(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 557 250 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.02.2013 Bulletin 2013/07

(51) Int Cl.:
E04D 3/35 *(2006.01)* ***E04D 13/16*** *(2006.01)*

(21) Application number: **11290368.7**

(22) Date of filing: **11.08.2011**

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

(71) Applicant: **Rockwool International A/S**
2640 Hedehusene (DK)

(72) Inventor: **Guyoton, Gilles**
94300 Vincennes (FR)

(74) Representative: **de Kernier, Gabriel**
Cabinet Netter
Conseils en Propriété Industrielle
36, avenue Hoche
75008 Paris (FR)

(54) Insulating panel with improved interlocking joint

(57) The invention concerns an insulating panel (20) of generally rectangular form bounded by narrow faces and having a layer of insulating material of a chosen thickness. At least one of the narrow faces of the panel (20) has a joint profile (28) produced in the thickness of the layer of insulating material and defining a multiplicity of teeth (26) capable of interlocking by cooperation of shape with the teeth (26) of a complementary joint profile (32) of an adjacent panel (20), creating a mechanically strong joint and providing continuous insulation. Applicable to the insulation of buildings.

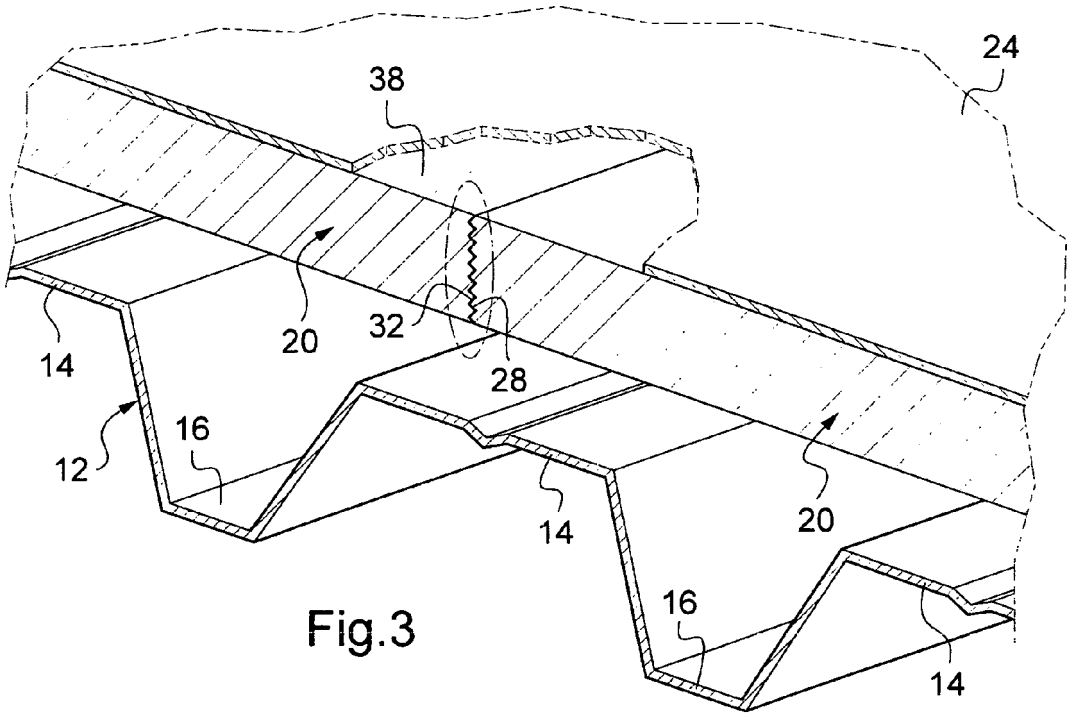


Fig.3

EP 2 557 250 A1

Description

[0001] The invention relates to insulating panels used in the construction industry.

[0002] More specifically, it concerns an insulating panel of generally rectangular form bounded by narrow faces and including a layer of insulating material of a chosen thickness.

[0003] Such panels are mainly used for thermal insulation, but are also used for soundproofing. They are preferably non-combustible in order also to confer fire barrier properties. However, there are insulating materials which are not totally non-combustible and which, in these circumstances, cannot be used as a fire barrier in fire protection.

[0004] There is a multiplicity of such insulating panels available on the market, with a wide range of sizes and thicknesses according to the applications.

[0005] The insulating material itself is also chosen according to the desired applications. It may, for instance, be mineral wool, such as rock wool, or cellular foam, or even other materials such as cellular glass, perlite, etc.

[0006] The insulating material itself may be used alone or in the form of a complex in which, for example, the layer of insulating material is combined with a facing or similar.

[0007] In the construction field, these insulating panels may be used for internal or external insulation. They may be placed vertically, obliquely, or horizontally according to the applications and may be subjected to mechanical stresses which vary considerably in their nature and intensity.

[0008] In order to produce insulation, these panels are usually placed edge to edge, in other words narrow face against narrow face, in order to provide continuity of insulation.

[0009] In the majority of cases, the narrow faces of the insulating panels are flat, and thus are perpendicular to the large faces of the panels, and so come to bear against one another in simple abutment.

[0010] However, there are also narrow faces arranged in the form of a rebate or in the form of interlocking male-female or tongue-and-groove joints.

[0011] In the majority of cases, these known panels enable a joint to be formed properly.

[0012] However, it has been found that, in certain applications, these joints with straight narrow faces or with rebated narrow faces or with a male-female interlocking joint are not satisfactory.

[0013] A typical example is that of roofs, in particular roofs for industrial buildings, in which insulating panels are placed horizontally or substantially horizontally on a metal load-bearing structure made from corrugated sheets.

[0014] In fact, these metal sheets most often form trapezoidal corrugations that define upper planar regions on which the insulating panels come to rest via their large faces and lower planar regions forming troughs or valleys and which do not provide support for the insulating panels.

[0015] If the width of the above-mentioned valleys is significant, typically at least 70 mm, it may happen that the assembly region of the respective narrow faces of two adjacent panels is positioned above a valley, without being supported by the load-bearing structure itself.

[0016] The result of this may be that the respective joint edges of two panels are in an overhanging position, and the length of the overhang may increase as the width of the valley increases.

[0017] As these insulating panels are usually covered with a waterproof coating on their respective large faces which are turned outwards, the joint regions are no longer visible.

[0018] Consequently, if these overhanging regions are subjected locally to a heavy load, even if only by the weight of an operator working on the roof, or the weight of an object that has fallen accidentally, the joint may come apart as a result of this, with a break in the seal. The result may then be not only a local break in the insulation but also a risk of leakage, particularly when there is rainfall.

[0019] As such panels can also be used in a fire barrier application, this break in the joint could have disastrous consequences.

[0020] The particular aim of the invention is to overcome the disadvantages mentioned above.

[0021] To that end, the invention proposes an insulating panel of the type specified in the introduction, which includes at least one first narrow face which has a joint profile produced in the thickness of the layer of insulating material and defining a multiplicity of teeth and at least one second narrow face which has a complementary joint profile defining a multiplicity of teeth, such that the teeth of the joint profile of said panel are capable of interlocking by cooperation of shape with the teeth of a complementary joint profile of an adjacent panel, producing a mechanically strong joint and providing continuous insulation.

[0022] This particular joint profile, which defines a multiplicity of teeth or indentations, makes it possible to produce an interlocking joint with a particularly high degree of mechanical strength, especially bending strength under load.

[0023] Furthermore, this joint provides perfectly continuous insulation, which is of particular interest in the case of fire barrier applications.

[0024] A joint profile of this kind cannot in any event be compared with rebated joint profiles or profiles with a male-female interlocking joint.

[0025] These known joints do not offer sufficient mechanical strength, particularly bending strength, nor continuous insulation that is equally effective.

[0026] Other features of the invention are detailed below:

- the insulating panel includes a first joint profile and

a first complementary joint profile, formed respectively along two first opposed sides of the panel;

- the two first opposed sides of the panel correspond to short sides of the rectangle;
- the insulating panel includes, in addition, a second joint profile and a second complementary joint profile formed respectively along two second opposed sides of the panel;
- the teeth of a joint profile are generally identical to one another;
- a joint profile has at least two teeth;
- the teeth of a joint profile are substantially triangular in shape;
- the teeth of a joint profile are substantially trapezoidal in shape;
- the teeth of a joint profile are substantially sinusoidal in shape;
- the teeth at the end of a joint profile are truncated in order to connect via straight edges to large faces of the panel;
- the joint profile is produced together with the panel;
- the joint profile is produced by machining a narrow face of the panel;
- the insulating material is a mineral wool, in particular a rock wool;
- the insulating material is a cellular foam;
- the insulating material is of cellular glass or perlite.

[0027] In another aspect, the invention relates to a building roof having a generally horizontal load-bearing structure on which is disposed a multiplicity of insulating panels as specified above. These panels are jointed to one another via their joint profiles and their complementary joint profiles, and are given a waterproof coating.

[0028] In the description that follows, given solely as an example, reference is made to the appended drawings, in which:

- Fig. 1 is a partial view in cross-section of a roof including a load-bearing structure on which are disposed insulating panels according to the prior art, whose narrow faces are straight and joined end to end;
- Fig. 2 is a partial view in cross-section of three insulating panels according to the invention having joint profiles with a multiplicity of teeth;
- Fig. 3 is a partial view in perspective, with cutaway, of a roof similar to the roof in Fig. 1 but with assembly panels according to the invention;
- Fig. 4 is a partial view in cross-section of two insulating panels according to the invention;
- Figs. 5 to 8 show different embodiments of joint profiles according to the invention; and
- Fig. 9 is a plan view schematically showing an assembly of insulating panels according to the invention in the case of use as a fire barrier.

[0029] Reference is made first of all to Fig. 1, which shows part of a roof 10 according to the prior art having a load-bearing structure formed from a metal component 12, for example made of steel, having a plurality of upper regions 14 disposed in a single plane, generally horizontal, and a multiplicity of lower regions 16 disposed in a single plane which is offset relative to that of the regions 14.

[0030] The regions 14 and 16 are connected to one another, alternately, via inclined walls 18, in such a way as to give the component 12 a transverse section that is corrugated in shape with corrugations which are substantially trapezoidal in shape.

[0031] Over the planar regions 14, insulating panels 20 according to the prior art come to rest flat via their large faces. These are panels which are generally rectangular in shape with, in particular, two straight narrow faces 22 simply placed end-to-end, thus in simple abutment. To this insulating panel there is then applied a coating 24 creating a seal.

[0032] As can be seen in Fig. 1, the assembly joint 26 between the two narrow faces 22 may be situated in the vicinity of a valley of the component 12, a valley whose width L may be from 70 mm to 300 mm, these values being given as an example.

[0033] The result of this is that the joint 26 may be in an overhanging position above a valley such that, if a force F is applied in the vicinity of the joint, the panel may bend locally causing a break in the joint and thus in the insulation.

[0034] When the coating 24 is applied to the panels, the joint regions are no longer visible. Thus, in the case where an operative is working on the roof, even if only during fitting, he may inadvertently exert sufficient force to cause bending of a panel in the region of the joint. A similar force may result from other circumstances: movement of a load on the roof, a falling object, etc.

[0035] Certainly, the use is known of joints with rebated narrow faces or with narrow faces having a male-female interlocking joint, but these narrow faces do not offer sufficient mechanical strength, particularly bending

strength.

[0036] The invention provides a solution to this problem.

[0037] Thus, as can be seen in Fig. 2, the insulating panels 20 according to the invention have at least one joint profile, here a joint profile 28 along a first narrow face 30 and another joint profile 32, or complementary profile, along a second narrow face 34 which is parallel to the narrow face 30. The joint profile 28 and the complementary joint profile 30 are formed respectively along two opposed sides of the panel which are advantageously sides corresponding to short sides of the rectangle. The two other sides of the rectangle can be straight narrow faces or, as will be seen below, narrow faces with similar joint profiles.

[0038] The profiles 28 and 32 have a multiplicity of teeth 36, in other words at least two teeth, which are capable of interlocking by cooperation of shape with counterpart teeth 36 of a complementary joint profile of an adjacent panel. Thus the joint profile 28 of the panel 20 situated in the centre interlocks with a complementary profile 32 of a panel situated immediately to its left. Likewise, the complementary joint profile 32 of the panel 20 situated in the centre cooperates with a joint profile 28 of a panel 20 situated immediately to its right. The left and right orientations are defined here in relation to Fig. 2 of the drawings.

[0039] The joint teeth 36 are advantageously formed along the full thickness E of the insulating layer, forming indentations similar to the teeth made in carpentry, using the tongue-and-groove method, to produce joints between wooden parts. However, this particular type of joint used in carpentry has never been used in the specific field of insulating panels made of materials other than wood.

[0040] Fig. 3 gives a perspective view of a roof with a metal component 12 similar to that shown in Fig. 1 on which are disposed two insulating panels 20 according to the invention. It can be seen that the teeth 36 of the joint profile 28 of the panel situated on the right interlock closely, by cooperation of shape, with the teeth 36 of the complementary joint profile 32 of the insulating panel on the left. The number, dimension and shape of the teeth may vary according to the strength required, as well as the thickness, density and nature of the insulating layer.

[0041] Thus, in the case of Fig. 3, the number of teeth is smaller than in the case of Fig. 2 for the same thickness E of the insulating layer. The joint region 38 of the profiles 28 and 32 is here placed in an overhanging position above a valley of the component 12. However, because of the toothed interlocking joint of the profiles 28 and 32, a force F corresponding to a load similar to that in Fig. 1 will not lead to bending, even where there is a significant overhang. In addition to this high degree of mechanical strength, particularly bending strength, the interlocking joint produced by cooperation of the respective teeth of the two joint profiles provides perfectly continuous insulation, which is of particular interest, especially where obtaining fire barrier properties is concerned.

[0042] Fig. 4 shows that the teeth 36 of the joint profiles may extend to a depth P which varies according to the degree of mechanical strength required. As can be seen in Fig. 4, the profiles are chosen and arranged in such a way that when two adjacent panels are interlocked, they have a single reference plane PR such that their respective large faces 40 are coplanar.

[0043] Figs. 5 to 8 show different possible shapes of teeth. Generally, the teeth will be identical to one another, but it is also possible to envisage teeth of different shapes within the same interlocking joint profile.

[0044] In the case of Fig. 5, the teeth 36 are triangular.

[0045] The teeth 36 in Fig. 6 are also triangular, but the end teeth are truncated in order to connect via straight edges 42 to the two large faces 40 of the panels.

[0046] In the case of Fig. 7, the teeth 36 are substantially sinusoidal in shape, in other words they are rounded at the apex.

[0047] The teeth 36 shown in Fig. 8 are substantially trapezoidal.

[0048] It will be understood that the scope of the invention also includes the production of teeth of different shapes, provided that they allow close interlocking by cooperation of shape.

[0049] In the previous embodiments, each panel has a first joint profile 28, also called profile A, and a first complementary joint profile 32, also called profile B, extending respectively along two opposed sides of the panel which, in the example, correspond to short sides of the rectangle.

[0050] It is also possible to produce counterpart profiles along the two other opposed sides of the rectangle, for example along the long sides, as can be seen in Fig. 9. In this case, the panel also includes a second joint profile and a second complementary joint profile formed respectively along two second opposed sides of the panel.

[0051] The point is to be able to produce an interlocking joint between the panels along their four narrow faces in order to improve the continuity of the insulation. This is of particular interest when the panels are used as fire barrier elements in roofs of the same type as those shown previously.

[0052] The insulating material can be varied in a number of ways depending on the required applications.

[0053] There is a particular preference for using a mineral wool, and in particular a rock wool, because of its remarkable thermal and sound insulation properties and also because of its non-combustible nature which enables it to be used as a fire barrier material.

[0054] Nevertheless, it is also possible to use other types of material, for example cellular foams such as expanded polystyrene, polyurethane, PVC, etc. However, these cellular foams are not suitable as fire barrier panels.

[0055] Other materials, such as cellular glass, perlite etc., could also be used.

[0056] The joint profile may be produced together with

the panel, in other words produced during production of the panel itself.

[0057] It is also possible to start from assembly panels having straight narrow faces and then to machine one or more narrow faces of the panel.

[0058] In the particular case of panels made of a mineral wool insulating material, this machining may easily be performed using machine tools similar to the tongue-and-groove tools used in carpentry.

[0059] Although the invention has been described more specifically with reference to the use of panels in roofs, these panels may of course be used for other applications, for example for applications on vertical walls as internal or external insulation.

Claims

1. Insulating panel of generally rectangular form bounded by narrow faces and including a layer of insulating material of a chosen thickness, **characterised in that** it includes at least one first narrow face (30) which has a joint profile (28) produced in the thickness (E) of the layer of insulating material and defining a multiplicity of teeth (36) and at least one second narrow face (34) which has a complementary joint profile (32) defining a multiplicity of teeth (36), such that the teeth (36) of the joint profile (28) of said panel are capable of interlocking by cooperation of shape with the teeth (36) of a complementary joint profile (32) of an adjacent panel (20), producing a mechanically strong joint and providing continuous insulation.

2. Insulating panel according to claim 1, **characterised in that** it includes a first joint profile (28) and a first complementary joint profile (32), formed respectively along two first opposed sides of the panel.

3. Insulating panel according to claim 2, **characterised in that** the two first opposed sides of the panel correspond to short sides of the rectangle.

4. Insulating panel according to either claim 2 or claim 3, **characterised in that** it includes, in addition, a second joint profile (28) and a second complementary joint profile (32) formed respectively along two second opposed sides of the panel.

5. Insulating panel according to any one of claims 1 to 4, **characterised in that** the teeth (36) of a joint profile (28) are generally identical to one another.

6. Insulating panel according to any one of claims 1 to 5, **characterised in that** a joint profile (28) has at least two teeth (36).

7. Insulating panel according to any one of claims 1 to 6, **characterised in that** the teeth (36) of a joint profile (28) are substantially triangular in shape.

8. Insulating panel according to any one of claims 1 to 6, **characterised in that** the teeth (36) of a joint profile (28) are substantially trapezoidal in shape.

9. Insulating panel according to any one of claims 1 to 6, **characterised in that** the teeth (36) of a joint profile (28) are substantially sinusoidal in shape.

10. Insulating panel according to any one of claims 1 to 5, **characterised in that** the teeth at the end (36) of a joint profile (28) are truncated in order to connect via straight edges (42) to large faces (40) of the panel.

11. Insulating panel according to any one of claims 1 to 10, **characterised in that** the joint profile (28) is produced together with the panel.

12. Insulating panel according to any one of claims 1 to 10, **characterised in that** the joint profile (28) is produced by machining a narrow face of the panel.

13. Insulating panel according to any one of claims 1 to 12, **characterised in that** the insulating material is a mineral wool, in particular a rock wool.

14. Insulating panel according to any one of claims 1 to 12, **characterised in that** the insulating material is a cellular foam.

15. Insulating panel according to any one of claims 1 to 12, **characterised in that** the insulating material is of cellular glass or perlite.

16. Building roof having a generally horizontal load-bearing structure (12) on which is disposed a multiplicity of insulating panels (20) according to any one of claims 1 to 15, said panels being jointed to one another via their joint profiles (28) and their complementary joint profiles (32), and receiving a waterproof coating (24).

Fig.1
PRIOR ART

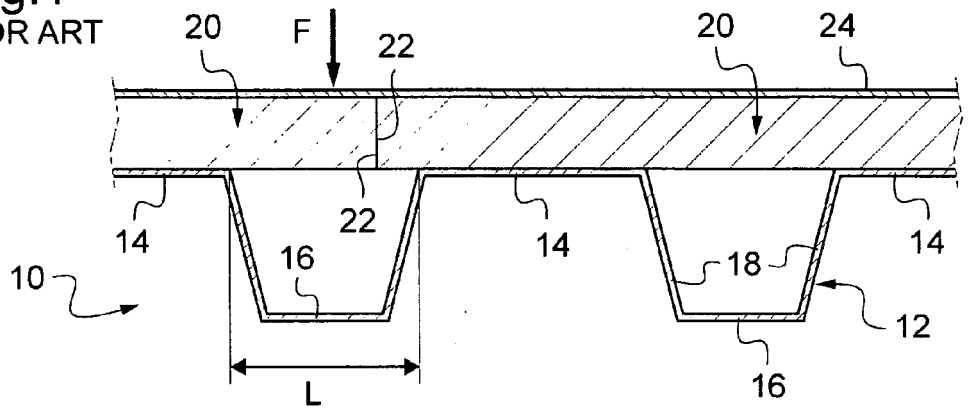
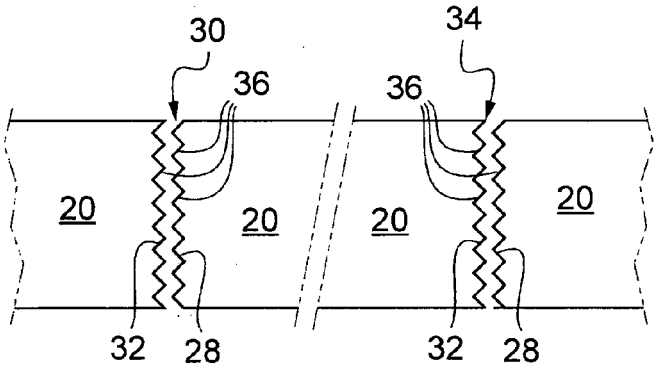


Fig.2



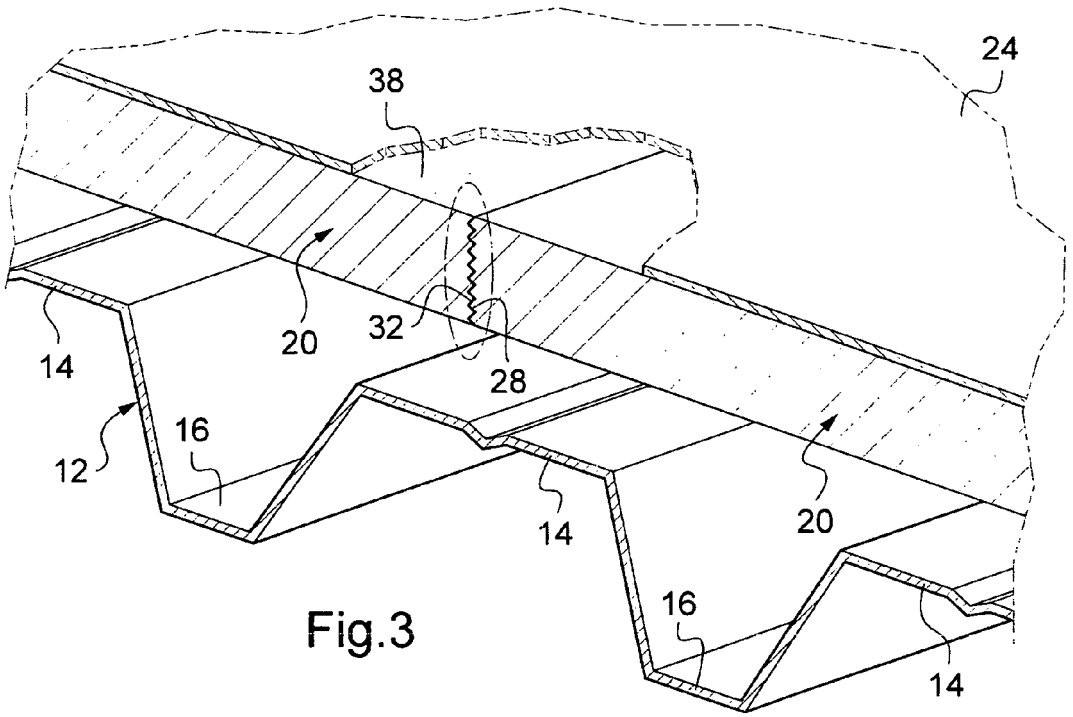
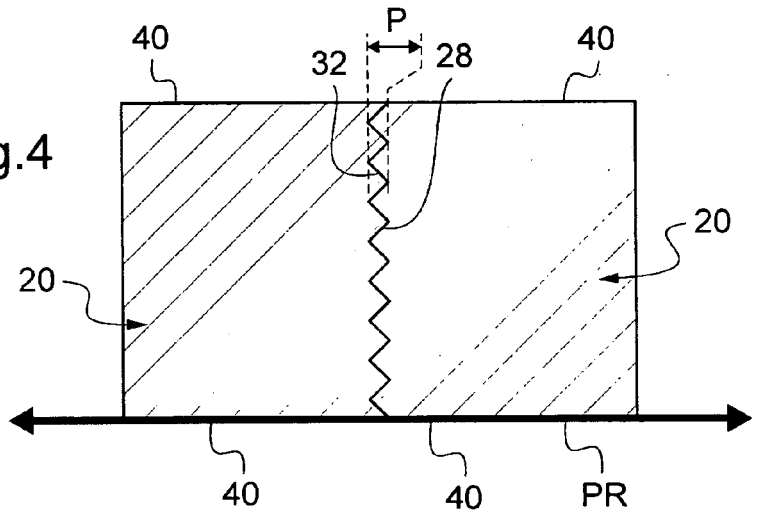


Fig.3

Fig.4



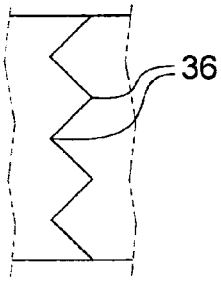


Fig.5

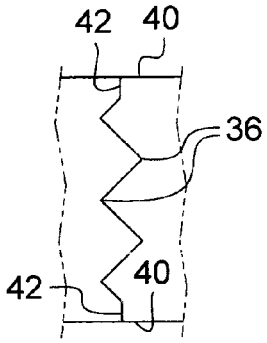


Fig.6

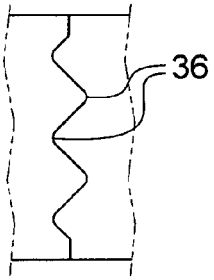


Fig.7

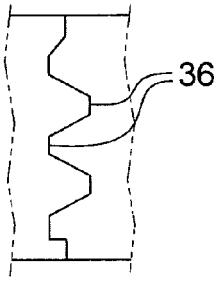
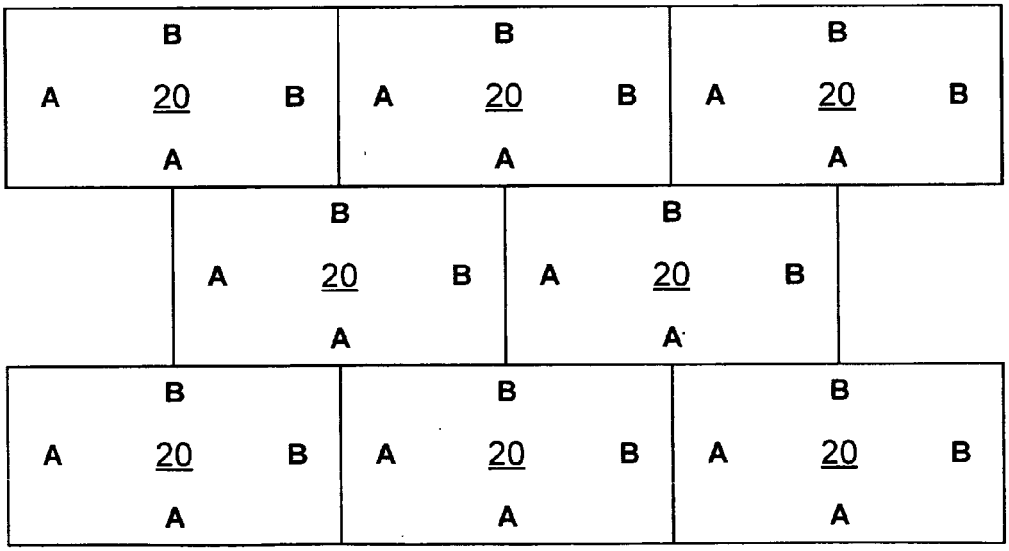


Fig.8

Fig.9



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 11 29 0368

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	DE 88 04 855 U1 (LINZMEIER [D]) 18 August 1988 (1988-08-18) * figure 3 *	1-7,11, 12,14,16	INV. E04D3/35 E04D13/16
X	DE 10 2007 061713 A1 (JOSEF MANG GMBH & CO KG [DE]) 3 July 2008 (2008-07-03) * figure 4 *	1-3,5-7, 10-12,14	
X	FR 2 436 222 A1 (LINZMEIER FRANZ [DE]) 11 April 1980 (1980-04-11) * figure 1 *	1-3,5,6, 8,10-16	
X	DE 25 47 637 A1 (NAUMANN WOLFGANG) 28 April 1977 (1977-04-28) * figures 1, 10-12 *	1-6,8-13	
X	WO 90/07040 A1 (PARTEK AB [FI]) 28 June 1990 (1990-06-28) * figure 3 *	1-3,5-7, 11-13	
A	DE 10 2005 011188 A1 (ZAHN HARALD GMBH [DE]) 6 October 2005 (2005-10-06) * figure 26 *	16	TECHNICAL FIELDS SEARCHED (IPC) E04D E04B

1 The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	12 January 2012	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 29 0368

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

12-01-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 8804855 U1	18-08-1988	NONE	
DE 102007061713 A1	03-07-2008	NONE	
FR 2436222 A1	11-04-1980	AT 368232 B	27-09-1982
		CH 642128 A5	30-03-1984
		DE 7827101 U1	18-01-1979
		FR 2436222 A1	11-04-1980
DE 2547637 A1	28-04-1977	NONE	
WO 9007040 A1	28-06-1990	AT 118580 T	15-03-1995
		CA 2028272 A1	17-06-1990
		DE 68921218 D1	23-03-1995
		DE 68921218 T2	14-06-1995
		DK 114491 A	14-08-1991
		EP 0445240 A1	11-09-1991
		ES 2071102 T3	16-06-1995
		FI 885847 A	17-06-1990
		NO 912307 A	09-08-1991
		US 5313758 A	24-05-1994
		WO 9007040 A1	28-06-1990
DE 102005011188 A1	06-10-2005	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82