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(54) Insulating wall system

(57) This invention relates to a wall system comprising a first (5) and a second wall part, where the second wall part comprises insulation panels (3) each insulation panel having first and second substantially parallel major surfaces (7,8). The second major surface (8) is facing the first wall part (5), and the insulation panel has at least three, preferably four, minor surfaces (9), where a slit (10) is made in a minor surface and extending substantially parallel with the major surfaces. The insulation panel is positioned between at least two profiles (4), each profile having a base portion (13) substantially parallel with and in contact with a part of one minor edge surface of the insulation panel and a flange portion (11) substantially parallel with the major surfaces of the insulation panel and extending into said slit in the minor surface of the insulation panel. The insulation panel having a thickness larger than a width of the base portion (13) of the profiles, and at least one profile is arranged and fastened to parts of the building different from the first wall part, so that no elements connected to said profile except the insulation panel span from the first major surface of the insulation panel to the second major surface of the insulation panel.

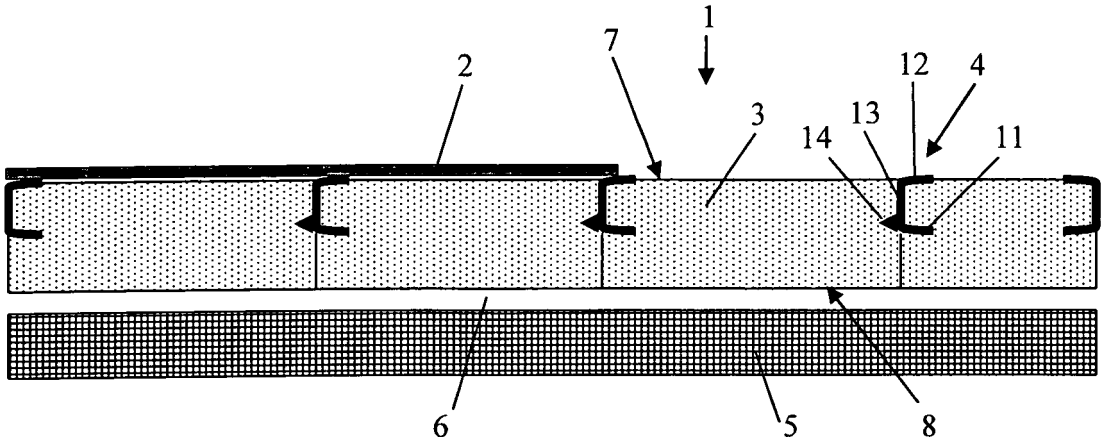

Figure 1

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Description

[0001] The invention concerns a wall system as described in the preamble of claim 1 and a method for installing such a wall system.

[0002] This type of wall systems is known from DE 101 47 831 A1, describing a wall with C-profiles as the load-bearing construction and insulation panels arranged between the C-profiles. Covering layers such as plasterboards are mounted on both sides of the wall. The insulation layer is thicker than the distance between the two flanges of the C-profile. Therefore, the covering layer on one side of the wall is fixed directly to one flange of the C-profile, while the cover layer on the other side is placed against the insulation layer and fixed to the other flange of the C-profile by screws extending through the insulation. This type of construction reduces the heat loss through thermal bridges and improves the sound reduction slightly compared to a traditional construction where the C-profile extends from one cover layer to the other.

[0003] Such a wall system, however, still has the significant disadvantage of a considerable number of screws. These screws together with the C-profile to which they are attached will still transport a significant amount of heat energy from one side of the wall system to the other and thereby reduce the heat insulating capacity of the wall. Also the sound insulating capacity is reduced.

[0004] This problem has been solved by the present invention by arranging the wall system as described in the characterising part of claim 1. Thereby the wall system comprises two individual walls placed next to each other and secured individually to the rest of the building construction. The two individual walls may be placed closely together and may be fitted together by use of an adhesive, or there may be a small air gap ensuring ventilation. This will often be necessary when the wall is an outer wall where the temperature difference may be relatively high, increasing the risk of condensation of vapour.

[0005] The wall system according to the invention comprises a first wall part, usually the outer wall, and a second wall part where the insulation panels are installed. The insulation panels have two substantially parallel major surfaces minor surfaces. The insulation panel is positioned between at least two profiles where each profile has a base portion substantially parallel with and in contact with a part of one minor edge surface of the insulation panel. Means for engaging the insulation panels and holding them in position are arranged in connection with the base portion of the profile. The insulation panel has a thickness larger than the width of the base portion of the profiles.

[0006] At least one profile is arranged and fastened to parts of the building different from the first wall part in such way that no single element or combination of elements except the insulation panels themselves extends from a plane formed by the major surfaces facing the inside of the building to a plane formed by the major surfaces of the insulation panels facing the outer wall.

[0007] Preferably, a slit is made in a minor surface and extending substantially parallel with the major surfaces of the insulation panels. Preferably, the profile is provided with a flange portion substantially parallel with the major surfaces of the insulation panel.

[0008] The profiles are arranged and fastened so that practically no parts will span from one major surface to the opposite major surface of the insulation panels and the two wall parts are not directly connected by mechanical means other than possibly part of the heat insulating layer.

[0009] One further advantage of this new wall system is that the two parts of the wall system can be installed independently from each other, which means that the system is suitable for renovation projects and improvements of the insulation performance of a building. E.g. an existing non-insulated façade wall can be used as the first outer wall part in the new wall system, and the second part comprising the insulation can be installed independently.

[0010] To achieve this new wall system with two independent wall parts, the inner part of the wall system comprising the insulation could be secured to the ceiling, roof and/or wall construction and not to the outer wall other than by the insulation material, possibly with some adhesive.

[0011] The advantages of this wall system is that there is no thermal bridging nor elements suitable for transporting sound from one side of the wall to the other. This means that both improved heat and sound insulation can be achieved. Also, the fire properties will be improved with the wall system according to the invention, as the heat from a fire starting at the first wall part side of the insulation will be insulated from the profiles, and therefore these will be affected and e.g. starting bending at a later stage of the fire. This will delay the fire break through of the second wall part.

[0012] The profiles will extend a distance of maximum 85 % of the thickness of the insulation layer, preferably a maximum of 75 %, and even more preferably a maximum of 60 %. Obviously, this distance will depend on the thickness of the insulation layer. If the profiles extend 75 % of a 100 mm thick insulation layer, the same profile will only extend 37.5 % of a 200 mm thick insulation layer. The profiles are preferably made of metal, preferably steel or aluminium. Perforations in the profiles in order to reduce the heat conductivity could be advantageous. The profiles could also be made from a material having lower heat conductivity than metal e.g. plastic or wood. Also a combination of different materials is a possibility.

[0013] The insulation material used in the new wall system may be any known insulation material such as fibrous or foam or plastic based materials. Mineral fibre insulation such as glass wool or stone wool is particularly useful due to the better fire properties. Especially stone wool provides very good fire properties and has also good acoustic properties. Mineral wool will also offer an easier

installation as these products are more flexible than e.g. foam insulation.

[0014] This new wall system can be used for refurbishments of existing buildings, for new buildings and also for prefabricated façade elements.

[0015] In a first embodiment the wall system is made as an outer wall where the first part of the wall without insulation is the outer wall part, typically made of bricks and/or concrete, also being the façade of the building. Often there will be an air gap between the two parts of the wall. The second part, being the inner wall part, comprises the insulation placed in a framework of profiles. Each insulation panel has four minor surfaces where a slit extending substantially parallel with the major surfaces is made in at least one minor surface. The insulation panels are each placed between at least two profiles. Each profile has a base portion being substantially parallel with and in contact with one minor surface of the insulation panel and one flange portion being substantially parallel with the major surfaces of the insulation panel and extending into said slit in a minor surface of the insulation panel. The insulation panels have thicknesses larger than the width of the base portion of the profiles.

[0016] In a preferred embodiment the wall system according to the invention has substantially all profiles arranged and fastened to parts of the building different from the first wall part, so that no elements connected to said profiles except the insulation panels them selves span from the first major surfaces of the insulation panels to the second major surfaces of the insulation panels. Preferably, also the base portions of the profiles are placed parallel to a minor surface of the insulation panels and between the first major surface of the insulation panels and the slit in a minor surface of the insulation panels.

[0017] This means that the two wall parts are not directly connected by mechanical means. If there is an air gap between the two wall parts they will not be connected at all. If there is no air gap they will only be connected through the heat insulating material, possibly with some adhesive between the second major surface of the insulation panel and the first wall part.

[0018] Preferably, C- or U- profiles are applied for the framework holding the insulation panels. These profiles will comprise one base portion and two flange portions extending from the base portion. One of these flange portions are arranged to penetrate into the slit in the insulation panels in order to hold the insulation panel in position. Other means for achieving this purpose could also be applied, e.g. punched out pieces from the base portion or screws or clips, and then an L-profile could be sufficient. The other flange portion is arranged to be flush with a major surface of the insulation panel. This major surface of the insulation will often be the outer surface opposite the first part of the wall. These types of profiles have the advantage of fixing the insulation panels better into the correct position. Furthermore, a flange placed opposite the other first part of the wall and flush with the outer major surface of the insulation panel, may be used for attaching a cover layer to this side of the wall. This cover layer could be gypsum boards, wood panels, fibre boards or any other material suitable for cladding of inner walls.

[0019] In a further preferred embodiment the wall system according to the invention has two substantially vertical profiles holding the insulation panel, and a first profile has a flange portion extending into the slit in the insulation panel and a second profile has a flange portion pointing away from said insulation panel. The flange portion pointing away from the insulation panel is arranged for holding a neighbouring insulation panel. Furthermore, the second profile may be provided with fixation means for holding the said first mentioned insulation panel in place. These fixation means may e.g. be arranged after placement of first mentioned insulation panel but before placing the second neighbouring insulation panel in position.

[0020] The framework of profiles, which usually form one or more frames in which the insulation panels are installed, will often be attached to the floor and the ceiling with one horizontal profile attached to the floor and one attached to the ceiling. Vertical profiles are placed between the horizontal profiles. In building or parts of buildings where the distance between floor and ceiling is particularly large one or more vertical supporting profile could be added in a position between the floor and the ceiling.

[0021] The framework of profiles could also be attached to the walls perpendicular to and adjoining the new inventive wall system. This would be especially relevant when the new wall system is applied for an external wall being part of the building façade.

[0022] In a further preferred embodiment of the invention the majority of the insulation panels, preferably of mineral wool, comprise at least two different layers having different densities. Often, this will be made as so-called dual density boards, meaning that the panels comprise layers, extending parallel to the major surfaces, of different densities. Usually, this will be in the form of one relatively thin layer (up to 25 % of the total thickness of the insulation panel) with a high density, e.g. higher than 60 kg/m^3. The remaining part of the insulation will be of a lower density, e.g. below 45 kg/m^3. One advantage of such an insulation panel is that a high degree of mechanical stability may be achieved from the high density layer without getting a very heavy product.

[0023] In a further embodiment of the invention a high density layer of the insulation could substitute a cover layer. If the surface of the insulation facing the occupied room is sufficiently hard and stable, it may not always be necessary with a separate cladding layer. In these cases the high density layer of the insulation could be covered by a fleece and/or paint in order to improve the aesthetic appearance of the surface and/or to improve the wear resistance of the surface. If the mineral wool is covered by a fleece or a paint layer having an open or porous surface it will have the advantageous effect of higher

acoustic absorption than a traditional covering layer of e.g. gypsum boards. In such an embodiment the layer in the insulation with the highest density will be placed opposite the other first wall part of the system.

[0024] The layer in the insulation with the highest density may also be placed facing the first wall part, depending on the purpose. This placement would be relevant if the purpose is to reduce the risk of blocking an air gap for ventilation between the two wall parts. Such blocking could be a result of soft insulation material buckling out.

[0025] The high density layer will have a mechanical stabilising effect on the part of the wall comprising the insulation. This means that the risk for the insulation panels buckling out will be reduced. Such buckling out could result in open air gaps between the insulation panels, reducing the heat and acoustical insulating effect significantly.

[0026] Preferably a ventilation air gap is provided between the first wall part and the second wall part comprising the insulation panels. This has the advantage of removing humidity condensed on the first wall part. If no air gap is provided, the first wall part and the second major surface of the insulation panels may be interconnected by use of an adhesive. This would give the wall system improved mechanical stability.

[0027] In a further embodiment of the invention one or more minor surfaces of the insulation panel has been made more flexible than the rest of the insulation panel. This could be by a method similar to the method described in European patent application 04388066.5. This would serve two purposes: first to ensure a close fit between the insulation panels and the profiles, and second to allow some minor variations in the distance between the profiles.

[0028] The invention also covers a method of installing a wall system according to any of the above described embodiments. This method comprise the step of installing a framework of profiles for a second wall part, parallel to a first wall part, usually an outer wall, without connecting at least one profile to the first wall part. The method further comprises the step of arranging the insulation panels between the base portions of the profiles so that the means, which are arranged in connection with the base portion of the profile, for engaging the insulation panels will hold them in position. The insulation panel has a thickness larger than the width of the base portion of the profiles. The arrangement of the insulation panels also means that it is pushed into position between at least two profiles.

[0029] In a preferred embodiment of the method one of the two profiles have a flange portion penetrating into the insulation material and the insulation panel is placed in the framework by aligning a slit in the insulation panel to fit over this flange portion. Preferably, the other profile will have a flange portion pointing away from the insulation material, and preferably the insulation panel is secured to this second profile by fixation means. These fixation means could be a screw, a nail or any kind of clips.

[0030] In the following the invention will be described in more details with reference to the figures.

[0031] Figure 1 illustrates an example of the new wall system.

[0032] Figure 2 illustrates an insulation panel to be used in the new wall system.

[0033] Figure 3 illustrates a method for installing the insulation panels between the profiles.

[0034] Figure 4 illustrates an embodiment of the profile.

[0035] In figure 1 an embodiment of the wall system (1) according to the invention is illustrated. The first wall part (5) is often an outer wall made of bricks, concrete etc. I may be an existing wall or a newly erected wall. The second wall part is made up of insulation panels (3), profiles (4) and preferably an outer cladding layer (2) which could be gypsum boards or wood boards. There will usually be a ventilation air gap (6) between the first and the second part of the wall system.

[0036] Figure 1 further illustrates an embodiment of the profile (4) to be used in the wall system (1) having a base portion (13), at least one flange portion (11) and preferably also a second flange portion (12). In the shown embodiment the outer cladding layer (2) is secured to the second flange portion (12) of the profiles by e.g. screws (not shown). Preferably it is possible to apply fixation means (14) holding the insulation panel (3) on the side of the profile opposite the one or two flange portions (11, 12) in place. This fixation means (14) could have the form of nails e.g. barbed in order to prevent the insulation panel (3) from detaching from the profile (4) once installed.

[0037] Figure 2 illustrates an embodiment of the insulation panel (3) to be used in the wall system. The insulation panel have two major surfaces (7,8); the first major surface (7) facing the outer cover layer (2), and the second major surface (8) facing the first wall part (5). The insulation panel also comprises four minor edge surfaces (9, 9'). In at least one of these (9') a slit (10) is made. This slit (10) is made to fit together with one flange (12) of the profile. There may be slits in more than one minor edge surface of the insulation panel. This is of relevance if the insulation panel is held in place by flange portions of profiles on more than one minor edge surface. This would be the case if horizontal profiles also are provided, e.g. attached to the ceiling and/or to the floor and/or in a position in between. For this purpose two slits should be applied. The slits may be pre-cut from factory or they may easily be cut on site at the time of installation.

[0038] Figure 3 illustrates a method for installing the insulation panels (3) in the new wall system. This method comprises the steps of installing a framework of profiles (4) fastened to parts of the building construction other than the first wall part of the new wall system. Insulation panels are placed in this framework of profiles by aligning a slit (10) in a minor edge (9') to fit over a flange portion (11) of a first profile (4'). Then the insulation panel (3) is pushed into position between at least two profiles (4).

Optionally, the insulation panel is secured in position by fixation means (14) securing the panel to a second profile (4"). As illustrated in figure 3 the insulation panel may be of the dual density type comprising a layer (20) of relatively high density and a layer (21) of relatively low density. The high density layer (20) will give the necessary mechanical stability while the other layer will ensure the insulating capacity.

[0039] Figure 4 illustrates an embodiment of the profile where an L-shaped profile (4) is used. Instead of the flange portion entering a slit in the insulation panel a small area of the base portion (13) of the profile is punched partly, e.g. in a V-shape so that a triangular shaped piece (31) can be bended out. A number of such pieces (31) along the length of the profile will be able to hold the insulation in position. These bend out pieces (31) will be able to penetrate the insulation material without a precut slit. They may be bend beforehand or during installation, preferably by hand. The angle could be from 0 degrees and up to 90 degrees. If an angle in the range 10 - 40 degrees are applied, the bend out pieces (31) may act as a kind of barbs. If the angle is closer to 90 degrees the function will be more like the flange of a C-profile, except that it may not be necessary having a precut slit in the insulation panel. The fixation means (14) for holding the insulation panel on the other side of the profile may also be cared for by bending out such punched pieces to the other side of the base portion (13). Obvious, also other means for holding the insulation in place may be applied. This could be screws, or special clips of any type. These could be applied for holding the insulation to both sides of the base portion (13).

[0040] In an example of the invention the insulation panels (3) has a thickness of 150 mm (may be in the range 100 to 200 mm). Insulation materials will be mineral wool or foam or plastic based. Often a mono density insulation material is applied with a density in the range 15 to 150 kg/m^3, preferably around 70 kg/m^3. If dual density insulation is applied, the thickness of the high density layer is preferably around 25 mm and the density is about 60 kg/m^3, while the density of the low density layer is preferably about 35 kg/m^3. The slit (10) provided in the insulation panel (3) is cutout by a saw, and with a minimum width of 3 mm and a depth of around 50 mm. The cladding layer (2) may e.g. be gypsum plaster board or gypsum fibre board with a width of 60 - 90 cm or 120 cm. The thickness of these boards is in the range 10 - 20 mm, often 12 mm. The cladding layer may be arranged in one or two layers. The profiles (4) are metal-stud C-profiles with a width of the base portion (13) from 50 to 150 mm preferably around 75mm, and a width of the flange portions (11, 12) of 25 - 75 mm preferably around 50 mm. The profiles (4) have a distance from each other of 60, 45 or 30 cm center-to-center. This distance is preferably arranged so that the plasterboards can be fastened to a profile along at least the two longer edges of the plasterboard. The insulation panels may have a lining at the side facing the cladding layer (2). This lining is a vapour barrier in the form of a PE or aluminium foil. This lining may be secured to the insulation panels (3). At the side of the insulation facing the first wall part (5) an open foil (such as perforated PE foil, aluminium, glass fibre or plastic tissues like non-woven) can be arranged e.g. secured to the insulation panels (13). The cladding layer (2) e.g. gypsum plasterboard may be arranged with a lining in the form of a barrier foil (e.g. PE or aluminium foil) at the side facing the insulation panels (3). The first wall part (5), usually being the outer wall, is preferably made of bricks, concrete bricks, limestone, genuine natural stone bricks or wood. The system may secure a ventilation air gap (6), preferably with a minimum width of 20 mm, and has no cold-bridge when installing insulation to existing outer walls (5). The system is also suitable for horizontal and pitched ceilings.

[0041] The metal-stud system of preferably C-profiles is supporting itself but not meant to be applied as a constructive wall. The system should preferably be constructed between an existing floor and ceiling, either of which may be made of e.g. concrete, wood or steel. U- or C-profiles are attached to the floor and ceiling by e.g. plugs and screws. The vertical C-profiles are arranged and preferably secured to the horizontal U- or C-profiles, e.g. by screws, rivets or by simply stamping them together. The insulation panels are arranged between the C-profiles, whereas the slit (10) should be positioned over one flange portion (11) of the C-profile.

[0042] The vapour barrier is arranged between the cladding layer (2) and the insulation (3). It may be preattached to either the cladding layer e.g. gypsum boards or to the insulation. The vapour barrier may also be secured to the C-profiles e.g. by the use of two-sided adhesive tape.

[0043] The new wall system has many applications in both new buildings and in refurbishment. It can also be used in prefabricated building elements. Other applications are for pitched ceilings mounted against the pitched roof construction being the first wall part (5), and even for horizontal ceiling constructions. The wall system may also be applied for inner walls and for separation walls between two adjacent houses.

Claims

1. A wall system (1) comprising a first and a second wall part, where the second wall part comprises insulation panels (3), each insulation panel (3) having first and second substantially parallel major surfaces (7,8), where the second major surface (8) faces the first wall part, and said insulation panel (3) also having minor surfaces (9,9'), said insulation panel (3) being positioned between at least two profiles (4), each profile having a base portion (13) substantially parallel with and in contact with a part of one minor surface (9) of the insulation panel (3), said profiles (4) being provided with engaging means (11, 31) en-

gaging the insulation panels (3) and holding them in position, said insulation panel (3) having a thickness larger than a width of the base portion (13) of the profiles (4),
characterised in that
at least one profile (4) is arranged and fastened to parts of the building different from the first wall part (5), in such way that no single element or combination of elements except the insulation panels (3) themselves extends from a plane formed by the first major surfaces (7) to a plane formed by the second major surfaces (8) of the insulation panels (3).

2. A wall system according to claim 1, **characterised in that** said engaging means (11,31) engaging the insulation panels (3), is arranged in connection with the base portion (13) of the profile (4).

3. A wall system according to claim 1 or 2, **characterised in that** a slit (10) receiving the engaging means (11, 31) of the profiles (4) is provided in a minor surface (9') and extending substantially parallel with the major surfaces (7,8) of the insulation panels.

4. A wall system according to claim 2 or 3, **characterised in that** said profile (4) is provided with a flange portion (11) substantially parallel with the major surfaces (7,8) of the insulation panel (3).

5. A wall system according to claim 3 and 4, **characterised in that** said flange portion (11) of the profile (4) is extending into said slit (10) in the minor surface (9') of the insulation panel (3).

6. A wall system according to any one of claim 1-5, **characterised in that** substantially all profiles (4) are arranged and fastened to parts of the building different from the first wall part (5), in such way that no single element or combination of elements except the insulation panels (3) themselves extends from a plane formed by the first major surfaces (7) to a plane formed by the second major surfaces (8) of the insulation panels (3).

7. A wall system according to any one of claim 3 - 6, **characterised in that** said base portions (13) of the profiles (4) are placed parallel to a minor surface (9) of the insulation panels (3) and between the first major surface (7) of the insulation panels (3) and the slit (10) in a minor surface (9') of the insulation panels (3).

8. A wall system according to any one of claims 1 - 7, **characterised in that** said profiles (4) have one base portion (13) and two flange portions (11,12).

9. A wall system according to any one of claims 1 - 8, **characterised in that** said profiles (4) are C- or U-profiles.

10. A wall system according to any one of claims 1 - 9, **characterised in that** said profiles (4) are made of metal, e.g. steel or aluminium.

11. A wall system according to any one of claims 1-10, **characterised in that** said profiles (4) form one or more frameworks in which the insulation panels (3) are installed.

12. A wall system according to any one of claims 4-11, **characterised in that** two substantially vertical profiles (4',4") are holding the insulation panel (3), a first profile (4') has a flange portion (11) extending into the slit (10) in the insulation panel (3) and a second profile (4") has a flange portion (11) pointing away from said insulation panel (3).

13. A wall system according to claim 12, **characterised in that** said second profile (4") has fixation means (14) holding the insulation panel (3) in place.

14. A wall system according to any one of claims 1-13, **characterised in that** the majority of the insulation panels (3) comprise at least two different layers having different densities (20, 21).

15. A wall system according to any one of claims 1-14, **characterised in that** a ventilation air gap (6) is provided between the first wall part (5) and the second wall part comprising the insulation panels (3).

16. A wall system according to any one of claims 1-14, **characterised in that** the first wall part (5) and the second major surface (8) of the insulation panels (3) are interconnected by use of an adhesive.

17. A method of installing a wall system (1) according to any one of claims 4-16 comprising the steps of:

- installing a framework of profiles (4) for said second wall part without connecting at least one profile to the first wall part (5),
- placing insulation panels (3) in this framework by aligning a slit (10) in the insulation panels (3) to fit over a flange portion (11) of a first profile (4'), and
- pushing the insulation panel (3) into position between at least two profiles (4).

18. A method according to claim 17, **characterised in** securing the insulation panels (3) to the second profiles (4") by fixation means (14).

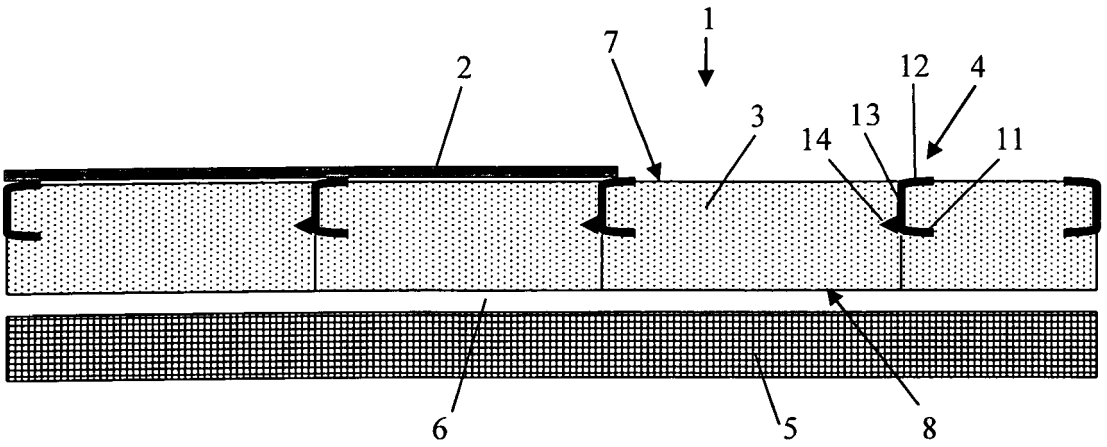

Figure 1

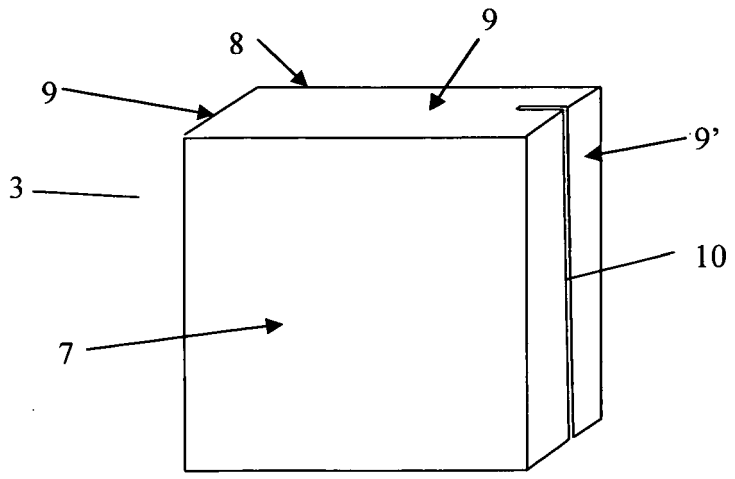

Figure 2

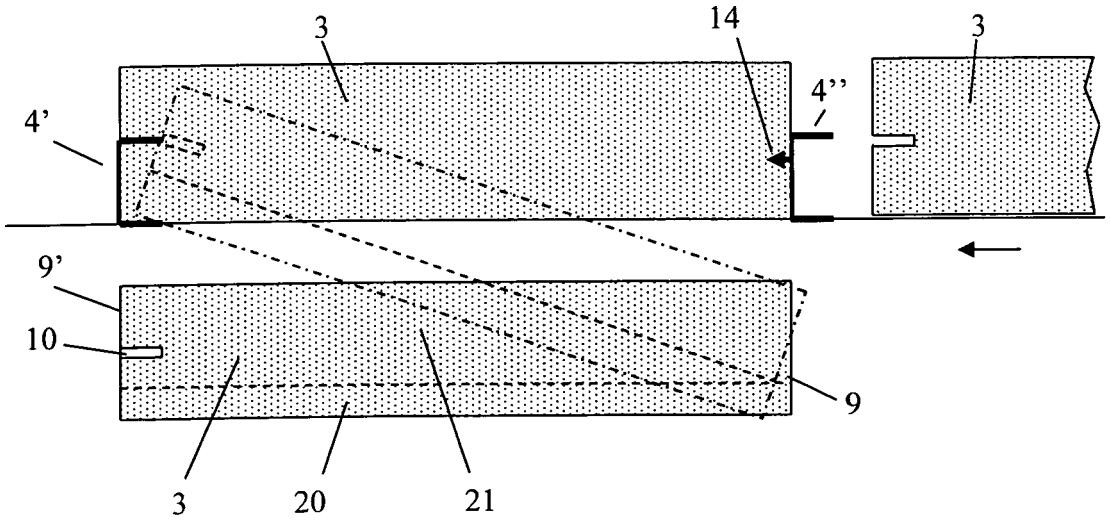

Figure 3

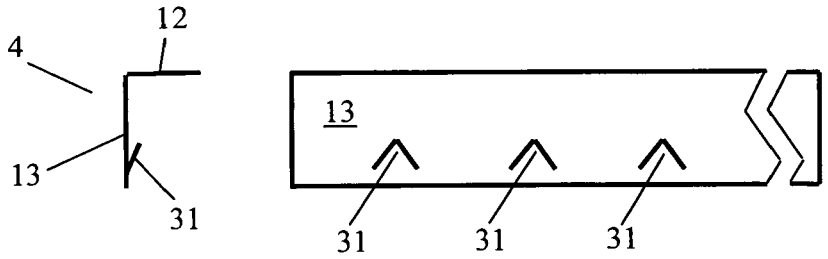

Figure 4

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 38 8009

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 Y	EP 1 286 004 A (DEUTSCHE ROCKWOOL MINERALWOLL GMBH & CO. OHG) 26 February 2003 (2003-02-26) * paragraph [0028] - paragraph [0031]; figures 1,2 *	1-7, 10-14, 17,18 8,9,16	INV. E04B1/74 E04B1/76
Y	WO 98/45545 A (RAUTARUUKKI OY; SARJA, ASKO, ERKKI; MONONEN, TARMO, KALEVI; RAJALA, LA) 15 October 1998 (1998-10-15) * page 5, line 27 - page 7, line 26; figures 1-3 *	8,9	
Y A	FR 2 631 647 A (CASCO NOBEL FRANCE SA) 24 November 1989 (1989-11-24) * page 3, line 19 - page 5, line 25; figure 1 *	16 1-11	
A	US 4 736 917 A (THURESSON ET AL) 12 April 1988 (1988-04-12) * abstract; figure 1 *	13,18	
A	DE 195 40 750 A1 (FOAG, JOHANN, 86647 BUTTENWIESEN, DE) 7 May 1997 (1997-05-07) * abstract; figure 1 *	1-10	TECHNICAL FIELDS SEARCHED (IPC) E04B E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	2 August 2006	Khera, D

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
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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 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 38 8009

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
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