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

(11) EP 1 426 518 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
30.04.2008 Bulletin 2008/18

(51) Int Cl.:
E04C 2/292 *(2006.01)* ***E04F 13/08*** *(2006.01)*

(21) Application number: **03396099.8**

(22) Date of filing: **29.10.2003**

(54) **Improved tongue and groove in light building panels**

Nut und Feder für Leichtbauplatten

Rainure et languette pour panneaux légers

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
LT LV

(30) Priority: **05.12.2002 FI 20022157**

(43) Date of publication of application:
09.06.2004 Bulletin 2004/24

(73) Proprietor: **Rannila Steel Oy**
62800 Vimpeli (FI)

(72) Inventors:
- **Heikkilä, Simo**
  62900 Alajärvi (FI)
- **Mäkelä, Keijo**
  62950 Paalijärvi (FI)
- **Joensuu, Jukka**
  62830 Luoma-aho (FI)

(74) Representative: **Laako, Tero Jussi**
Berggren Oy Ab
P.O. Box 16
00101 Helsinki (FI)

(56) References cited:
WO-A-02/098648
CH-A- 546 866
GB-A- 2 142 670

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 426 518 B1

Description

[0001] The invention relates to wall or ceiling panels of a building forming a tongue and groove joint without fastening elements, said panels comprising a metallic outer surface plate, a metallic inner surface plate arranged at a thickness from the outer surface plate, and heat insulation therebetween; in said tongue and groove joint, the groove is placed at the first edge of the panel and comprises a fold that is bent inwardly from one of said edges of the surface plate in a second direction, and, as an extension thereof, a first bend pointing in the opposite first direction inside said thickness; and the tongue is placed at the other edge of the panel and comprises a bead strip extending outwards, in said second direction of a surface plate, and as an extension thereof, a second bend pointing in said first direction inside said thickness. In particular, the invention relates to a fire resistant panel of this type.

[0002] Currently used seams, i.e. tongue and groove joints provided between wall or ceiling panels made of metallic surface plates and insulation provided therebetween, are not the best possible joints. One such tongue and groove joint between light panels is described in the publication WO-01/77457. The panel described in said publication comprises an upper and a lower metal or plastic plate, and therebetween, insulation made of elastic material, such as mineral wool. In particular, the publication relates to a hidden joint provided between the panels, by which joint the panels are attached to the load-bearing structure. The joining to the load-bearing structure is carried out by screw fasteners at the tongue provided at the panel edge, and through a plate-like additional load distribution element arranged in between the screw head and the metal or plastic plate constituting the tongue and groove. The groove edge of the adjacent panel covers said fasteners and load-distributing elements. By this fastening to the load-bearing structure at the tongue and groove, it is also attempted to prevent the breaking up of the tongue and groove and hence the access of additional air in a fire site. Although said fastening method might prevent larger motions of the tongue and groove area in the case of a fire, the solution does not, however, prevent combustion gases from infiltrating too fast into the panels and further through the tongue and groove to the opposite side of the panels, which means that the fire resistant capacity is lost. In comparison with said publication, the publications GB-2,142,670 and EP-1,260,647 describe somewhat more complicated tongue and groove joints, which are provided with reinforcing additional folds of the plate, when compared with the tongue and groove of the above mentioned WO publication. The tongue and groove of the GB publication is designed as a snap-on joint, which means that the making of the tongue and groove joint requires the use of considerable strength. The high rigidity of the elements of the tongue and groove joint makes the installation difficult in other ways, too, especially if the elements of the tongue and groove joint have formal defects. In both publications, the gap between the tongue and groove plates inside the panels opens directly up to the border surface of the insulations of the top and bottom panel, in the GB publication even in the clear gap left between the insulations, and as a result, in these tongue and groove joints combustion gases have an easy and rapid access to infiltrate into the panels and further through the tongue and groove to the opposite side, which means that the fire resistant capacity is lost. In the case of the structure described in the GB publication, a non-desirable infiltration of exhaust gases is speeded up by a large tubular sealing, which bums rapidly down leaving a large space for the penetration of the combustion gases. Moreover, in the case of a fire, the tongue and groove joints described in said publications become slack or loose owing to the heat, thus making the situation even worse.

[0003] The object of the invention is to realize a tongue and groove joint of the type described in the beginning of this specification, which joint would have a distinctly better fire resistance than the prior art tongue and groove structures, and which joint would also otherwise have better airtightness and watertightness than known tongue and groove joints. Another object of the invention is to achieve said main objects without using any fire resistant paint or other thermally expanding mass between the insulations of the connected panels, and also without locking the tongue and groove joint with screws or similar means. A third object of the invention is to achieve, for a tongue and groove of this type, also a shape that does not result in mutual matching problems when installing the panels in place, as is sometimes the case with known seam solutions.

[0004] The above described drawbacks are eliminated, and the above defined objects achieved by means of a tongue and groove according to the invention, characterized by what is set forth in the characterizing part of claim 1.

[0005] It has surprisingly been found that by designing in the tongue and groove joints of wall or ceiling panels both the tongue section and the groove section, so that they include folds and first bends as extensions of the surface plates, and in addition by arranging, as extensions of said bends, another set of inner flanges, at the same time as the tongue bend is preferably arranged on the opposite side of the bead strip than the surface plates, there is achieved a shape-locked joint between the tongue and the groove. The shape-locked joint that is achieved owing to these several plate bends or plate folds, designed according to the invention, drastically improves the sealing of the tongue and groove, particularly in the case of a fire. The reason for this improvement is that in the tongue and groove joint, the combustion gases infiltrating through the plate bends are in the case of a fire conducted towards the heat insulation, and not directly to the seam joint of the insulations provided between the panels, in which case also the insulation capacity remains good, in addition to the improved sealing.

We can speak of a three-step locking, where the vertical parts of the tongue and groove, i.e. the parts that are essentially parallel with the panel, stick against each other, and the innermost bend of the panel, pointing towards the inside of the panel, secures the locking, which in the case of a fire is tightened more owing to the expansion of the panels caused by the combustion heat, and owing to the deformations caused by said expansion. In the tongue and groove joint, the same conducting of the combustion gases works in both directions. In addition, the groove part is set precisely and reliably, without wedging, in the tongue part, because the tongue and groove parts do not include inclined surfaces. Thus the wall or ceiling surface formed of the panels is smooth. When being locked, the panel surface plates cannot slide or slip apart. When necessary, a double sealing can be utilized in this tongue and groove joint. As for a flow of water, caused by rain and wind, that attempts to penetrate into the tongue and groove joint, it can be prevented by a capillary groove or water-preventing trough according to the invention. The capillary groove is invisible, hidden in the vertical part of the tongue; owing to the expanded transversal surface, it prevents the water from rising deeper in the tongue and groove joint, and is left invisible after the installation of the next panel. The capillary groove can also be used as an extra sealing in the tongue and groove joint, by extruding for instance sealing mass therein, either in the factory or during the installation step at the building site.

[0006] The invention is described in more detail below with reference to the appended drawings.

[0007] **Fig. 1** illustrates a first embodiment of the tongue and groove according to the invention, seen in a cross-section in perpendicular to the panel plane and to the length of the tongue and groove joint.

[0008] **Fig. 2** illustrates a second embodiment of the tongue and groove according to the invention, seen in the same view as in figure 1, in a cross-section in perpendicular to the panel plane and the length of the tongue and groove joint.

[0009] The figures illustrate a panel construction to be used as wall or ceiling panels 1 in a building. This kind of light ceiling or wall panels comprise a metallic outer surface plate 3a, a metallic inner surface plate 3b placed at a thickness W1 thereof and heat insulation 6 in between said two surfaces. For fire safety, the heat insulation is generally mineral wool, but in some cases other heat insulations can also be used, such as foam polymers, for instance foam polyurethane or the like. Each of two superimposed wall panels 1a, 1b and respectively each of two adjacent ceiling panels 1a, 1b are interconnected at the edges by means of a mutual tongue and groove joint 2 without a fastening element. The fact that a fastening element is not provided means that in between the groove 7 and the tongue 8, there are not provided any mutually fastening elements, but there may be provided fasteners, such as screws or bolts, that penetrate the tongue alone and attach it to structures, not illustrated in the drawings. In the preferred embodiments illustrated in the drawings, not even these are provided, but the panels are fastened by other means. The absence of a mutual fastening element between the groove and the tongue enables a self-sealing capacity to be described below. Owing to said lack of fastening elements, in practice - the attached drawings representing, on the other hand, theoretical measures - at least one of the first bends 9a or 9b according to the invention is in contact with at least one of the second bends 10a or respectively 10b, i.e. the bend 9a is in contact with the bend 10a and/or the bend 9b is in contact with the bend 10b. At least between said bends 9a, 9b, 10a, 10b and the plate curves 13a, 13b, 14a, 14b, 15a, 15b, 16a, 16b to be described below, there is not provided any other material than the sealings 21 and 22. In most cases, in similar fashion, at least one of the folds 4a or 4b is in contact with at least one of the second bead strips 5a or respectively 5b. The groove 7 of the tongue and groove joint is provided at the first edge of each panel and comprises a fold 4a or 4b, folded from said edge of a surface plate inwards in said panel 1a, towards the tongue 8, i.e. in the second direction D2, and as an extension thereof, a first bend 9a, 9b pointed in the opposite first direction D1, i.e. outwards towards the edge 1a of said panel, inside the panel thickness W1. The tongue 8 of the tongue and groove joint is located at the second edge of each panel, said edge being opposite to the first edge, and comprises a bead strip 5a or 5b, extending outwards from said panel 1b of a surface plate, towards said edge, i.e. when the groove and tongue are mutually attached, in said second direction D2, and as an extension thereof, a second bend 10a, 10b pointing in said first direction, i.e. in this case towards the panel 1b, inside said panel and in the direction D1 towards said groove 7, inside said second thickness W1. It is pointed out that said panels 1, of which in the above specification, for the sake of clarity there are used individual reference numbers 1a and 1b, are typically identical, containing a groove at one edge and a tongue at the other edge, i.e. in general, there is used a common reference number 1. For special purposes, there can naturally be made panels that are mutually different. If said panel 1 is used as a wall panel or a ceiling panel installed in an inclined position, the tongue 8 is provided at the top edge of the panel, and the groove 7 is provided at the bottom edge of the panel. Thus the first direction D1 points downwards, and the second direction D2 points upwards. In any case, the directions D1 and D2 are parallel with the center line connecting the panel edge on the tongue side and the panel edge on the groove side. If the surface plates are in parallel, the directions D1, D2 are also parallel with them.

[0010] According to the invention, the groove 7 comprises a fold 4a, 4b and a first bend 9a, 9b as an extension of both surface plates 3a and 3b, and the tongue 8 is provided with a bead strip 5a, 5b and a second bend 10a, 10b as an extension of both surface plates 3a and 3b, which thus means that the first tongue and groove section

31 located on the side of the first surface plate 3a is essentially of the same type as the second tongue and groove section 32 located on the side of the second surface plate 3b. The first and second tongue and groove sections 31, 32 are not necessarily mutually identical or located at precisely the same height in the directions D1, D2, but according to the invention, they are in principle corresponding in shape, and contain sections or shapes that are functionally of the same type. Thus for example the second tongue and groove section 32 can be located upper, i.e. shifted in the direction D2, or lower, shifted in the direction D1, the curvatures to be dealt with below can be of different orders etc. However, it is most advantageous that the first and second tongue and groove section 31, 32 are identical in measures, in which case the tongue and groove joint 1 is mirror symmetrical with respect to the center plane that is parallel with the panel surface plates. The bead strips 5a, 5b of the tongue 8 according to the invention, as well as the folds 4a, 4b of the groove 7 arranged on both sides thereof, can be essentially parallel with the surface plates 3a, 3b, as is depicted by unbroken lines in the drawings, but especially the tongue bead strips 5a, 5b can also in the second direction D2 approach each other, so that the bead strips form, with respect to the direction of the surface plates, an angle K3 that is smaller than 10°, generally not larger than 7° and typically of the order 5°, as is depicted by dotted lines in figure 1. The groove folds 4a, 4b are generally parallel with the surface plates, but in any case the folds form a smaller angle, when compared with the direction of the surface plates, than the bead strips. Likewise, advantageously the first groove bends 9a, 9b according to the invention and the second bends 10a, 10b of the tongue 8, arranged on both sides thereof, are essentially parallel with the surface plates 3a, 3b. In addition, according to the invention the groove 7 comprises, as extensions of both of said first bends 9a, 9b, first inner flanges 11a, 11b pointing essentially in said second direction D2, and the tongue 8 also comprises, as extensions of both of said second bends 10a, 10b, second inner flanges 12a, 12b pointing essentially in said second direction D2. With respect to the second direction D2, the first inner flanges 11a, 11b form a first angle K1, and with respect to the second direction D2, the second inner flanges 12a, 12b form a second angle K2, said angles K1, K2 being at maximum 60°, preferably not larger than 45° and typically within the range 30° - 0°, in which case the gap 26 between the first inner flanges 11a, 11b and the second inner flanges 12a, 12b is oriented, direction D_F, away from the border surface formed by the edges 19a, 19b of the heat insulations. In size, the second angle K2 can be equal to the first angle K1, but advantageously the second angle K2 is larger, for example by 5° - 10° larger than the first angle K1. Said second bend 10a, 10b of the tongue is placed on the opposite side of the bead strip 5a and respectively 5b, than the outer surface plate 3a or respectively the inner surface plate 3b.

[0011] In the groove 7, the distance W2 between the folds 4a, 4b is smaller than the thickness W1 of the wall elements, and in addition the distance W2 of these folds 4a, 4b is larger than the distance W3 of the bead strips 5a, 5b of the tongue 8, but by no more than for the length of the first clearances P1. In similar fashion, in the tongue 8 the distances W4 of the second bends 10a, 10b are larger than the distances W5 off the first bends 9a, 9b of the groove 7, but by no more than for the length of the second clearances P2. Typically these second clearances P2 are smaller than the first clearances P1, and further the second clearances P2 are at least at some point of the distance between the first and second plate curves 13a, 13b, 14a, 14b on one hand, and the distance between the third and fourth plate curves 15a, 15b, 16a, 16b on the other hand, parallel with the surface plates 3a, 3b, preferably along the length H_X, i.e. at this point or length, the first and second bends 9a, 9b, 10a, 10b are in parallel. By utilizing this configuration, there is obtained a self-sealing quality for the tongue and groove joint 2 by means of thermal expansion during a fire, which is further enhanced by the existence of the first and second plate curves 13a, 13, 14a, 14b located on both sides of the length H_X of the second clearance P2, oriented in the opposite directions and shapewise accurately matching, as well as the existence of the shapewise accurately matching third and fourth plate curves 15a, 15b, 16a, 16b. The mutual matching of said plate curves is achieved so that the distance from the first plate curves to the third plate curves is essentially equal to the distance from the second plate curves to the fourth plate curves, and in a ready-installed tongue and groove joint 2, the first and second plate curves 13a, 13, 14a, 14b mutually and the third and fourth plate curves 15a, 15b, 16a, 16b mutually are simultaneously positioned in corresponding positions, i.e. they could, without the sealing materials 21, 22, get into contact with each other. Thus the above described self-sealing is achieved both in the direction of the surfaces of the panels 1 and in the directions of the panel thicknesses W1. The size of the second clearance P2, as well as both gaps between the first and second plate curves and the third and fourth plate curves, where the first and second sealing materials 21, 22 are located, are at the most three times the thickness S of the surface plates, and advantageously at the most two times the thickness S of the surface plates, in which case it should be observed that the surface plates may have different thicknesses. Typically the size of the second clearance is within the range 0.5 - 1.2 times the thickness of the surface plates, in test pieces about 0.85 times the thickness of the plate. As for the first clearance P1, it is at least 1.2 times but not more than three times the second clearance P2, preferably within the range 1.5 - 2.5 times the second clearance. By means of the design and measures of the tongue and groove sections according to the invention, the tongue and groove joint 2 is when installing and as a ready-made structure fairly loose in a normal situation, but in the case of a fire at least one of the second clearances P2, or at a later stage both second

clearances approach zero, thus closing the route of combustion gases. The surface plates 3a, 3b are curved as groove folds 4a, 4b in the semi-curves 17, and as tongue bead strips 5a, 5b in the opposite curve sections 18a and 18b, as is shown in the drawings. When necessary, for example when the panel is used as an exterior wall panel, the tongue 8 according to the invention also comprises, at least in the bead strip 5a on the side of the outer surface plate 3a, pointing in the other direction, a capillary trough 20 parallel with the tongue and groove, which capillary trough decreases the wind-oriented tendency of rain water to penetrate into the tongue and groove joint.

[0012] The groove folds 4a, 4b and the first bends 9a, 9b are interconnected by first plate curves 13a, 13b, and the bead strips 5a, 5b and the second bends 10a, 10b of the tongues are interconnected by second plate curves 14a, 14b. The first plate curves 13a, 13b have a first curvature R1, and the second plate curves 14a, 14b have a second curvature R2, and the first curvature R1 is larger than the second curvature R2. The first curvature R1 and the second curvature R2 are convex in the same direction, and especially in the second direction D2, i.e. the first plate curves 13a, 13b and the second plate curves 14a, 14b are all convex in the second direction D2 and concave in the opposite first direction D1. Further, the third plate curves and the fourth plate curves are roughly semicircles, in which case there must naturally be observed the angles K3 possibly formed by the bead strips 5a, 5b. Moreover, the first bends 9a, 9b and the first inner flanges 11a, 11b of the groove are interconnected by third plate curves 15a, 15b, and the second bends 10a, 10b and the second inner flanges 12a, 12b of the tongue are interconnected by fourth plate curves 16a, 16b. The third plate curves 15a, 15b have a third curvature R3, the fourth plate curves 16a, 16b have a fourth curvature R4, and the third curvature is smaller than the fourth curvature. The third curvature R3 and the fourth curvature R4 are convex in the same direction, and especially in the first direction D1, i.e. the third plate curves 15a, 15b and the fourth plate curves 16a, 16b are all convex in the first direction D1 and concave in the opposite second direction D2. Further, the third plate curves and the fourth plate curves are roughly semicircles, in which case - when there are taken into account the above described first and second angles K1, K2 and the fact that the first and second bends 9a, 9b, 10a, 10b are at least roughly parallel with the surface plates 3a, 3b - the third plate curves 15a, 15b form an arch that is at least 30°, preferably at least 45° and typically 60° - 90°, and the fourth plate curves 16a, 16b respectively form an arch that is at least 20° or 25°, preferably at least 35° or 40° and typically 50° - 80° or 55° - 85°. The tongue and groove joint is sealed at least by a first sealing 21 that is arranged in between the above described first plate curves 13a, 13b and the second plate curves 14a, 14b. Advantageously the tongue and groove joint also comprises second sealings 22, which are arranged in between the third plate curves 15a, 15b and the fourth plate curves 16a, 16b. The sealings 21 and 22 are made of a suitable elastic sealing material. The edges 19a, 19b of the heat insulation 6 located between the surface plates are placed, when observed in the directions of the panels or their planes D1, D2, in the area of the third plate curves 15a, 15b and the fourth plate curves 16a, 16b, i.e. in the thickness direction of the panels, between the opposite fourth plate curves 16a and 16b, set against each other, so that they form a mutual border surface 29, in which case the edges 23, 24 of the first inner flanges 11a, 11b and the second inner flanges 12a, 12b are located at the heights H' and H" from the border surface formed by the heat insulation edges 19a, 19b, and on the same side of said border surface 29, i.e. in the second direction D2 when observed from the border surface. It is possible to place the border surface 29 also in the direction of the panel thickness in between the opposite second inner flanges 12a and 12b, but by no means as far as the edges 24 of the second inner flanges; in between said edges 24 and the border surface 29, there must be left clearly said first height H', the size of which is at least half of the third curvature R3, more precisely of the radius of curvature and preferably at least half of the radius of curvature corresponding to the third curvature. The edges 23 of the first inner flanges are located at least at the second height H", which in a preferred embodiment of the figures is at least as large as the first height, i.e. H" $\geqq$ H', but it may also be somewhat smaller than the first height, i.e. H" $\lesssim$ H'.

[0013] The folds 4a, 4b of the groove, folded in the second direction D2, have a first height H, and the bends 5a, 5b of the tongue, pointing in the second direction D2, have a second height H2, said second height being larger than the first height. Moreover, the first bends 9a, 9b of the groove, pointing in the first direction D1, have a third height H3, and the second bends 10a, 10b of the tongue, pointing in the first direction D1, have a fourth height H4, and the third height is equal to the fourth height or larger or smaller than the fourth height for the length of the third clearance P3.

Claims

1. Wall or ceiling panels of a building forming a tongue and groove joint (2) without fastening elements, said panels comprising a metallic outer surface plate (3a), a metallic inner surface plate (3b) placed at a thickness (W1) of said outer surface plate, and heat insulation (6) therebetween, where:

   - the groove (7) is located at a first edge of the panel and comprises inside said thickness a fold (4a or 4b) folded inwards from said edge of the surface plate, in a second direction (D2), and as an extension thereof, a first bend (9a or resp. 9b), bent in the opposite first direction (D1);
   - the tongue (8) is located at a second edge of

the panel and comprises inside said thickness a bead strip (5a or 5b) of the surface plate extending outwardly in said second direction (D2), and as an extension thereof, a second bend (10a or resp. 10b) pointing in said opposite first direction (D1); and

- the groove (7) is provided with said fold and first bend as an extension of both surface plates (3a and 3b), and the tongue (8) is provided with said bead strip and second bend as an extension of both surface plates (3a and 3b),

characterized in that the groove (7) further comprises, as extensions of both of said first bends (9a, 9b), first inner flanges (11a, 11b) pointing substantially in said second direction (D2), and that the tongue (8) further comprises, as extensions of both of said second bends (10a, 10b), second inner flanges (12a, 12b) pointing substantially in said second direction (D2), so that a gap (26) left between the first inner flanges (11a, 11b) and the second inner flanges (12a, 12b) is in a direction (D_F) directed away from a border surface (29) formed by edges (19a, 19b) of the heat insulations.

2. Wall or ceiling panels according to claim 1, **characterized in that** a distance (W2) between said folds (4a, 4b) is smaller than the thickness (W1) of the wall elements; and that the distance (W2) between said folds (4a, 4b) is at the maximum by the size of first clearances (P1) larger than a distance (W3) between said bead strips (5a, 5b).

3. Wall or ceiling panels according to claim 1 or 2, **characterized in that** distances (W4) between the second bends (10a, 10b) are at the maximum by the size of second clearances (P2) larger than distances (W5) between the first bends (9a, 9b).

4. Wall or ceiling panels according to claim 1, **characterized in that** said folds (4a, 4b) and first bends (9a, 9b) are interconnected by first plate curves (13a, 13b); and that said bead strips (5a, 5b) and second bends (10a, 10b) are interconnected by second plate curves (14a, 14b).

5. Wall or ceiling panels according to claim 1, **characterized in that** the first bends (9a, 9b) and the first inner flanges (11a, 11b) are interconnected by third plate curves (15a, 15b); and that the second bends (10a, 10b) and the second inner flanges (12a, 12b) are interconnected by fourth plate curves (16a, 16b).

6. Wall or ceiling panels according to claim 4 or 5, **characterized in that** the first plate curves (13a, 13b) have a first curvature (R1) and the second plate curves (14a, 14b) have a second curvature (R2); and that the first curvature is larger than the second curvature.

7. Wall or ceiling panels according to claim 4 or 5, **characterized in that** the third plate curves (15a, 15b) have a third curvature (R3), and the fourth plate curves (16a, 16b) have a fourth curvature (R4); and that the third curvature is smaller than the fourth curvature.

8. Wall or ceiling panels according to claim 1, **characterized in that** it further comprises first sealings (21) between the first plate curves (13a, 13b) and the second plate curves (14a, 14b).

9. Wall or ceiling panels according to claim 8, **characterized in that** it further comprises second sealings (22) between the third plate curves (15a, 15b) and the fourth plate curves (16a, 16b).

10. Wall or ceiling panels according to claim 1, **characterized in that** said folds (4a, 4b) folded in the second direction (D2) have a first height (H1), and said sections (5a, 5b) pointing in the second direction (D2) have a second height (H2); and that the second height is larger than the first height.

11. Wall or ceiling panels according to claim 1 or 10, **characterized in that** said first bends (9a, 9b) pointing in the first direction (D1) have a third height (H3), and said second bends (10a, 10b) pointing in the first direction (D1) have a fourth height (H4); and that the third height is equal to the fourth height, or by the size of a third clearance (P3) larger or smaller than the fourth height.

12. Wall or ceiling panels according to any of the preceding claims, **characterized in that** it further comprises a capillary trough (20) in parallel with the tongue and groove, provided at least in the bead strip (5a) placed on the side of the outer surface plate (3a) and pointing in the second direction.

13. Wall or ceiling panels according to any of the preceding claims, **characterized in that** the tongue and groove joint (1) is mirror symmetrical with respect to a plane parallel with the panel surface plates.

14. Wall or ceiling panels according to claim 5, **characterized in that** the edges (19a, 19b) of the heat insulation (6) are located, in said directions (D1, D2) of the panels, in a region of the third plate curves (15a, 15b) and the fourth plate curves (16a, 16b).

15. Wall or ceiling panels according to any of the preceding claims, **characterized in that** said second bend (10a, 10b) of the tongue is located on the opposite side of the bead strip (5a and resp. 5b) than the outer surface plate (3a) or respectively the inner

surface plate (3b).

Patentansprüche

1. Wand- oder Deckenpaneele eines Gebäudes, welche eine Feder und Nut Verbindung (2) ohne Befestigungselemente bilden, wobei die Paneele eine metallische Außenflächenplatte (3a), eine metallische Innenflächenplatte (3b), die ausgehend von der Außenflächlenplatte in einem Dickenabstand (W1) angeordnet ist, sowie eine dazwischenliegende Wärmeisolierung (6) umfassen, wobei:

   - die Nut (7) sich an einem ersten Rand des Paneels befindet und innerhalb des Dickenabstands ein Falz (4a oder 4b), der ausgehend von dem Rand der Flächenplatte nach innen in eine zweiten Richtung (D2) gefaltet ist, sowie als Verlängerung desselben einen ersten Bogen (9a bzw. 9b), der in die entgegengesetzte erste Richtung (D1) gebogen ist, umfasst;
   - die Feder (8) sich an einem zweiten Rand des Paneels befindet und innerhalb des Dickenabstands einen Wulststreifen (5a oder 5b) der Flächenplatte, der sich nach außen in die zweite Richtung (D2) erstreckt, sowie als eine Verlängerung desselben einen zweiten. Bogen (10a bzw. 10b), der in die entgegengesetzte erste Richtung (D1) weist, umfasst; und
   - die Nut (7) mit dem Falz und dem ersten Bogen als eine Verlängerung der beiden Flächenplatten (3a und 3b) versehen ist und die Feder (8) mit dem Wulststreifen und dem zweiten Bogen als eine Verlängerung der beiden Flächenplatten (3a und 3b) versehen ist,

   dadurch gekennzeichnet, dass die Nut (7) ferner als Verlängerungen der beiden ersten Bögen (9a, 9b) erste Innenflansche (11a, 11b), welche im Wesentlichen in die zweite Richtung (D2) weisen, umfasst, und dass die Feder (8) ferner als Verlängerungen der beiden zweiten Bögen (10a, 10b) zweite Innenflansche (12a, 12b), welche im Wesentlichen in die zweite Richtung (D2) weisen, umfasst, so dass ein zwischen den ersten Innenflanschen (11a, 11b) und den zweiten Innenflanschen (12a, 12b) verbleibender Zwischenraum (26) in einer Richtung (D_F) liegt, die von einer durch Ränder (19a, 19b) der Wärmeisolierungen gebildeten Grenzfläche (29) weggerichtet ist.

2. Wand- oder Deckenpaneele nach Anspruch 1, **dadurch gekennzeichnet, dass** ein Abstand (W2) zwischen den Falzen (4a, 4b) kleiner ist als der Dikkenabstand (W1) der Wandelemente, und dass der Abstand (W2) zwischen den Falzen (4a, 4b) maximal um das Maß von ersten Aussparungen (P1) größer ist als ein Abstand (W3) zwischen den Wulststreifen (5a, 5b).

3. Wand- oder Deckenpaneele nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** Abstände (W4) zwischen den zweiten Bögen (10a, 10b) maximal um das Maß von zweiten Aussparungen (P2) größer sind als Abstände (W5) zwischen den ersten Bögen (9a, 9b).

4. Wand- oder Deckenpaneele nach Anspruch 1, **dadurch gekennzeichnet, dass** die Falzen (4a, 4b) und die ersten Bogen (9a, 9b) miteinander durch erste Plattenrundungen (13a, 13b) verbunden sind, und dass die Wulststreifen (5a, 5b) und die zweiten Bögen (10a, 10b) miteinander durch zweite Plattenrundungen (14a, 14b) verbunden sind.

5. Wand- oder Deckenpaneele nach Anspruch 1, **dadurch gekennzeichnet, dass** die ersten Bögen (9a, 9b) und die ersten Innenflansche (11a, 11b) miteinander durch dritte Plattenrundungen (15a, 15b) verbunden sind, und dass die zweiten Bögen (10a, 10b) und die zweiten Innenflansche (12a, 12b) miteinander durch vierte Plattenrundungen (16a, 16b) verbunden sind.

6. Wand- oder Deckenpaneele nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** die ersten Plattenrundungen (13a, 13b) eine erste Krümmung (R1) aufweisen und die zweiten Plattenrundungen (14a, 14b) eine zweite Krümmung (R2) aufweisen, und dass die erste Krümmung größer ist als die zweite Krümmung.

7. Wand- oder Deckenpaneele nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** die dritten Plattenrundungen (15a, 15b) eine dritte Krümmung (R3) aufweisen und die vierten Plattenrundungen (16a, 16b) eine vierte Krümmung (R4) aufweisen, und dass die dritte Krümmung kleiner ist als die vierte Krümmung.

8. Wand- oder Deckenpaneele nach Anspruch 1, **dadurch gekennzeichnet, dass** sie ferner erste Abdichtungen (21) zwischen den ersten Plattenrundungen (13a, 13b) und den zweiten Plattenrundungen (14a, 14b) umfassen.

9. Wand- oder Deckenpaneele nach Anspruch 8, **dadurch gekennzeichnet, dass** sie ferner zweite Abdichtungen (22) zwischen den dritten Plattenrundungen (15a, 15b) und den vierten Plattenrundungen (16a, 16b) umfassen.

10. Wand- oder Deckenpaneele nach Anspruch 1, **dadurch gekennzeichnet, dass** die in die zweite Richtung (D2) gefalteten Falzen (4a, 4b) eine erste Höhe (H1) aufweisen, und dass die in die zweite Richtung (D2) weisenden Abschnitte (5a, 5b) eine zweite Höhe (H2) aufweisen, und dass die zweite Höhe größer ist als die erste Höhe.

11. Wand- oder Deckenpaneele nach Anspruch 1 oder 10, **dadurch gekennzeichnet, dass** die in die erste Richtung (D1) weisenden ersten Bögen (9a, 9b) eine dritte Höhe (H3) aufweisen, und dass die in die erste Richtung (D1) weisenden zweiten Bögen (10a, 10b) eine vierte Höhe (H4) aufweisen, und dass die dritte Höhe gleich ist mit der vierten Höhe oder um die Größe einer dritten Aussparung (P3) größer oder kleiner ist als die vierte Höhe.

12. Wand- oder Deckenpaneele nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** sie ferner eine Kapillarmulde (20) parallel zur Feder und Nut umfassen, wobei die Kapillarmulde wenigstens in dem sich auf der Seite der Außenflächenplatte (3a) befindlichen Wulststreifen (5a) vorgesehen ist und in die zweite Richtung weist.

13. Wand- oder Deckenpaneele nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Feder und Nut Verbindung (1) spiegelsymmetrisch relativ zu einer Ebene ausgebildet ist, die parallel zu den Paneelflächenplatten liegt.

14. Wand- oder Deckenpaneele nach Anspruch 5, **dadurch gekennzeichnet, dass** die Ränder (19a, 19b) der Wärmeisolierung (6) in den Richtungen (D1, D2) der Paneele in einem Bereich der dritten Plattenrundungen (15a, 15b) und der vierten Plattenrundungen (16a, 16b) angeordnet sind.

15. Wand- oder Deckenpaneele nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** der zweite Bogen (10a, 10b) der Feder sich auf der gegenüberliegenden Seite des Wulststreifens (5a bzw. 5b) als die Aut3enflächenplatte (3a) bzw. die Innenflächenplatte (3b) befindet.

Revendications

1. Panneaux de mur ou de plafond d'une construction formant un joint (2) de languette ou de rainure sans éléments de fixation, lesdits panneaux comprenant une plaque de surface extérieure métallique (3a), une plaque de surface intérieure métallique (3b) placée à une épaisseur (W1) de ladite plaque de surface extérieure, et une isolation thermique (6) entre celles-ci, où :

la rainure (7) est située au niveau d'une première arête du panneau et comprend à l'intérieur de ladite épaisseur un recouvrement (4a ou 4b) plié vers l'intérieur à partir de ladite arête de la plaque de surface, dans une seconde direction (D2), et en tant qu'extension de celle-ci, une première courbure (9a ou 9b respectivement), courbé dans la première direction opposée (D1) ;
la languette (8) est située au niveau d'une seconde arête du panneau et comprend à l'intérieur de ladite épaisseur une bande de nervure (5a ou 5b) de la plaque de surface s'étendant vers l'extérieur dans ladite seconde direction (D2), et en tant qu'extension de celle-ci, une seconde courbure (10a ou 10b respectivement) pointant dans ladite première direction opposée (D1) ; et
la rainure (7) est pourvue dudit recouvrement et de la première courbure en tant qu'extension des deux plaques de surface (3a et 3b), et la languette (8) est pourvue de ladite bande de nervure et de la seconde courbure en tant qu'extension des deux plaques de surface (3a et 3b), **caractérisés en ce que** la rainure (7) comprend en outre, en tant qu'extensions des deux dites premières courbures (9a, 9b), des premières brides intérieures (11a, 11b) pointant sensiblement dans ladite seconde direction (D2), et **en ce que** la languette (8) comprend en outre, en tant qu'extensions des deux dites secondes courbures (10a, 10b) des secondes brides intérieures (12a, 12b) pointant sensiblement dans ladite seconde direction (D2), de sorte qu'un espace (26) laissé entre les premières brides intérieures (11a, 11b) et les secondes brides intérieures (12a, 12b) se trouve dans une direction (D_F) orientée à l'opposé d'une surface de bordure (29) formée par des arêtes (19a, 19b) des isolations thermiques.

2. Panneaux de mur ou de plafond selon la revendication 1, **caractérisés en ce qu'**une distance (W2) entre lesdits recouvrements (4a, 4b) est inférieure à l'épaisseur (W1) des éléments de mur ; et **en ce que** la distance (W2) entre lesdits recouvrements (4a, 4b) est au maximum la taille des premiers jeux (P1) et supérieure à une distance (W3) entre lesdites bandes de nervure (5a, 5b).

3. Panneaux de mur ou de plafond selon la revendication 1 ou 2, **caractérisés en ce que** les distances (W4) entre les secondes courbures (10a, 10b) sont au maximum la taille des seconds jeux (P2) et supérieures aux distances (W5) entre les premières

courbures (9a, 9b).

4. Panneaux de mur ou de plafond selon la revendication 1, **caractérisés en ce que** lesdits recouvrements (4a, 4b) des premières courbures (9a, 9b) sont interconnectés par des premières courbes de plaques (13a, 13b) : et **en ce que** lesdites bandes de nervure (5a, 5b) et les secondes courbures (10a, 10b) sont interconnectées par des secondes courbes de plaques (14a, 14b).

5. Panneaux de mur ou de plafond selon la revendication 1, **caractérisés en ce que** les premières courbures (9a, 9b) et les premières brides intérieures (11a, 11b) sont interconnectées par des troisièmes courbes de plaques (15a, 15b) ; et **en ce que** les secondes courbures (10a, 10b) et les secondes brides intérieures (12a, 12b) sont interconnectées par des quatrièmes courbes de plaques (16a, 16b).

6. Panneaux de mur ou de plafond selon la revendication 4 ou 5, **caractérisés en ce que** les premières courbes de plaques (13a, 13b) présentent une première courbe (R1) et les secondes courbes de plaques (14a, 14b) présentent une seconde courbe (R2) ; et **en ce que** la première courbe est supérieure à la seconde courbe.

7. Panneaux de mur ou de plafond selon la revendication 4 ou 5, **caractérisés en ce que** les troisième courbes de plaques (15a, 15b) présentent une troisième courbe (R3) et les quatrièmes courbes de plaques (16a, 16b) présentent une quatrième courbe (R4) ; et **en ce que** la troisième courbe est inférieure à la quatrième courbe.

8. Panneaux de mur ou de plafond selon la revendication 1, **caractérisés en ce qu'**ils comprennent en outre des premiers scellements (21) entre les premières courbes de plaques (13a, 13b) et les secondes plaques de courbes (14a, 14b).

9. Panneaux de mur ou de plafond selon la revendication 8, **caractérisés en ce qu'**ils comprennent en outre des seconds scellements (22) entre les troisièmes courbes de plaques (15a, 15b) et les quatrièmes plaques de courbes (16a, 16b).

10. Panneaux de mur ou de plafond selon la revendication 1, **caractérisés en ce que** lesdits recouvrements (4a, 4b) pliés dans la seconde direction (D2) présentent une première hauteur (H1), et lesdites sections (5a, 5b) pointant dans la seconde direction (D2) présentent une seconde hauteur (H2) ; et **en ce que** la seconde hauteur est supérieure à la première hauteur.

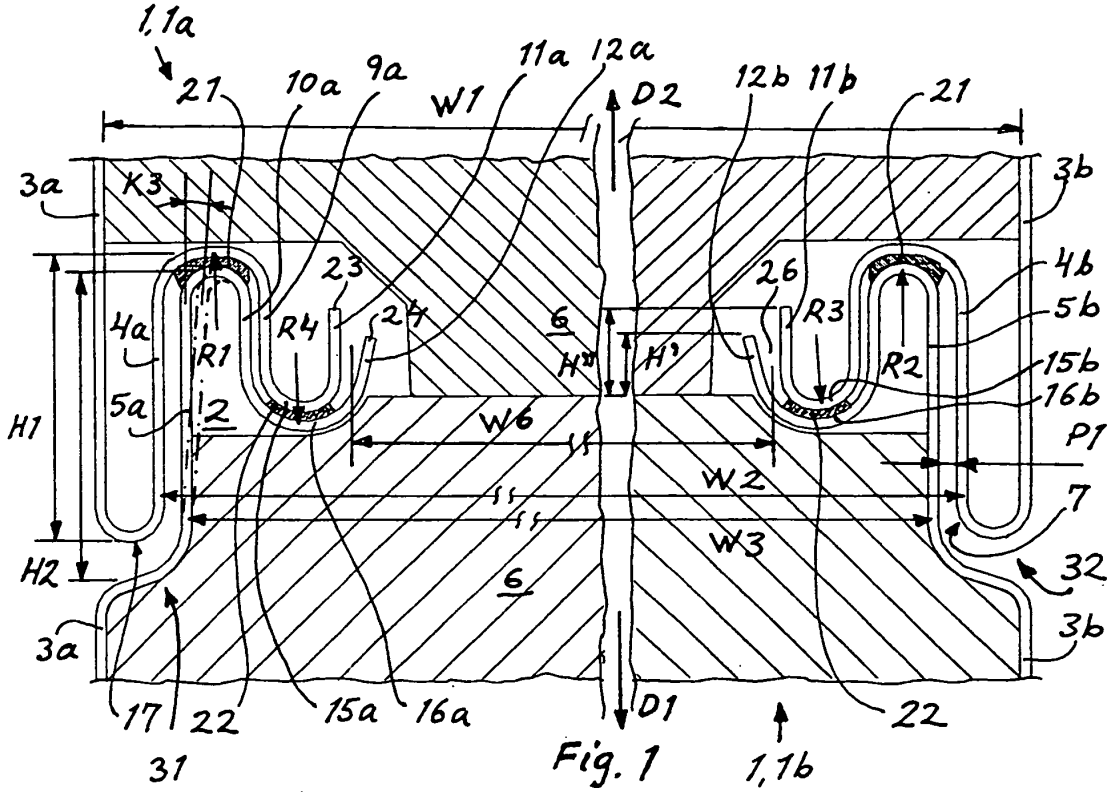
11. Panneaux de mur ou de plafond selon la revendication 1 ou 10, **caractérisés en ce que** lesdites premières courbures (9a, 9b) pointant dans la première direction (D1) présentent une troisième hauteur (H3), et lesdites secondes courbures (10a, 10b) pointant dans la première direction (D1) présentent une quatrième hauteur (H4) ; et **en ce que** la troisième hauteur est égale à la quatrième hauteur, ou que la taille d'un troisième jeu (P3) est supérieure ou inférieure à la quatrième hauteur.

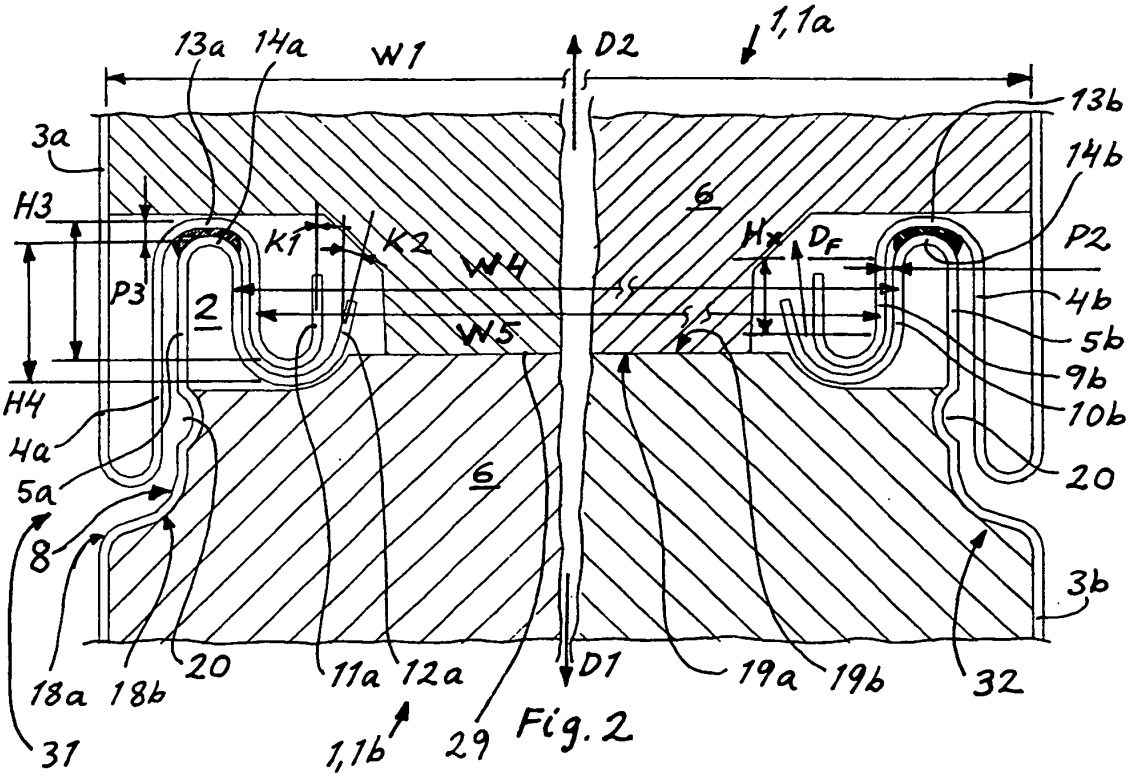
12. Panneaux de mur ou de plafond selon l'une quelconque des revendications précédentes, **caractérisés en ce qu'**ils comprennent en outre une goulotte capillaire (20) parallèlement à la languette et à la rainure, prévue au minimum dans la bande de nervure (5a) placée sur le côté de la plaque de surface extérieure (3a) et pointant dans la seconde direction.

13. Panneaux de mur ou de plafond selon l'une quelconque des revendications précédentes, **caractérisés en ce que** le joint (1) de languette et de rainure est symétrique en miroir par rapport à un plan parallèle aux plaques de surfaces du panneau.

14. Panneaux de mur ou de plafond selon la revendication 5, **caractérisés en ce que** les arêtes (19a, 19b) de l'isolation thermique (6) sont situées, dans lesdites directions (D1, D2) des panneaux, dans une zone des troisièmes courbes de plaques (15a, 15b) et des quatrièmes courbes de plaques (16a, 16b).

15. Panneaux de mur ou de plafond selon l'une quelconque des revendications précédentes, **caractérisés en ce que** ladite seconde courbure (10a, 10b) de la languette se trouve sur le côté opposé de la bande de nervure (5a ou 5b respectivement) plutôt que sur la plaque de surface extérieure (3a) ou respectivement la plaque de surface intérieure (3b).


1,1a
21
10a
9a
W1
11a
12a
D2
12b
11b
21
3a
K3
3b
4b
5b
23
26
24
6
R3
4a
R1
R4
H'
H''
R2
15b
16b
5a
2
H1
W6
P1
W2
7
W3
H2
32
6
3a
3b
17
22
15a
16a
D1
22
31
Fig. 1
1,1b


13a
14a
W1
D2
1,1a
13b
3a
14b
H3
6
H
DF
P2
K1
K2
W4
P3
2
W5
4b
5b
9b
H4
10b
4a
5a
6
20
8
3b
18a
18b
20
11a
12a
D1
19a
19b
32
31
1,1b
29
Fig. 2

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- WO 0177457 A **[0002]**
- GB 2142670 A **[0002]**
- EP 1260647 A **[0002]**