



(51) International Patent Classification:

E04D 13/16 (2006.01) *E04B 1/80* (2006.01)

(21) International Application Number:

PCT/EP2017/066096

(22) International Filing Date:

29 June 2017 (29.06.2017)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

2016127071 06 July 2016 (06.07.2016) RU

(71) Applicants: **ROCKWOOL INTERNATIONAL A/S** [DK/DK]; Hovedgaden 584, 2640 Hedehusene (DK). **ROCKWOOL RUSSIA GROUP ZAO "MINERAL-NAYA VATA"** [RU/RU]; Avtozavodskaya str., 48A, Zheleznodorozhny, Moscow region 143985 (RU).

(72) Inventor: **VASILIEV, Maxim**; District Pavlino, 39, flat 25, Balashihia, Moscow region 143988 (RU).

(74) Agent: **HØIBERG P/S**; Adelgade 12, 1304 Copenhagen K (DK).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,

SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH,

GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

(54) Title: A METHOD FOR HEAT INSULATING A BUILDING SURFACE AND AN INSULATION BOARD THEREFOR

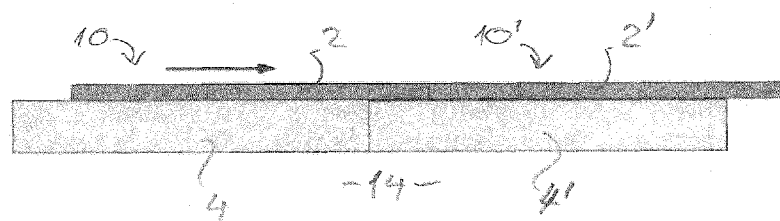


Fig. 3

(57) Abstract: The present invention concerns a method for heat insulating a building surface with insulation boards, wherein each insulation board has two parallel main surfaces and four side surfaces connecting the two large surfaces, whereby the insulation boards are arranged adjacently on the building surface with each insulation board having a lowermost of the main surfaces facing the building surface, wherein each insulation board is divided into an upper part and a lower part with an interface that is substantially parallel with the two main surfaces, and wherein the method comprises the steps of arranging an insulation board on the building surface and then shifting the upper part of said insulation board a distance to at least partly cover a lower part of at least one neighbouring insulation board. The invention also concerns an insulation board for use in the method.



A method for heat insulating a building surface and an insulation board therefor

The present invention relates to a method for heat insulating a building surface and an insulation board therefor.

5

Heat insulation of buildings is well-known and there are numerous systems and products for insulating building surfaces, such as roofs and walls. The requirements to the insulation quality are constantly increasing which requires improved insulation systems and/or improved skills by the insulation installer. The requirements are mainly directed to improved insulation value which is often achieved by increasing the insulation thickness. Another issue is to avoid thermal bridges, so-called cold bridges, which often are caused by poorly installed insulation boards having gaps between them. A common way to meet these two requirements is to use a two-layer solution, wherein a first layer of insulation boards is first installed and then a second layer of insulation boards is installed on top of the first layer with the insulation boards of the second layer being shifted in relation to the insulation boards of the first layer.

If the building surface to be insulated is a flat, or substantially flat, roof it is often required that the installed insulation shall be able to support person traffic or even heavier traffic. This may be achieved by using a two-layer solution, wherein the first layer comprises heat insulation elements or boards and the second layer is a force distributing layer made of high density heat insulation boards or other materials.

A packing and/or transport unit with roof insulation elements for a two-layer solution is known from WO 2012/059192. The insulation elements include a number of lamellae and a few insulation boards, i.e. at least two different types. The insulation elements are used to insulate a flat roof construction. A predetermined number of transport units are provided on the roof. The elements of each of the transport units are laid out in two layers whereby an insulating layer is built on the roof. The two layers are typically made as a lower layer of lamellae and a top layer of larger insulation boards preferably having a higher density than the lower layer to provide a roof insulation which can carry load from e.g. building workers on the roof. The lamellae and the top layer boards are preferably provided in a staggered configuration. This solution is advantageous but does involve handling of many elements during the fitting of the roof insulation, which in turn is labour intensive and time consuming.

In another solution, which after installation looks like a two-layer solution, is to use so-called dual density insulation boards for flat roof insulation, wherein the two layers are included in a single product, namely an insulation board having a first layer of relatively low density and a second layer of higher density. An example of a dual density insulation board is known from e.g. WO 03/054264 A1.

A disadvantage with using the dual density products is though that when installing the dual density boards on the roof there is a risk that a gap will be provided between two adjoining boards creating a cold bridge from the roof to the roof membrane on top of the dual density boards. There is also a risk that the two adjoining dual density boards are slightly different in thickness and thereby the top surface of the insulation will not be at the same level thus creating one or more small steps from one dual density board to another. Such unevenness will be visible on the roof membrane provided as the exterior roof cover and does entail a risk of damage to the roof membranes, for instance as pools of rain water may form, or the like.

It is therefore an object by the present invention to provide a method for heat insulating a building surface, such as a flat, or substantially flat, roof and an insulation board therefor which alleviates or even eliminates the above-mentioned drawbacks.

According to a first aspect of the invention there is provided a method for heat insulating a building surface with insulation boards, wherein each insulation board has two parallel main surfaces and four side surfaces connecting the two large surfaces, whereby

- the insulation boards are arranged adjacently on the building surface with each insulation board having a lowermost of the main surfaces facing the building surface, wherein each insulation board is divided into an upper part and a lower part with an interface that is substantially parallel with the two main surfaces, and
- wherein the method comprises the steps of
 - arranging an insulation board on the building surface and then shifting the upper part of said insulation board a distance to at least partly cover a lower part of at least one neighbouring insulation board.

The advantage hereby achieved is that a two-layer building insulation may be provided by insulation boards which are handled as a single product but which overcomes the issues of cold bridging due to gaps between insulation boards.

5 It should be mentioned that the term “lower part” when used in this specification refers to the part of the insulation board that in use is facing the building surface, while the term “upper part” refers to the part of the insulation board that faces away from the building surface. In a preferred embodiment that building surface is a flat, or substantially flat, roof. However, the invention is also applicable to a building surface in
10 form of a more or less vertical wall.

In a second aspect of the invention there is provided an insulation board comprising a upper part made of fibrous mineral material and a lower part made of fibrous mineral material, wherein the upper part is shiftable relative to the lower part. Preferably, the
15 upper part and the lower part are made of stone wool.

Preferably, the upper part of the insulation board has a first density within the range of 100-250 kg/m³ and the lower part has a second density within the range of 50-140 kg/m³, and wherein the first density is higher than the second density.

20

In some preferred embodiments of the invention, the upper part has a first thickness which is 5-50% of the total product thickness and the lower part has a second thickness of 50-95% of the total product thickness.

25 By the invention, the upper part is shiftable relative to the lower part in either one or two directions by pushing or pulling the top part relative to the lower part.

To produce such a board, the third aspect of the invention is the provision of a method for producing insulation boards for use in the method for insulating a building surface, wherein the method comprises the following steps:

30

- producing a cured web of mineral wool insulation, said web having an upper surface and a lower surface;
- dividing the web of mineral wool insulation into an upper part and a lower part that are kept together with an interface substantially parallel with the upper and lower surfaces;
- 35 - cutting the mineral wool web lengthwise and laterally into insulation boards.

It is preferred that the web before curing is divided into an upper part and a lower part; the upper part or lower part is compressed to a higher density than the other; re-assembling of the upper part and lower part; and then curing the re-assembled web.

5 Thereby a dual density product is provided. Further to these production steps, then the higher density upper part is split from the lower density lower part.

According to this method the dual density board may be provided by horizontally dividing a known dual density product into the two layers. This can easily be
10 implemented on the existing production lines by arranging a horizontal knife or saw after the dual density products has exited the curing oven.

Preferably, the split is provided at the interface between the high density and the low density in the dual density product. However, if appropriate the split can be provided at
15 other positions.

In an embodiment, each divided insulation board comprising an upper part and a lower part are wrapped individually in a packaging foil. Alternatively, the boards may be stacked in a transport unit, e.g. on a pallet.

20

In the following, the invention is described in more detail with reference to the accompanying drawings, in which:

Fig. 1 is a stack of insulating boards according to an embodiment of the invention;
25 Fig. 2 is a schematic side view of two adjoining insulating boards during the process of installing such insulation boards on a flat roof;
Fig. 3 is the same as fig. 2 when the insulation boards are installed; and
Figs. 4 a) to d) show an example of the steps of producing a roof insulation board according to the invention.

30

Figure 1 shows a stack of insulation boards 10 according to the invention ready to be installed on a building surface, such a flat roof or a wall (not shown). On the building site each insulation board 10 can be handled as a single element as indicated with the uppermost insulation 10 which is taken away from the stack. The insulation board 10 is
35 split such that the insulation board 10 consists of an upper part 2 and a lower part 4.

Each insulation board 10 also has a top main surface 6 and a bottom main surface 8. Both the upper part 2 and the lower part 4 is preferably made of fibrous mineral wool, such as stone wool; the upper part 2 with a high density, for instance within the range of 100-250 kg/m³, and the lower part 4 with a second lower density, preferably within the range of 50-140 kg/m³.

As indicated in the figures 2 and 3, the insulation boards 10, 10' are arranged on a flat roof 14. After the adjoining insulating boards 10, 10' are placed, the upper parts 2, 2' are then shifted by pushing or pulling to at least partly cover a lower part 4, 4' of a neighbouring or adjoining insulation board 10, 10' and thereby also cover the interface of the lower parts 4, 4' between the adjoining insulation boards 10, 10'. The shifting of the upper parts 2, 2' may be in one direction only or in two directions so that all interfaces between adjacent lower parts 4, 4' are covered by shifted upper parts 2, 2'.

As shown in fig. 4D the stack of insulation boards 10 shown in fig. 1 may be provided on a pallet 18, which may be made of wood or can be made of fibrous mineral wool similar to the insulation boards 10, so that the pallet 18 can form part of the building surface insulation. This stack of insulation boards 10 on the pallet 18 - preferably wrapped in packaging foil (not shown) - is then provided as a transport unit which can be transported to the building site for installation. Since each insulation boards 10 comprises an upper part 2 and a lower part 4 these upper parts 2 and the lower parts 4 appears alternately in the stack; however, each insulation board 10 comprising an upper part 2 and a lower part 4 is handled at the building site, e.g. on a roof, as single insulation boards 10 that can be arranged successively adjacent each other during the insulation installation process. After the insulation boards 10 are arranged, the upper parts 2, 2' are shifted for completing the building surface insulation installation. The upper parts 2, 2' may be shifted immediately after installation of each insulation board 10 or they may be shifted after installation of a plurality of insulation boards 10.

With reference to figures 4A and 4B, the insulation board 10 may be produced initially as a dual density board by a conventional process and then subjected to a horizontal cutting member 16, such as a knife or a saw, and thereby split into an upper part 2 and the lower part 4. This split may be provided at the interface between the low density and the high density layers in the dual density product. However by the invention it is

realised that the split may also be provided at another level relative to the density transition point.

- 5 After the splitting action is completed, the insulation board 10 may be individually wrapped in a wrapping foil 12 as shown in fig. 4C and/or the insulation boards 10 may be stacked on a pallet 18 as shown in fig. 4D.

Claims

1. A method for heat insulating a building surface with insulation boards, wherein each insulation board has two parallel main surfaces and four side surfaces connecting the two large surfaces, whereby
- 5 - the insulation boards are arranged adjacently on the building surface with each insulation board having a lowermost of the main surfaces facing the building surface, wherein each insulation board is divided into an upper part and a lower part with an interface that is substantially parallel with the two main surfaces, and
- 10 wherein the method comprises the steps of
- arranging an insulation board on the building surface and then shifting the upper part of said insulation board a distance to at least partly cover a lower part of at least one neighbouring insulation board.
- 15 2. A method according to claim 1, wherein the building surface is a flat, or substantially flat, roof.
3. An insulation board for use in the method according to claim 1 or 2, wherein said insulation board comprises a upper part made of fibrous mineral material and a lower
- 20 part made of fibrous mineral material, wherein the upper part is shiftable relative to the lower part.
4. An insulation board according to claim 3, wherein the upper part has a first density within the range of 100-200 kg/m³ and the lower part has a second density within the
- 25 range of 50-250 kg/m³, and wherein the first density is higher than the second density.
5. An insulation board according to claim 3 or 4, wherein the upper part has a first thickness which is 10-50% of the total product thickness and the lower part has a
- second thickness of 50-95% of the total product thickness.
- 30 6. An insulation board according to any one of the claims 3 to 5, wherein the upper part and the lower part are made of stone wool.
7. An insulation board according to any one of the claims 3 to 6, wherein the upper part
- 35 is shiftable relative to the lower part in two directions.

8. A method for producing insulation boards for use in the method for heat insulating a building surface according to claim 1 or 2, wherein the method comprises the following steps:

- 5 - producing a cured web of mineral wool insulation, said web having an upper surface and a lower surface;
- dividing the web of mineral wool insulation into an upper part and a lower part that are kept together with an interface substantially parallel with the upper and lower surfaces;
- cutting the mineral wool web lengthwise and laterally into insulation boards.

10

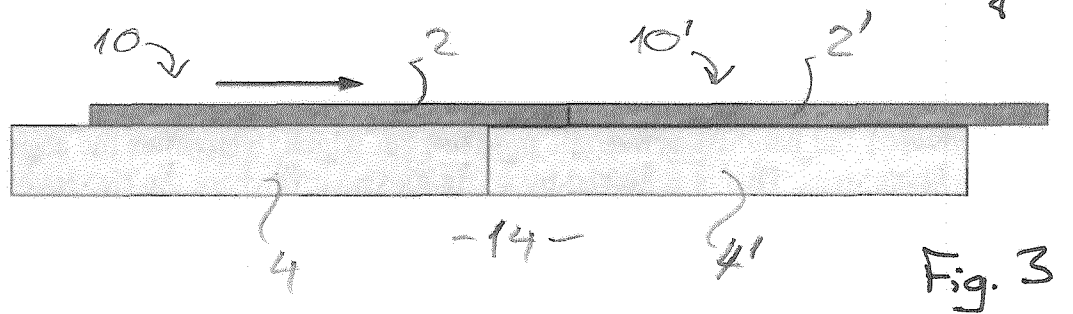
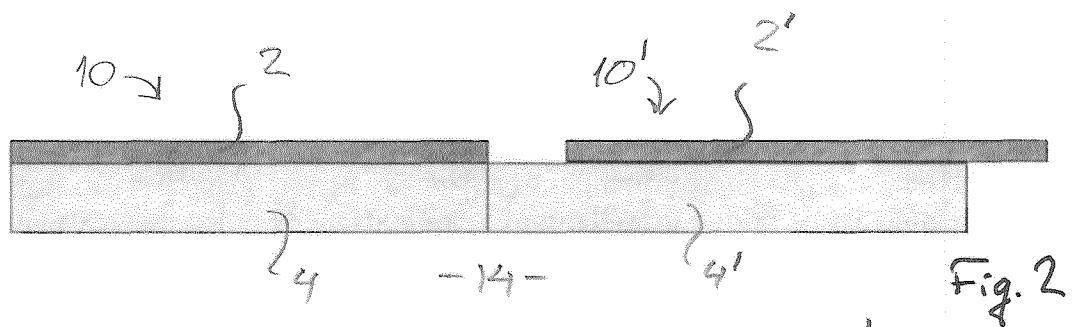
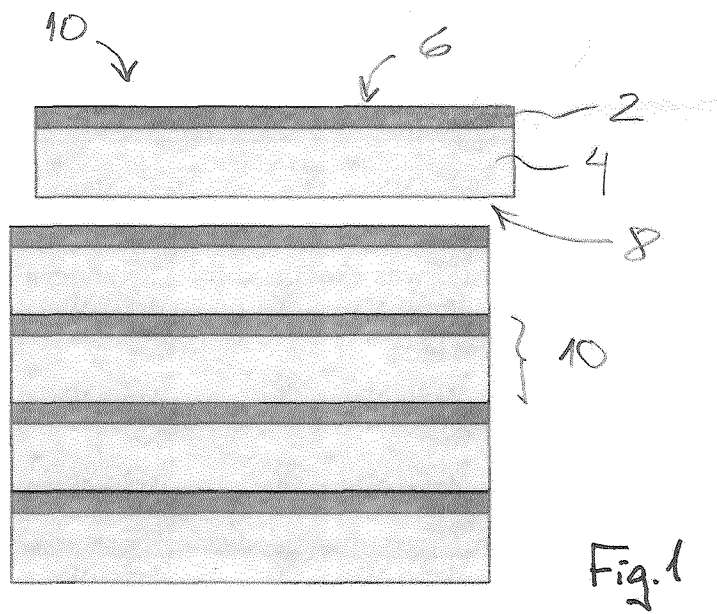
9. A method according to claim 8, whereby

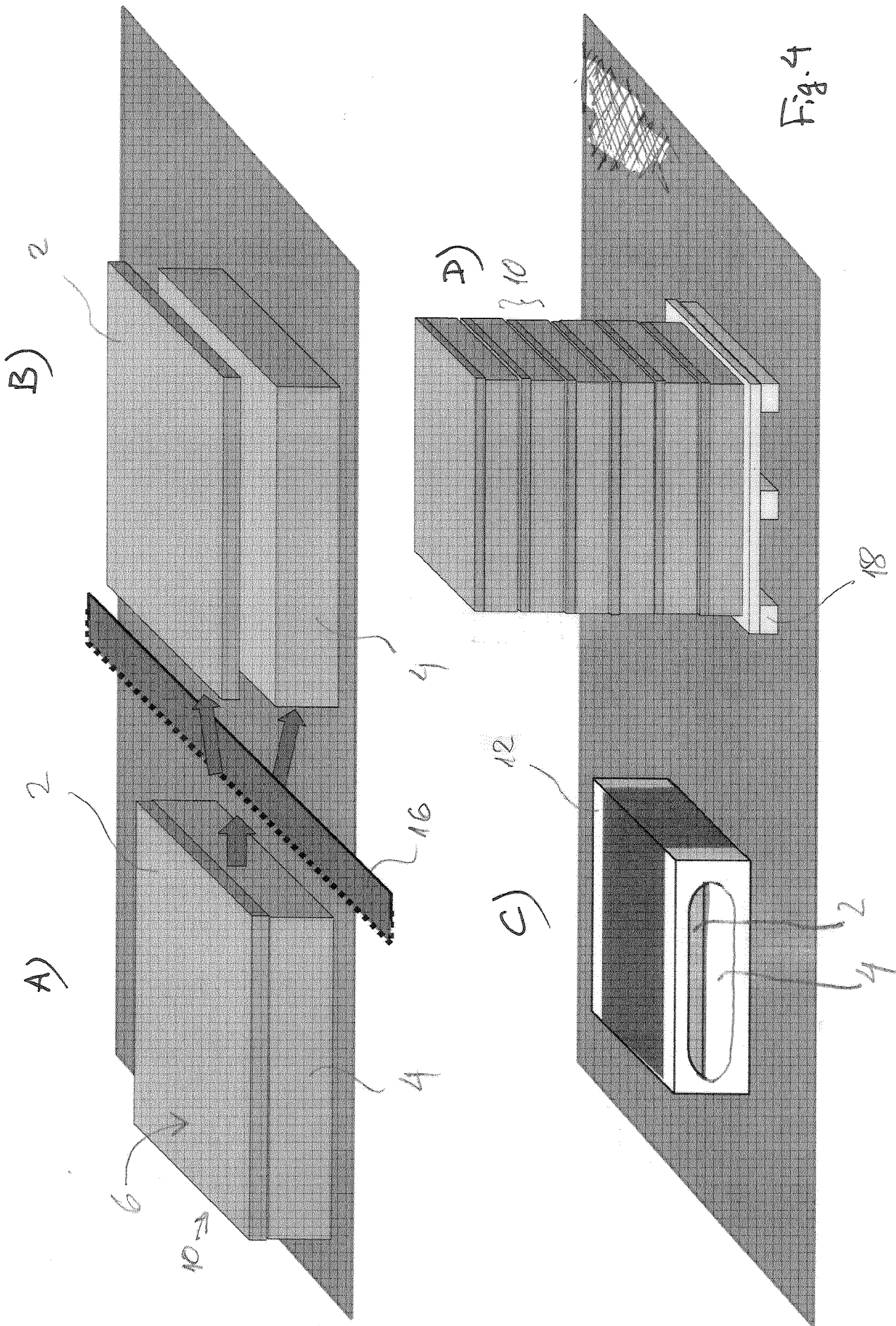
- the web before curing is divided into an upper part and a lower part;
- the upper part or lower part is compressed to a higher density than the other;
- re-assembling of the upper part and lower part: and
- 15 - curing the re-assembled web.

10. A method according to claim 9, wherein a dual density product is provided and then the higher density upper part is split from the lower density lower part.

- 20 11. A method according to claim 10, whereby the split is provided at the interface between the high density layer and the low density layer in the dual density product.

12. A method according to any one of the claims 8 to 11, wherein each divided insulation board comprising an upper part and a lower part are wrapped individually in
- 25 a packaging foil.





INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/066096

A. CLASSIFICATION OF SUBJECT MATTER
 INV. E04D13/16 E04B1/80
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

E04D E04B B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/000585 A1 (ROCKWOOL INT [DK]; BAUER ULRICH [DE]; JOERGENSEN KRISTIAN SKOVGAARD [D] 5 January 2012 (2012-01-05) figure 3	3-7,9-11
A	-----	1,2,8,12
X	WO 03/012220 A1 (SAINT GOBAIN ISOVER [FR]; LE BIHAN CHRISTINE [FR]; COUSIN STEPHANE [FR] 13 February 2003 (2003-02-13) page 9, lines 19-21; figure 1	3-7,9-11
A	-----	1,2,8
X	DE 297 18 016 U1 (BENDER ROLAND [DE]) 27 November 1997 (1997-11-27) page 3; figure 2	3-7,9-11
A	-----	1,2,8
X	WO 03/095756 A1 (SIRCELJ D O O [SI]; SIRCELJ MARJAN [SI]) 20 November 2003 (2003-11-20) figure 1	3-7,9-11
A	-----	1,2,8
	-/--	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

14 August 2017

Date of mailing of the international search report

23/08/2017

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Tran, Kim Lien

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2017/066096

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 180 182 A1 (ROCKWOOL INT [DK])	3-7,9-11
A	20 February 2002 (2002-02-20) figure 1 -----	1,2,8,12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2017/066096

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012000585 A1	05-01-2012	EP 2402150 A1 ES 2435442 T3 US 2013171900 A1 WO 2012000585 A1	04-01-2012 19-12-2013 04-07-2013 05-01-2012
WO 03012220 A1	13-02-2003	EA 200400232 A1 EP 1412593 A1 FR 2829162 A1 WO 03012220 A1	24-06-2004 28-04-2004 07-03-2003 13-02-2003
DE 29718016 U1	27-11-1997	NONE	
WO 03095756 A1	20-11-2003	AU 2002311260 A1 EP 1540100 A1 US 2006165938 A1 WO 03095756 A1	11-11-2003 15-06-2005 27-07-2006 20-11-2003
EP 1180182 A1	20-02-2002	AT 362023 T AU 4745300 A CZ 20014199 A3 DE 60034782 T2 EP 1180182 A1 ES 2286020 T3 HR P20010943 A2 HU 0201483 A2 MY 138537 A PL 357412 A1 SK 17142001 A3 WO 0073600 A1	15-06-2007 18-12-2000 17-07-2002 31-01-2008 20-02-2002 01-12-2007 30-04-2003 28-10-2002 30-06-2009 26-07-2004 04-04-2002 07-12-2000