(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 January 2003 (03.01.2003)

PCT

(10) International Publication Number
WO 03/000567 A1

(51) International Patent Classification[7]: B65D 71/00, 71/04

(21) International Application Number: PCT/DK02/00418

(22) International Filing Date: 20 June 2002 (20.06.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PA 2001 00996 26 June 2001 (26.06.2001) DK

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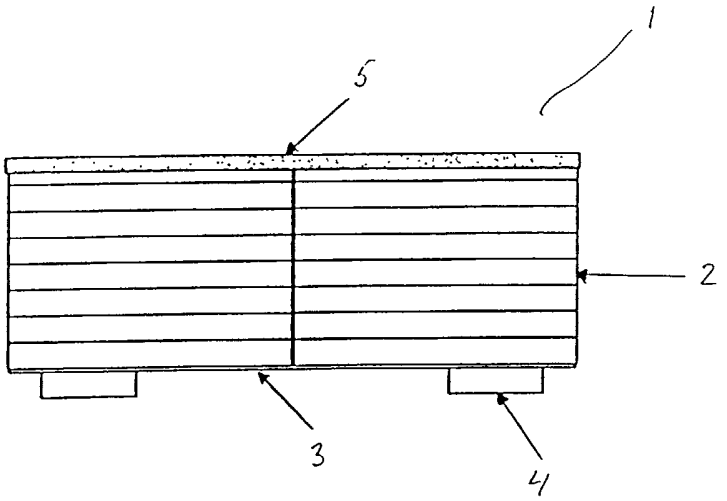
(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) **Title:** A TRANSPORT UNIT FOR A STACK OF PANELS



(57) **Abstract:** The invention relates to a transport unit which comprises a plurality of panels (2) selected from a group consisting of insulating panels (2). The panels are preferably rectangular and are stacked in one or more adjoined stacks to form a pile of panels (2) shaped as a substantially rectangular prism. The rectangular prism has a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces. The bottom surface is supported using one or more support elements (3), wherein at least one of the support elements has a length of at least 15 % of the perpendicular distance between the front surface and the back surface. The transport unit further comprises one or more carrying feet (4) for carrying the pile of panels, wherein the carrying feet (4) for carrying the pile of panels are at least partially in contact with the one or more support elements, where the one or more support elements (3) represent the interface between the bottom surface of the panel pile and the carrying feet (4).

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A TRANSPORT UNIT FOR A STACK OF PANELS

The present invention relates to a transport unit comprising a plurality of panels selected from the group consisting of insulating panels including fibre and foam based insulating panels and other fibre and foam based panels.

Traditionally the fibrous materials are frequently supplied to the users in the form of panels in relatively large dimensions. These panels can be covered on one or several of their surfaces, with a protective sheet material and the panels are themselves joined in bundles assembled by a sheath.

In accordance with a general ecological trend, also the insulation material industry wants a reduction in the packaging materials, since usually these packaging materials cannot be used at the places where the insulating panels are used and therefore need to be disposed of.

A transport unit is known from e.g. DE 92 18 320 U1. This transport unit transports panels of insulating material, where a plurality of panels of insulating material are arranged on top of each other to form a stack, the lowermost panels of insulating material being placed on two support elements which consist of a material useful for insulation purposes e.g. wool. The stack of panels of insulating material and the support elements are then enclosed by a sheet, so that the stack of panels of insulating material and the support elements form a stable transport unit because of the sheet. One of the problems with this transport unit is that it has high

production costs, because the two support elements consist of wool.

A transport unit is also disclosed in WO 98/23497 wherein a transport unit consisting of several panels of insulating material is stacked on support elements made of a material suitable for insulation purposes. The support elements and the panels of insulating material are connected and both enveloped by a foil cover. This transport unit solves the problem concerning a reduction of the amount of packaging material for transport units consisting of a plurality of panels of insulating material.

This transport unit is only suitable for transport of a few panels of insulating material. Several panels of insulating material can only be stacked in a specific way or the stability of the disclosed transport unit is adversely affected to a significant degree.

Accordingly, there remains a need for a transport unit of the above-mentioned kind, which does not exhibit the above-identified drawbacks, and which is particularly suitable for stacks in all size.

In view of prior art, the object of the invention is additionally to reduce the amount of packaging material for transport units consisting of a plurality of panels of insulating material, without the stability of such transport units being adversely affected to a significant degree.

The object of the present invention is also to provide a transport unit which is stable with all kinds of panels

of insulating material during transport, and where these several panels of insulating material can be stacked in any desired way.

A further object of the present invention is to provide a transport unit which can be produced at low cost.

Yet another object of the present invention is also to provide an alternative transport unit to the known transport unit disclosed in WO 98/23497.

The objectives are achieved with the transport unit according to the invention as defined in the claims.

The invention relates to a transport unit, which comprises a plurality of panels selected from a group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels. The panels are preferably rectangular and are stacked in one or more adjoined stacks to form a pile of panels shaped as a substantially rectangular prism. The rectangular prism has a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces. The bottom surface is supported using one or more support elements, wherein at least one of the support elements has a length of at least 15 %, preferably at least 50 % of the perpendicular distance between the front surface and the back surface. The transport unit further comprises one or more carrying feet for carrying the pile of panels, wherein the carrying feet for carrying the pile of panels are at least partially in contact with the one or more support elements, where the one or more support elements represent the interface between the bottom surface of the

panel pile and the carrying feet. The carrying feet are panels selected from the group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels.

The transport unit comprises a plurality of panels. These panels are selected from a group consisting of insulating panels including fibre and foam based insulating panels and other fibre and foam based panels. In principle the insulating panels may be any kind of panels which is normally used as an insulation material.

In particular the transport unit is suitable for bendable or low-density insulation material.

The panels are preferably rectangular, but could also have a shape as a roll, where the rolls could be placed in the horizontal and the vertical direction on the transport unit.

The panels preferably have a density in the interval 10-250 kg/m^3 .

In a preferred embodiment the transport unit comprises 12 layers. Each of these layers comprises 4 panels, each with a length of 1000 mm and a width of 600 mm. The panels are made of mineral fibre e.g. rock wool.

So as to reduce the quantity of packaging material required for this type of transport unit without adversely affecting stability, the invention proposes that the insulating panels should be stacked in two or more adjoined stacks.

The one or more stacks preferably have a width of 600 mm and the transport unit preferably a total height of 1300 mm.

The one or more stacks should preferably be arranged in such a way that at least partly they share one or more of the support elements.

The one or more adjoined stacks form a pile of panels having a shape of a substantially rectangular prism. The rectangular prism comprises a bottom surface which is supported by using one or more support elements, wherein at least one of the support elements has a length of at least 15 %, preferably at least 50 % of the perpendicular distance between the front surface and the back surface.

The one or more support elements preferably support the one or more panels lying closest to the one or more support elements and/or support the bottom surface of the substantially rectangular prism. By supporting the one or more panels the transport unit is stable during the transport.

The one or more support elements are preferably a material having a tensile strength above 4 MPa measured in the length direction according to ASTM D638. The one or more support elements having a tensile strength above 4 MPa do not cause damage to the insulating panels during transport. In a preferred embodiment the one or more support elements are made of a wood like material having a tensile strength above 4 MPa measured in the main direction of the fibers.

The one or more support elements are preferably made of a material selected from the group consisting of wood, plastic, metal or any composite material. The one or more support elements preferably made of metal could be in any shape likewise a ⊥-shape, T-shape, a Π-shape or an L-shape.

In a preferred embodiment one or more support elements have a tensile strength which is essentially higher than the tensile strength of the one or more panels lying closest to the one or more support elements. The one or more support elements, if more than one, are preferably parallel to each other. The one or more support elements preferably have a length corresponding to the length of one or more panels, and preferably have a width corresponding to 10-20 % of the width of one or more panels, and preferably have a thickness corresponding to 1-20 % of the thickness of one or more panels.

In another preferred embodiment the one or more support elements in the longitudinal direction are preferably perpendicular to the longitudinal direction of the two or more carrying feet.

In a preferred embodiment the transport unit according to the invention could also comprise a pull strap in combination with at least two vertical beams e.g. timber beams. These beams are placed beside the plurality of panels and have the function as an attaching point for the pull strap which is placed along the length direction of a panel. The pull strap in combination with at least two vertical beams keeps the transport unit stable during the transport.

The two or more carrying feet for carrying the pile of panels according to the invention are placed under or in partial contact with the bottom surface and the one or more support elements. The two or more carrying feet are preferably glued on or fastened mechanically e.g. with a nail or the like to the one or more support elements.

The carrying feet are panels selected from the group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels.

The carrying feet may also be panels of insulating material comprising one or more layers having one or more densities, and where the density of the lowest density layer is at least 30 kg/m^3 .

Consequently it is possible to use the carrying feet in the construction of insulating structures. The carrying feet may be used in roof insulation. The carrying feet are adaptable to the roof insulation panel, as an example the carrying feet fit with the roof insulation panels, adaption work, e.g. cutting, can be avoided, which also saves material.

In a preferred embodiment the carrying feet are trapezium shaped especially for use in roof insulation.

The carrying feet preferably have a length of 1000 mm, a width of 300 mm and a height of 90 mm.

The rectangular prism also comprises a top surface which in a preferred embodiment is applied with one or more support frames or two or more support corners.

The support frame has preferably a dimension and shape corresponding to the dimension and shape of the top surface of the pile of panels, where the support frame preferably covers between 10-25 % of the size of the top surface of the pile of panels. In principle the support frame could cover 100% of the top surface area of the pile of panels.

The support corners preferably have a dimension and shape corresponding to the dimension and shape of the corner of the pile of panels, where the support corners are preferably constituted by the joining of the top surface, a side surface and a front or back surface, respectively, of the pile of panels. Use of a support frame as described above makes the transport unit according to the invention stable during the transport.

In another embodiment the stack of panels is also applied with a tape or a glass fibre bond preferably wrapped around to the one or more adjoined stacks to form a pile of panels or placed perpendicularly to the length direction of the panels.

A transport unit according to the invention, comprising one or more support elements, two or more carrying feet and the pile of panels applied with a support frame or two or more support corners, is partly or totally surrounded by a foil. The foil is applied tightly around one or more support elements, two or more carrying feet and the pile of panels applied with a support frame or two or more support corners.

The foil preferably has a foil thickness of 10-200 µm and more preferably a thickness of 15-60 µm.

The foil is preferably made of a material selected from the group consisting of polyethylene, polypropylene, polyamide, polyvinyl chloride or polyvinyl alcohol. In a preferred embodiment the foil is shrink foil used for the wrapping.

In a preferred embodiment the transport unit is partly or totally surrounded by a hydrophobic foil to withstand adverse weather conditions e.g. rain or snow.

The invention also relates to a transport unit, which comprises a plurality of panels selected from a group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels. The panels are preferably rectangular and are stacked in one or more adjoined stacks to form a pile of panels shaped as a substantially rectangular prism. The rectangular prism has a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces. The one or more adjoined stacks are supported using one or more body-belts, wherein at least one of the body-belt covers at least 15 %, preferably at least 30 % of the surface area of said one or more adjoined stacks. The transport unit further comprises one or more carrying feet for carrying the pile of panels, wherein the carrying feet for carrying the pile of panels are at least partially in contact with the one or more support elements but not in contact with the body-belt, and where the one or more support elements represent the interface between the bottom surface of the panel pile and the carrying feet. The carrying feet are panels selected from

the group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels.

In a preferred embodiment the one or more body-belts are placed all around the one or more stacks in vertical or horizontal direction and are made of a flexible or elastic material.

An embodiment of the transport unit according to the invention is described in the following with reference to the drawing in which

Figure 1 and figure 2: show a preferred embodiment of a transport unit according to the invention.

Figure 1a shows the front side of a transport unit 1 according to the invention. The transport unit comprising a plurality of panels 2, which are preferably being rectangular and are stacked in one or more adjoined stacks to form a pile of panels 2. The panels 2 are supported by support elements 3 at the bottom surface. The support elements 3 are resting on carrying feet 4. In order to stabilize the piles or stacks of panels 2 the top surface of the transport unit is supplied with a support frame 5.

Figure 1b shows the transport unit 1 from one side surface. The transport unit 1 also contains two stacks of panels 2 on the width of the unit. The two stacks of panels are each supported by two support elements 3, which are further supported by carrying feet 4. The top surface of the transport unit 1 is applied with a support frame 5.

Figure 1c shows the transport unit 1 seen from above. The transport unit 1 contains four stacks of panels 2 which have a width corresponding substantially to the half of their length. The four stacks of panels 2 are supported by a support frame 5. The support elements 3 and carrying feet 4 are indicated by dotted lines.

Figure 2a shows the front side of a transport unit 1 according to the invention. The transport unit comprising a plurality of panels 2, which are preferably being rectangular and are stacked in one or more adjoined stacks to form a pile of panels 2. The panels 2 are supported by a body-belt 6. The transport unit further comprises carrying feet 4. In order to stabilize the piles or stacks of panels 2 the top surface of the transport unit is provided with a support frame 5.

Figure 2b shows the transport unit 1 from one side surface. The transport unit 1 also contains two stacks of panels 2 on the width of the unit. The panels 2 are supported by a body-belt 6. The transport unit further comprises carrying feet 4. The top surface of the transport unit 1 is provided with a support frame 5.

Claims:

1. A transport unit comprising a plurality of panels selected from a group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels, said panels preferably being rectangular and being stacked in one or more adjoined stacks to form a pile of panels shaped as a substantially rectangular prism having a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces, said bottom surface being supported using one or more support elements, wherein at least one of said support elements has a length of at least 15 %, preferably at least 50 % of the perpendicular distance between the front surface and the back surface, said transport unit further comprising one or more carrying feet for carrying the pile of panels, wherein said carrying feet being panels selected from the group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels, and being at least partially in contact with the one or more support elements, said one or more support elements representing the interface between the bottom surface of the panel pile and the carrying feet.

2. A transport unit according to claim 1, wherein the one or more support elements have a tensile strength which is essentially higher than the tensile strength of the one or more panels lying closest to the one or more support elements, said one or more support elements preferably being of a material having a tensile strength above 4 MPa measured in the length direction according to ASTM D638.

3. A transport unit according to claim 1 or 2, wherein one or more support elements support the one or more panels lying closest to the one or more support elements and/or support the bottom surface of the substantially rectangular prism.

4. A transport unit according to any one of the preceding claims, wherein one or more support elements, if more than one, are preferably parallel to each other, said one or more support elements having preferably a length corresponding to the length of one or more panels, and preferably having a width corresponding to 10-20 % of the width of one or more panels, and preferably having a thickness corresponding to 1-20 % of the thickness of one or more panels.

5. A transport unit according to any one of the preceding claims, wherein one or more support elements in the longitudinal direction are preferably perpendicular to the longitudinal direction of the one or more carrying feet.

6. A transport unit according to any one of the preceding claims, wherein one or more support elements are made of a material selected from the group consisting of wood, plastic, metal or cardboard.

7. A transport unit according to claim 6, wherein one or more support elements made of metal or plastic preferably has a ⊥-shape, T-shape, a Π-shape or an L-shape.

8. A transport unit comprising a plurality of panels selected from a group consisting of insulating

panels including fibre and foam based insulating panels and/or other fibre and foam based panels, said panels preferably being rectangular and being stacked in one or more adjoined stacks to form a pile of panels shaped as a substantially rectangular prism having a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces, said one or more adjoined stacks being supported using one or more body-belts, wherein at least one of said body-belts covers at least 15 %, preferably at least 30 % of the surface area of said one or more adjoined stacks, said transport unit further comprising one or more carrying feet for carrying the pile of panels, wherein said carrying feet are panels selected from the group consisting of insulating panels including fibre and foam based insulating panels and/or other fibre and foam based panels.

9. A transport unit according to claim 8, wherein one or more body-belts are placed all around the one or more stacks in vertical or horizontal direction.

10. A transport unit according to claim 8 or 9, wherein one or more body-belts are made of a flexible or elastic material.

11. A transport unit according to any one of the preceding claims, wherein the panels are preferably bendable, said bendable panels being stacked in two or more adjoined stacks to form a pile of panels having a shape of a substantially rectangular prism.

12. A transport unit according to any one of the preceding claims, wherein the panels are preferably stacked in two or more adjoined stacks to form a pile of

panels having a shape of a substantially rectangular prism comprising a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces, said top surface being applied with one or more support frames or two or more support corners.

13. A transport unit according to claim 12, wherein said support frame has a dimension and shape corresponding to the dimension and shape of the top surface of the pile of panels, said support frame preferably covering 10-25 % of the size of said top surface of the pile of panels.

14. A transport unit according to claim 12, wherein said support corners have a dimension and shape corresponding to the dimension and shape of the corner of the pile of panels, said support corners being preferably constituted by the joining of the top surface, a side surface and a front or back surface, respectively, of the pile of panels.

15. A transport unit according to any one of the preceding claims, wherein the panels are preferably stacked in two or more adjoined stacks to form a pile of panels having a shape of a substantially rectangular prism comprising a bottom surface, a top surface, a front surface, a back surface and at least two side surfaces, said stack of panels being applied with a tape or a glasfiber bond preferably wrapped around the one or more adjoined stacks to form a pile of panels or placed in the length direction of the panels.

16. A transport unit according to any of the preceding claims, wherein one or more support elements,

two or more carrying feet and the pile of panels applied with a support frame or two or more support corners are partly or totally surrounded by a foil.

17. A transport unit according to claim 16, wherein said foil is made of a material selected from the group consisting of polyethylene, polypropylene, polyamide, polyvinyl chloride or polyvinyl alcohol.

18. A transport unit according to claim 16 or 17, wherein said foil preferably has a foil thickness of 10-200 µm and more preferably a thickness of 15-60 µm.

Fig. 1a

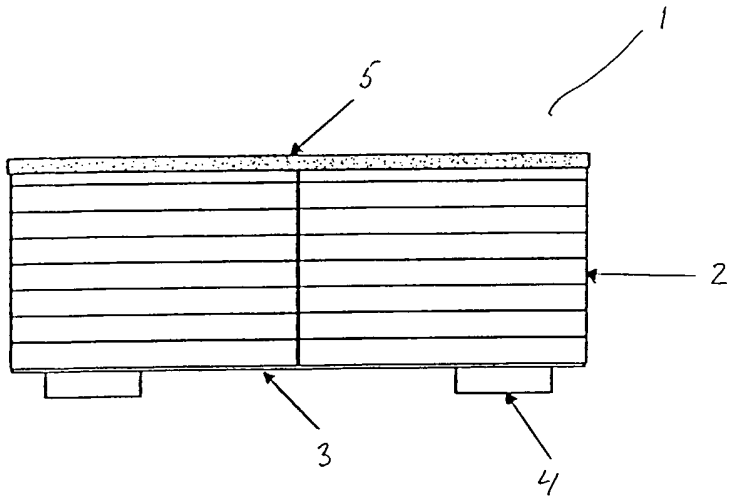


Fig. 1b

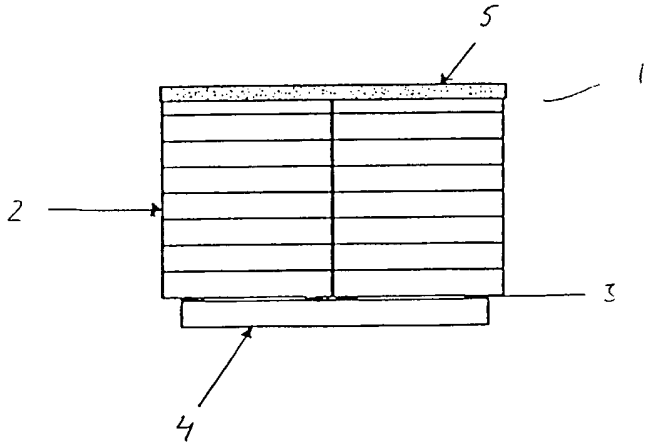


Fig. 1c

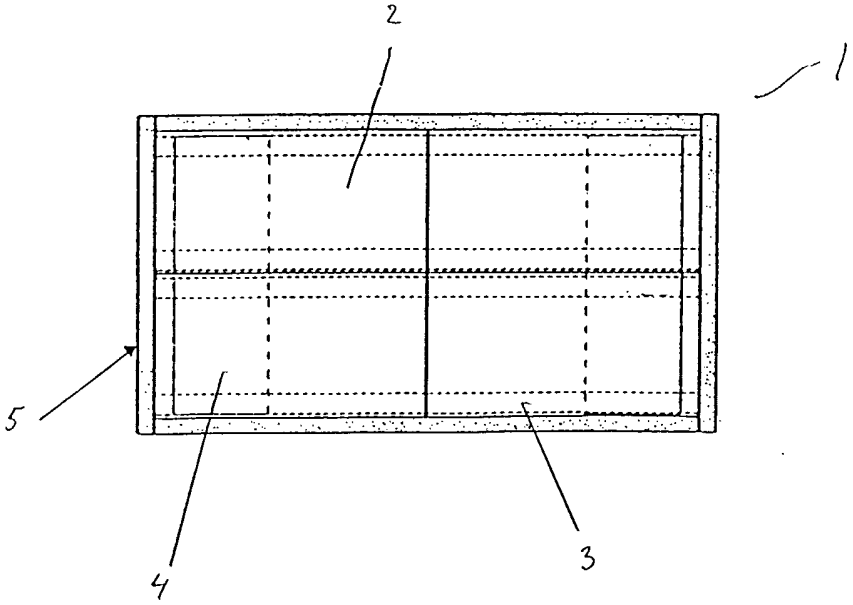


Fig. 2a

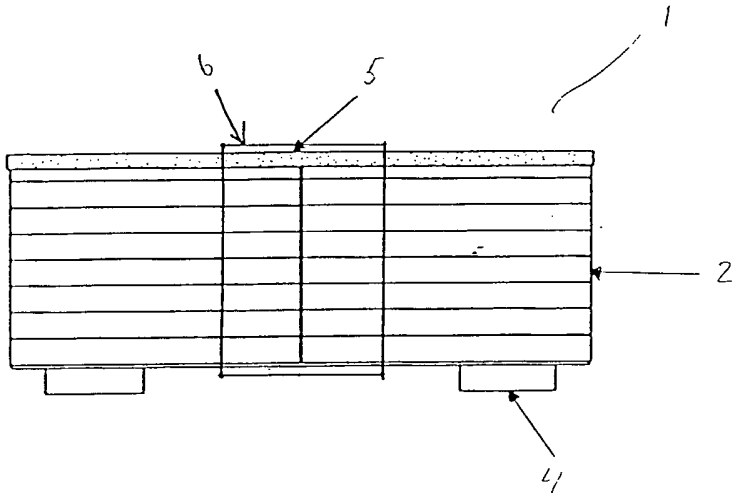
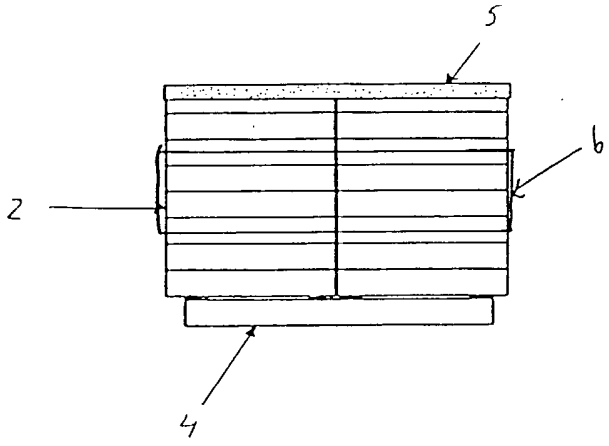


Fig. 2b



INTERNATIONAL SEARCH REPORT

International Application No
PCT/DK 02/00418

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B65D71/00 B65D71/04

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)
IPC 7 B65D

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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A	EP 1 002 738 A (ROCKWOOL MINERALWOLLE) 24 May 2000 (2000-05-24) the whole document ---	1-18
A,P	WO 02 16223 A (TRAPPMANN JUERGEN ;BIHY LOTHAR (DE); BECKER MICHAEL (DE); KELLER C) 28 February 2002 (2002-02-28) the whole document ---	1-18
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A	WO 98 23497 A (ROCKWOOL DEUTSCHE) 4 June 1998 (1998-06-04) cited in the application the whole document ---	8-18

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
18 September 2002	26/09/2002

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Pernice, C

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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