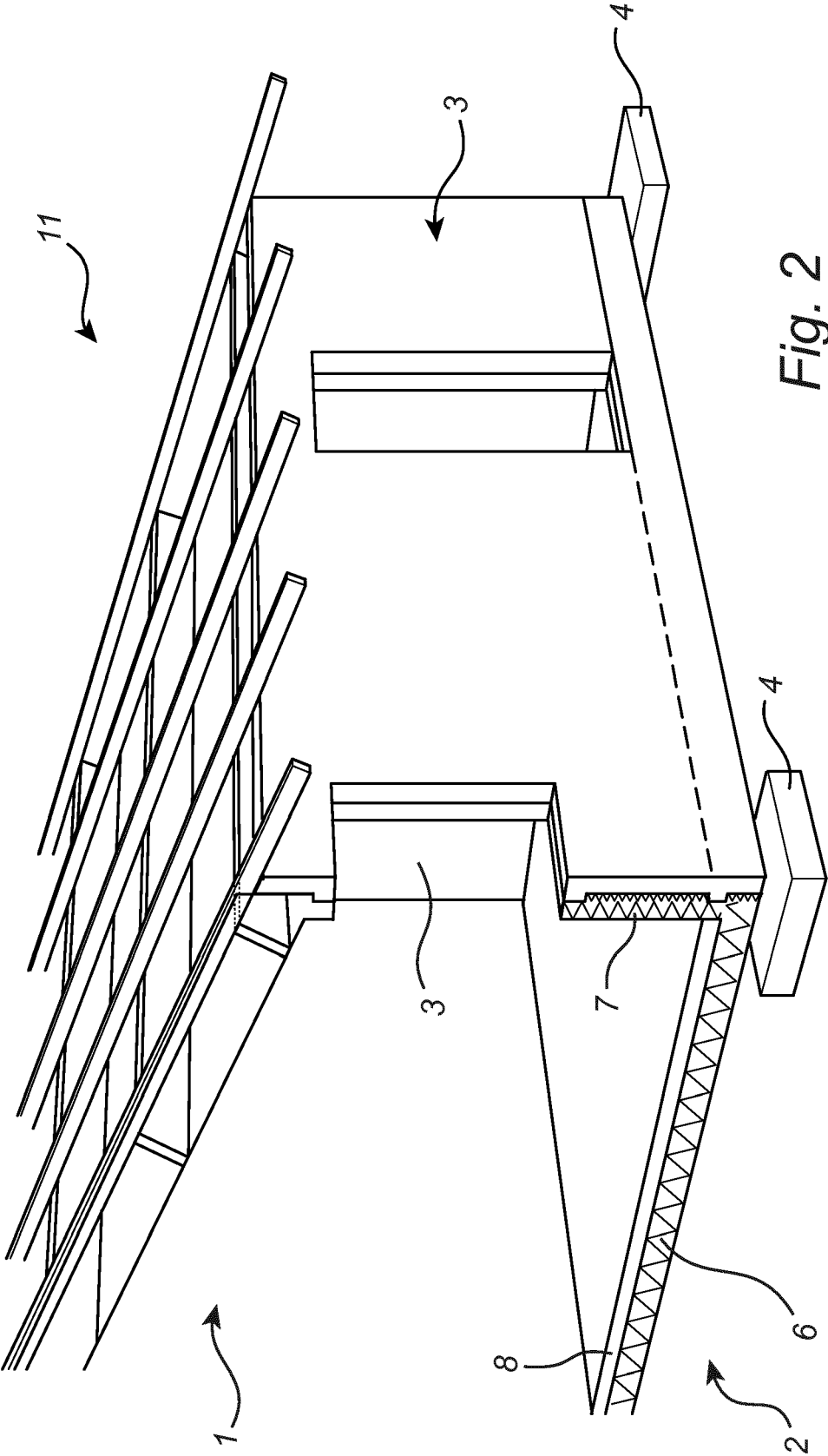


Fig. 2

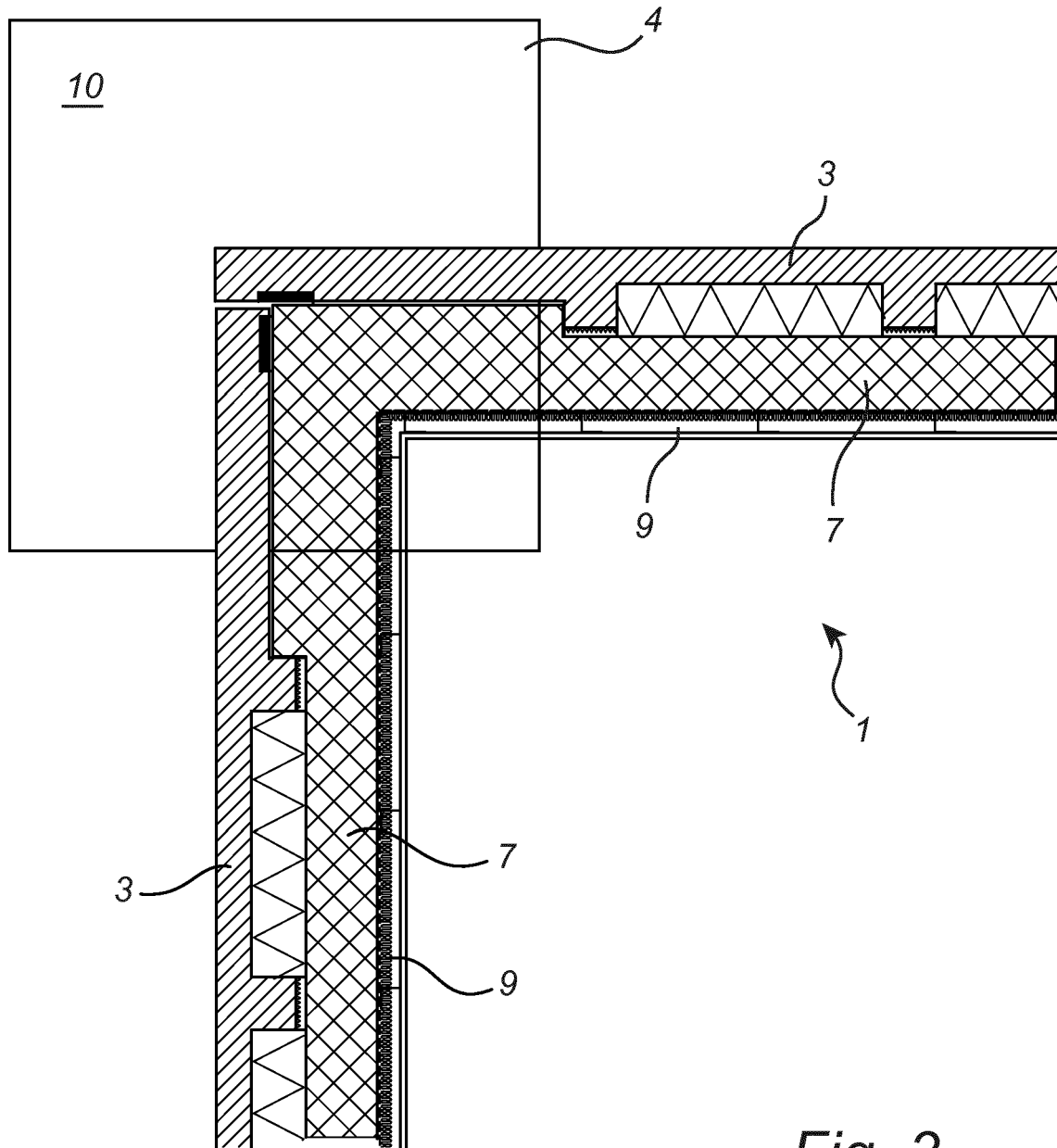


Fig. 3

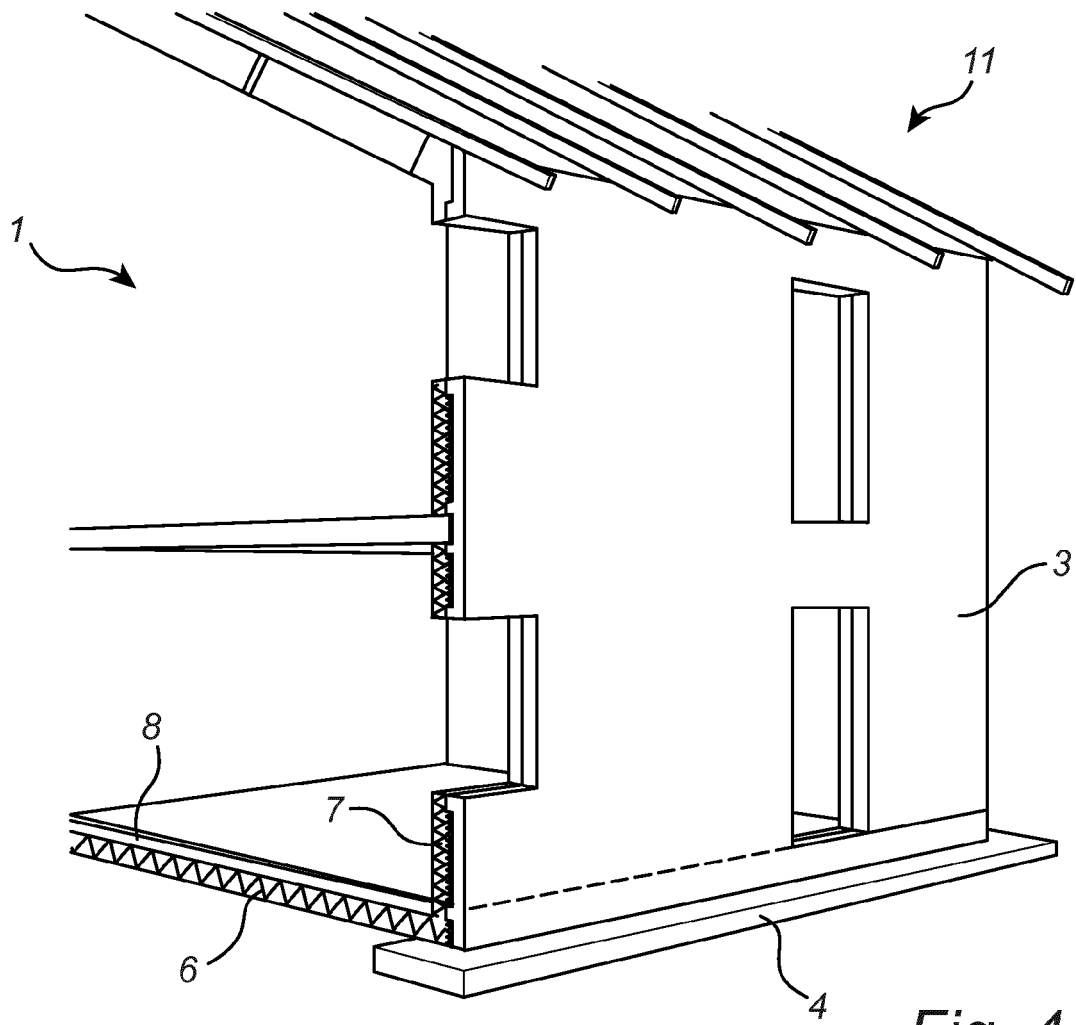


Fig. 4

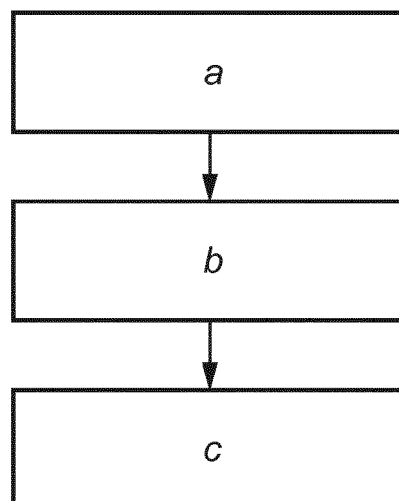


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 7432

5

10

15

20

25

30

35

40

45

50

55

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	SE 0 800 311 L (ROBERT SEGERDAHL, VISBY [SE]) 13 August 2009 (2009-08-13) * page 2, lines 12-23; figures 1, 2 *	1-15	INV. E04B1/00
X	EP 2 241 690 A2 (NIELSEN KLAUS [DK] KLAUS NIELSEN RAADGIVENDE INGENIOER F R I I S FA [D]) 20 October 2010 (2010-10-20) * paragraph [0021] - paragraph [0029]; figures 3-6 *	1-15	
X,D	WO 97/35079 A1 (FREEMAN JOHN JOSEPH [GB]; LEASK ANDREW WILLIAM [GB]) 25 September 1997 (1997-09-25) * page 4, line 20 - page 9, line 7; figures 1,5 *	1-15	
X	FR 2 950 372 A1 (CHAMOIS CONSTRUCTEUR DIDIER DEMERCASTEL & ASSOCIES [FR]) 25 March 2011 (2011-03-25) * page 4, line 31 - page 5, line 1; figure 1 * * page 7, line 22 - line 24; figure 4 *	1-15	TECHNICAL FIELDS SEARCHED (IPC)
X	DATABASE WPI Week 199901 Thomson Scientific, London, GB; AN 1999-007865 XP002737885, -& NL 1 009 712 C1 (BOOG BOUW ONTWIKKELING ONROEREND GOED) 26 August 1998 (1998-08-26) * abstract; figure 1 *	1-15	E04B E02D
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 March 2015	Examiner Couprie, Brice
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			

EPO FORM 1503 03.02 (P04C01)



EUROPEAN SEARCH REPORT

Application Number
EP 14 18 7432

5

10

15

20

25

30

35

40

45

50

55

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	DATABASE WPI Week 201203 Thomson Scientific, London, GB; AN 2011-Q88874 XP002737886, -& BE 1 018 967 A3 (DOUTERLOIGNE NV) 6 December 2011 (2011-12-06) * abstract; figures 1-5 * -----	1-15	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		27 March 2015	Couprie, Brice
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			

2
EPO FORM 1503 03/02 (P04C01)

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

EP 14 18 7432

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.

27-03-2015

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
SE 0800311	L	13-08-2009	-----	-----
EP 2241690	A2	20-10-2010	NONE	
WO 9735079	A1	25-09-1997	AU 1936297 A	10-10-1997
			WO 9735079 A1	25-09-1997
FR 2950372	A1	25-03-2011	NONE	
NL 1009712	C1	26-08-1998	NONE	
BE 1018967	A3	06-12-2011	BE 1018967 A3	06-12-2011
			BE 1019521 A3	07-08-2012
			-----	-----

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- EP 2317021 A1 [0006]
- EP 1317587 B1 [0007]
- WO 9735079 A [0008]