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(54) **WALL STRUCTURE**

(57) A wall structure which comprises a basic structure forming a basement wall or footing structure being at least partially underground, and a thermal insulation material layer arranged on the outer surface of the basic structure. The thermal insulation material layer comprises adjacently arranged thermal insulation sheets (1, 2) which comprise a first surface and a second surface, and short edge sides and long edge sides (9', 9", 10') delimiting the surfaces, of which the first surface and the second surface comprise grooves, and which thermal insulation sheets are attached into the basic structure by their first surface. The thermal insulation sheets (1, 2) are arranged into the structure so that the long edge sides (9', 9", 10') of the thermal insulation sheets and the grooves on the first surface and on the second surface of the thermal insulation sheets are vertically with respect to the height direction of the basic structure. Furthermore, the long edge sides (9', 10') of the adjacently arranged thermal insulation sheets (1, 2) are attached to each other by a locked tongue-and-groove-joint (7) so that the locked tongue-and-groove-joint comprises inside the locked tongue-and-groove-joint at least one air channel (8', 8") that is in a vertical direction of the wall structure.

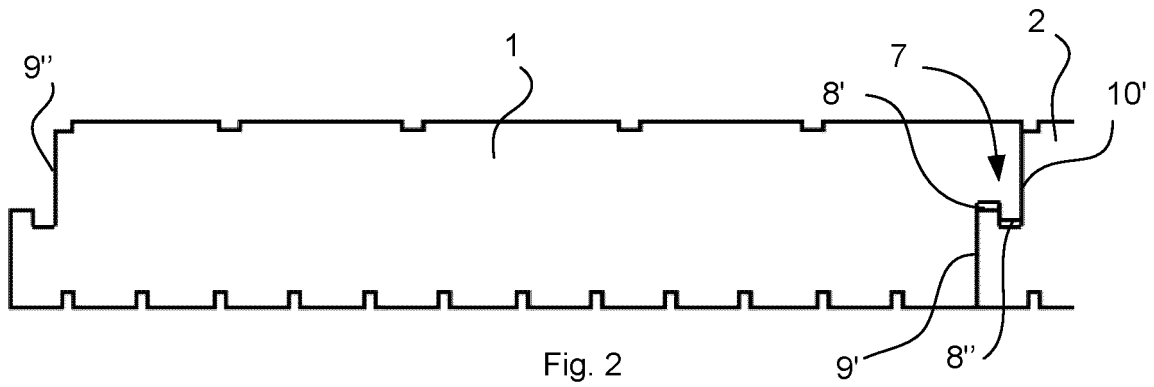

Fig. 2

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Description

Field of the invention

[0001] The invention relates to a wall structure according to the preamble of the enclosed independent claim, which wall structure is used in at least partly underground basement structures or footing structures.

Background of the invention

[0002] Thermal insulation sheets which are manufactured of extruded polystyrene (XPS) and comprise grooves on their outer surface for enabling water to run easily into subsurface drains, are used as thermal insulation and drainage membrane on the outer surface of a partially underground basement wall structure or footing structure. Thermal insulation sheets also have grooves on the surface that is against the basic structure of the basement or footing to enable the moisture coming from inside to exit. A structure made of such thermal insulation sheets and comprising ventilation channels advances to keep the basic structure dry. Thermal insulation sheets are usually arranged to each other by a tongue-and-groove-joint which comprises a common male tongue and a female groove. The structure is completely tight when the tongue-and-groove joints between the thermal insulation sheets are sealed with a sealing compound suitable for outdoor usage. The spread of moisture from the soil to the basic structure is thus prevented. However, it is clear that damp proofing the seams in this manner is quite laborious, incurs additional costs and slows down construction.

Object and description of the invention

[0003] An object of the present invention is to reduce or even eliminate the above-mentioned problems present in prior art.

[0004] An object of the present invention is to provide a thermal insulation for a partially underground basement wall or footing structure, that acts also at the same time as waterproofing, and which wall structure does not require separate sealing compound between the seams of the thermal insulation sheets.

[0005] In order to attain this object, the wall structure according to the invention is primarily characterised in what is presented in the characterising part of the independent claim.

[0006] The other, dependent claims present some preferred embodiments of the invention.

[0007] A typical wall structure according to the invention comprises

- a basic structure, which forms a basement wall or footing structure being at least partially underground,
- a thermal insulation material layer arranged on the outer surface of the basic structure which comprises adjacently placed thermal insulation sheets comprising short edge sides and long edge sides delimiting the first surface and the second surface, and of which the first surface and the second surface comprise grooves, and which thermal insulation sheets are attached to the basic structure by their first surface, and which thermal insulation sheets are arranged into the structure so that the long edge sides of the thermal insulation sheets and the grooves on the first surface and on the second surface of the thermal insulation sheets are vertically with respect to the height direction of the basic structure, and furthermore, the long edge sides of the adjacently arranged thermal insulation sheets are attached to each other by a locked tongue-and-groove-joint so that the locked tongue-and-groove-joint comprises inside the locked tongue-and-groove-joint at least one vertical air channel in the height direction of the wall structure.

[0008] The thermal insulation material layer used in the wall structure according to the invention acts both as a thermal insulation and as a drainage membrane. The wall structure according to the invention is used in the at least partially underground basement structures or footing structures behind which there is ground or crawl space of the building. The invention is based on a joint between the thermal insulation sheets used in the wall structure of the at least partly underground basement, basement floor of a building or footing structure, which joint is tight without separate sealing compound, and at the same time, more vertical channels can be made into the structure to remove moisture from the structure. In the structure according to the invention, the thermal insulation sheets are attached to each other by a locked tongue-and-groove-joint into which a separate air channel is formed. The wall structure according to the invention facilitates assembling as no separate sealing of the seams with sealing compound is required. In the thermal insulation sheet, there are already channels formed by the grooving on the surface of the thermal insulation sheet and which act as subsurface drains. Also, the joint between the thermal insulation sheets is now formed into a subsurface drain structure which prevents moisture from spreading into the basic structure of the wall structure through the joints. This way the wall structure according to the invention improves the moisture performance of the basement or footing.

Brief description of the drawings

[0009] In the following, the invention will be described in more detail with reference to the appended drawings, in which

Fig. 1 shows a cross-sectional view of a thermal insulation sheet according to an embodiment of

the invention which is used to form a thermal insulation layer on the outer surface of the basic structure,

Fig. 2 shows a cross-sectional view of a locked tongue-and-groove-joint according to an embodiment of the invention between two thermal insulation sheets attached to each other, and

Fig. 3 illustrates attachment of the thermal insulation sheets on the outer surface of the basic structure so that the long edge sides of the thermal insulation sheets comprising a locked tongue-and-groove joint are vertically with respect to the height direction of the basic structure.

Detailed description of the invention

[0010] The wall structure according to the invention comprises a basic structure, which forms a basement wall or footing structure being at least partially underground. The basic structure can be an at least partly underground basement, basement floor of a building or footing structure of a building. The basic structure can be formed for example by masoning or casting, and typically it contains rock material.

[0011] In the wall structure according to the invention, a thermal insulation material layer is arranged on the outer surface of the basic structure, which layer comprises adjacently placed thermal insulation sheets. These thermal insulation sheets comprise a first surface and a second surface, and shorter and longer edge sides delimiting the surfaces. The first surface and the second surface of the thermal insulation sheets comprise grooves. The grooves are formed substantially parallel with the long edge sides of the thermal insulation sheets.

[0012] The purpose of the grooves of the first surface which will be against the basic structure is to remove moisture coming from inside the structure. Typically, these grooves are closed at the top part of the structure to prevent outside air from entering the structure. The purpose of the grooves on the second surface of the thermal insulation sheet, that is on the outer surface of the structure, is to promote water to run into the subsurface drains. By means of these grooves, the structure can be provided with a vertical subsurface draining by placing a filter cloth against the outer surface of the thermal insulation sheet. Thus, infill soil does not have to be completely self-draining. According to one embodiment of the invention, the grooves on the first surface and on the second surface of the thermal insulation sheet have a width of 2-15 mm and a depth of 2-10 mm, and the distance between the grooves from each other (measured from the middle to the middle of the groove) can be 20-150 mm. However, the design and frequency of the grooves on the first and on the second surface may vary. The first surface of the thermal insulation sheet used in a wall structure according to an embodiment of the invention, which is against the basic structure, comprises wider grooves than the second surface of the thermal insulation sheet. Furthermore, the grooves arranged on the second surface of a thermal insulation sheet used in a wall structure according to an embodiment of the invention are arranged closer together than the grooves arranged on the first surface.

[0013] In the wall structure according to the invention, the thermal insulation sheets are attached to the basic structure by their first surface. Thermal insulation sheets can be attached to the basic structure for example by gluing or by other compound or mortar suitable for the purpose. The thermal insulation sheets are attached directly to the basic structure, whereby there is no separate damp proofing between the thermal insulation sheets and the basic structure. In the wall structure according to the invention, the thermal insulation sheets are arranged into the structure so that the long edge sides of the thermal insulation sheets and the grooves on the first surface and on the second surface of the thermal insulation sheets are vertically with respect to the height direction of the basic structure.

[0014] In the wall structure according to the invention, the long edge sides of the adjacently arranged thermal insulation sheets are attached to each other by a locked tongue-and-groove-joint so that the locked tongue-and-groove-joint comprises inside the locked tongue-and-groove-joint at least one air channel that is in a vertical direction of the wall structure. In an advantageous embodiment according to the invention, the locked tongue-and-groove-joint comprises two air channels inside the locked tongue-and-groove-joint. The tongues and grooves of the locked tongue-and-groove joint are designed so that when the thermal insulation sheets are place against each other, one or two air channels, preferably two air channels, are formed into the joint. The air channel or air channels in the locked tongue-and-groove joint are arranged along the entire length of the locked tongue-and-groove-joint in the vertical direction of the wall structure. In the structure according to the invention, the locked tongue-and-groove joint does not comprise separate sealing compound.

[0015] The thermal insulation sheets used in the wall structure according to the invention are manufactured of extruded polystyrene (XPS). The closed cell structure of the XPS sheet effectively prevents the transfer of moisture through the sheet material.

[0016] The thickness of the thermal insulation sheet used in the wall structure can typically be 50-200 mm, more typically 80-120 mm, even more typically 100 mm. The thermal insulation sheet usually has a rectangular shape comprising two parallel planar large surfaces, and a first and a second parallel long side edges delimiting the surfaces, and a parallel first and a second parallel short side edges, which are perpendicular to the long side edges. The length of the long side edge of the wall plate is typically 1000 to 4000 mm, more typically 1000 to 3000 mm, even more typically 2000 to 2600 mm. The length of the short side edge of the wall plate is typically 300 to 1500 mm, more typically 500 to 1000 mm, even more

typically 500 to 800 mm.

Detailed description of the Figures

[0017] Figure 1 shows a cross section of a thermal insulation sheet 1 used in the wall structure according to the invention. The thermal insulation sheet 1 comprises a first surface 3 and a second surface 4 which comprise grooves 5, 6. The design and distance of the grooves from each other may vary. The first surface 3 of the thermal insulation sheet shown in Fig. 1 comprises wider grooves 5 than the second surface 4 of the thermal insulation sheet. The grooves 6 arranged on the second surface 4 of the thermal insulation sheet of the Figure 1 are arranged closer together than the grooves 5 arranged on the first surface 3. The long edge sides 9', 9" of the thermal insulation sheet 1 comprise designs enabling the locked tongue-and-groove-joint.

[0018] Figure 2 shows a locked tongue-and-groove-joint 7 according to an embodiment of the invention as a cross view between two thermal insulation sheets 1, 2 attached to each other so that two air channels 8', 8", which act as subsurface drain channels of the structure, are formed into the locked tongue-and-groove-joint 7. The long edge sides 9', 10' of the adjacently arrangeable thermal insulation sheets 1, 2 are designed so that air channels 8', 8" are formed inside the locked tongue-and-groove-joint 7 when the thermal insulation sheet 1, 2 are attached to each other.

[0019] Figure 3 illustrates attachment of the thermal insulation sheets 1,2 on the outer surface of the basic structure 11 so that the long edge sides 9', 10' of the thermal insulation sheets comprising a lock-groove joint are vertically with respect to the height direction A of the basic structure. Figure 3 does not show the grooves on the surface of the thermal insulation sheets, but the grooves are also in the height direction A of the basic structure 11. The thermal insulation sheets 1, 2 are attached into the basic structure 11 of the at least partially underground basement wall or footing structure by their first surfaces.

Claims

1. A wall structure comprising

- a basic structure (11), which forms a basement wall or footing structure being at least partially underground,
- a thermal insulation material layer which is arranged on an outer surface of the basic structure (11), and which comprises adjacently placed thermal insulation sheets (1, 2) comprising a first surface (3) and a second surface (4) and short edge sides and long edge sides (9', 9", 10') delimiting the surfaces, of which the first surface (3) and the second surface (4) comprise grooves (5, 6), and which thermal insulation sheets are attached to the basic structure by their first surface (3), and which thermal insulation sheets (1, 2) are arranged into the structure so that the long edge sides (9', 9", 10') of the thermal insulation sheets (1, 2) and the grooves (5, 6) on the first surface (3) and on the second surface (4) of the thermal insulation sheets are vertically with respect to the height direction of the basic structure,

characterized in that the long edge sides (9', 10') of the adjacently arranged thermal insulation sheets (1, 2) are attached to each other by a locked tongue-and-groove-joint (7) so that the locked tongue-and-groove-joint comprises inside the locked tongue-and-groove-joint at least one air channel (8', 8") that is in a vertical direction of the wall structure.

2. A wall structure according to claim 1, **characterised in that** the locked tongue-and-groove-joint comprises two air channels (8', 8") inside the locked tongue-and-groove-joint (7).

3. A wall structure according to claim 1 or 2, **characterised in that** the air channel (8', 8") is arranged along the entire length of the locked tongue-and-groove-joint in the vertical direction of the wall structure.

4. A wall structure according to any of the preceding claims, **characterised in that** the thermal insulation sheets (1, 2) are manufactured of extruded polystyrene (XPS).

5. A wall structure according to any of the preceding claims, **characterised in that** the first surface (3) of the thermal insulation sheet placed against the basic structure comprises wider grooves (5) than the second surface (4) of the thermal insulation sheet.

6. A wall structure according to any of the preceding claims, **characterised in that** the grooves (6) arranged on the second surface (4) of the thermal insulation sheet are arranged closer together than the grooves (5) arranged on the first surface (3).

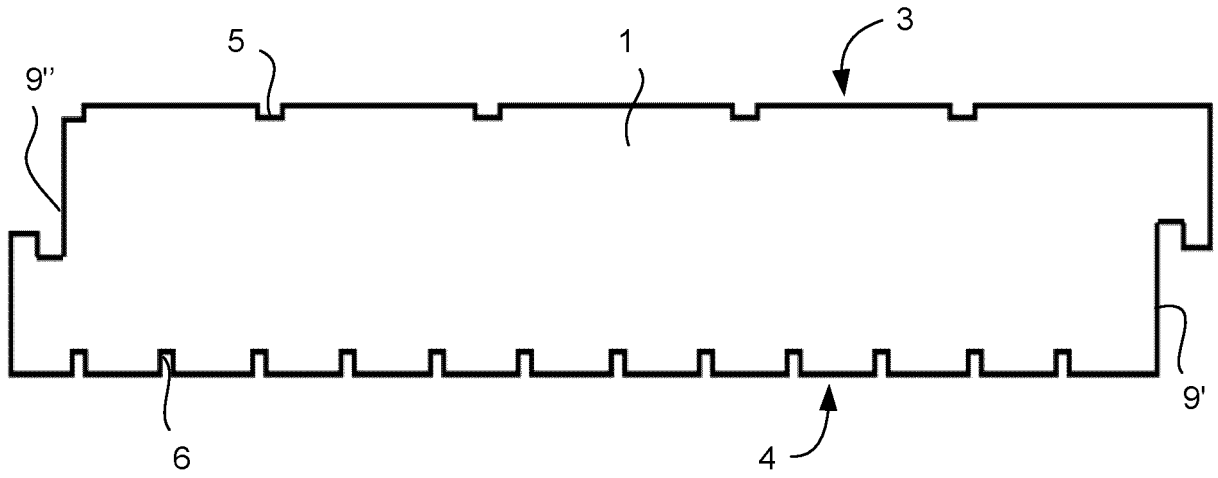

Fig. 1

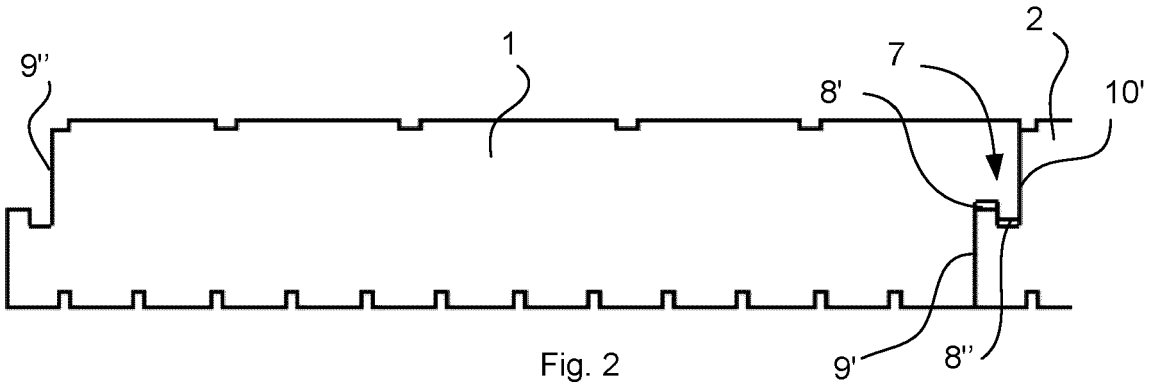

Fig. 2

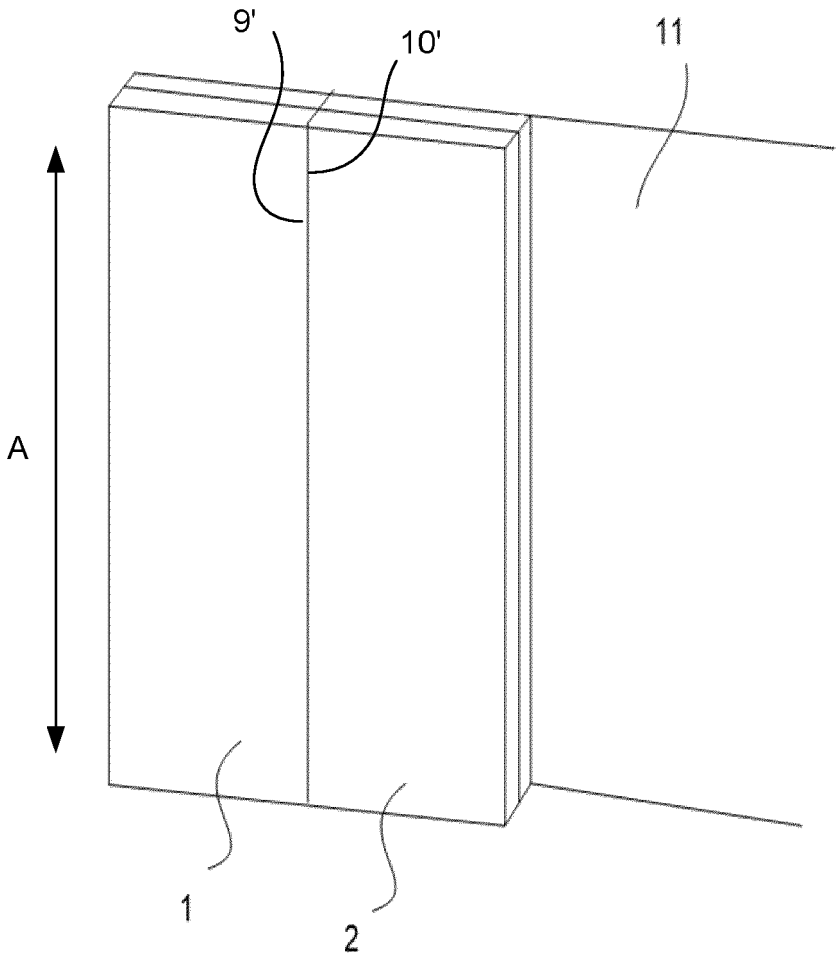

Fig. 3

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EUROPEAN SEARCH REPORT

Application Number
EP 24 20 3766

DOCUMENTS CONSIDERED TO BE RELEVANT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	7 February 2025	Galanti, Flavio

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