

(19)



(11)

EP 3 208 401 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
03.04.2019 Bulletin 2019/14

(51) Int Cl.:
E04C 2/24 (2006.01) **E04F 13/08** (2006.01)
E04C 2/00 (2006.01)

(21) Application number: **17156285.3**

(22) Date of filing: **15.02.2017**

(54) A SYSTEM FOR INSULATING AND FINISHING WALLS

SYSTEM FÜR WÄRMEDÄMMENDE UND VERKLEIDUNGSWÄNDE

SYSTÈME POUR MURS D'ISOLATION THERMIQUE ET D'HABILLAGE

(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**

(30) Priority: **22.02.2016 BE 201605122**
14.02.2017 BE 201705095

(43) Date of publication of application:
23.08.2017 Bulletin 2017/34

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Description

[0001] The present invention relates to a system for insulating and finishing walls, having rectangular panels that fit together through a tongue-and-groove joint. The panels are made up of an insulating foam panel coated with a flat, solid cladding panel with an upper side provided with a finishing layer. The cladding panel and the foam panel each have a first longitudinal and a first end side, and a second longitudinal and a second end side. The first longitudinal side of the cladding panel is provided with a longitudinal groove, the second longitudinal side with a longitudinal tongue, the first end side is provided with an end groove and the second end side with an end tongue. The longitudinal tongue fits into the longitudinal groove and the end tongue into the end groove to form the tooth-and-groove joint between the panels.

[0002] Such an insulation and finishing system has already been put on the market by the applicant. The panels of this known system are constructed from a MDF cladding panel with a melamine finishing layer and from a PIR (polyisocyanurate) rigid foam panel which is glued against the underside of the cladding panel. The MDF panel has a groove on two adjacent sides and a tongue on the other adjacent sides, which fits into the groove such that the finishing layers on top of the cladding panels fit against each other. The MDF panel is sawn off straight on the sides of the grooves, such that the inner and outer walls of the grooves protrude sideways the same distance.

[0003] Below the tongues in the MDF panel, the sides of the rigid foam panel are provided with a rectangular rebate just under the MDF panel, while below the grooves in the MDF panel, the rebate is provided on the other side of the MDF panel, such that there is a rectangular tongue on the rigid foam panel just below the grooves in the MDF panel. This tongue protrudes beyond the MDF panel and fits into the groove formed by the rebate and the MDF panel. Because the tongue in the foam panel is meant to support the edge of the MDF panel, it must be rectangular and should connect tightly to the MDF panel. In practice, however, this resulted in the problem that the panels are hard to slide into each other. So as to be able to insert the rectangular tongue into the rectangular groove, it was milled such that it fit into the groove with the necessary play. However, in this way it was no longer possible to obtain an airtight seal. In order to achieve the required airtight connection between the panels in the system that had already been put on the market, a self-adhesive, compressible joint sealing strip needed to be placed between the adjoining panels along the rebate. However, the application of such a joint sealing strip is cumbersome and also increases the cost of the system.

[0004] A further disadvantage of the known insulation and finishing panels is that each of them must be attached to a wooden frame by means of three insulation retaining clips, with two screws per clip. The insulation retaining

clips are provided with sharp points with which they are to be pressed into the rigid foam panel. This must be done with one hand, while it is necessary to press the rigid foam panel against the wooden frame with the other hand, in order to press the insulation retaining clips into the foam at the correct position. This is not so simple, especially since it requires some force to press the insulation retaining clip with its sharp points into the rigid foam. The clips then need to be screwed on with six screws.

[0005] The use of these insulation retaining clips with the corresponding screws, and the need for the application of joint sealing strips between the various panels, makes the application of the panels time-consuming and not that easy, and also increases the cost of the insulation and finishing system.

[0006] Rectangular panels of the type indicated above are also disclosed in DE 20 2007 010293 U1. These panels contain a rigid foam panel with on top of that a solid cladding panel. The foam panel consists, in particular, of expanded polystyrene, while the cladding panel is formed of, for example, an OSB panel. From this utility model, which can be regarded as the closest prior art, the following features are further known. The tongue-and-groove joint between the rectangular panels is a double tongue-and-groove joint, the first longitudinal side of the foam panel being provided with a further longitudinal groove, the second longitudinal side with a further longitudinal tongue, the first end side with a further end groove and the second end side with a further end tongue, said further longitudinal tongue fitting into said further longitudinal groove, and said further end tongue into said further end groove, to form a further tongue-and-groove joint between the panels. The longitudinal groove in the cladding panel is further formed by an outer longitudinal groove wall, which is provided with said finishing layer, and by an inner longitudinal groove wall, which is fully supported by the foam panel and having a portion which projects beyond the outer longitudinal groove wall.

[0007] By also providing a tongue-and-groove joint in the foam panel, the panels are easier to slide into one another. The panels themselves are floor panels, which are glued either to each other, or to the substrate. A system for easily attaching these panels against a wooden frame, which is arranged against a side wall or an upper wall, is therefore not described.

[0008] An insulation and finishing system with panels made up of a cladding panel and a rigid foam panel which is provided with a tongue-and-groove joint is further also known from practice and is marketed under the name 'Comboprime® Home'. The cladding panels of this system are plasterboard panels, which, in contrast to the panels the present invention relates to, are not provided with a tongue-and-groove joint. These panels are screwed through the bevelled edges of the plasterboard panels against the frame, after which the joints between the panels and these bevelled edges must be finished with a reinforcement tape and with plaster. However, all

this is also cumbersome work, and the finishing of the joints produces a lot of dust and dirt, and is best done by a professional.

[0009] The invention therefore aims to propose a new insulation and finishing system that no longer requires joint sealing strips between the various panels, no further finishing of the visible side of the panels and also no insulation retaining clips in order to be able to screw the panels to a wall and which further allows the panels to be fastened to the wall in a faster and easier way, in particular to a wooden frame attached thereto.

[0010] To this end, the insulation and finishing system according to the present invention is characterised in that it further includes screws with countersunk heads in order to screw said panels through the protruding portion of the inner longitudinal groove wall of the cladding panel and through the foam panel against said wall.

[0011] In the system according to the invention, insulation retaining clips are therefore no longer needed to screw down the panels. These can now easily be screwed down directly through the cladding panel and the foam panel by means of a number of screws, the panels being automatically pulled against the wooden frame correctly by the screws and the heads of the screws being fixed against the cladding board. Not only the foam panels are attached to the frame by the screws, but also the cladding panels, which are glued thereto, so that they cannot come loose. Because the inner longitudinal groove wall into which the screws are screwed is fully supported by the foam panel, the screws can be tightened according to good practice without the inner longitudinal groove wall being deformed or itself broken. To limit the thickness of the flat, solid cladding panel, this inner longitudinal groove wall has only a relatively small thickness.

[0012] In the system according to the invention, the foam panel is either manufactured from a rigid foam or it comprises a flexible foam panel, i.e., a foam panel having a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of less than 40 kPa. The embodiment with a rigid foam panel is particularly advantageous for providing thermal insulation. Flexible foams can also provide thermal insulation, and in particular also provide for the avoidance of drafts. However, compared to a rigid foam, they offer the advantage that they can provide better acoustic insulation. Optionally, the foam panel may include both a rigid foam and a flexible foam, in particular, a layer of rigid foam and a layer of flexible foam.

[0013] In a preferred embodiment of the system according to the invention, said first longitudinal side of the cladding panel is located on the same side of the panel as the first longitudinal side of the foam panel, and said first end side of the cladding panel is located on the same side of the panel as the first end side of the foam panel. Preferably, said screws are provided to be screwed through the inner longitudinal groove wall at a distance from the free end of the inner longitudinal groove wall that is greater than the depth D_1 of said further longitudinal

groove, where, at said distance from the free end of the inner longitudinal groove a longitudinal groove is preferably provided to which the screws can be applied.

[0014] In this embodiment, the screws can be screwed through the panel perpendicularly without extending through the further longitudinal groove of the foam panel, and thus without forming an obstacle to the insertion of the further longitudinal tongue of the foam panel into this further longitudinal groove.

[0015] In a further preferred embodiment of the system according to the invention, said further longitudinal tongue has a portion with parallel side faces which is provided in order to, up to a predetermined depth of said further longitudinal groove, make contact with the side walls thereof, and said longitudinal tongue has a length which is substantially equal to said predetermined depth. Furthermore, said further end tongue also has a portion with parallel lateral faces which is provided in order to, up to a predetermined depth of said further end groove, make contact with the side walls thereof, and said end tongue has a length which is substantially equal to said predetermined depth.

[0016] In this way, the tongues on the cladding panel and the tongues on the foam panel can be simultaneously positioned in their respective grooves, making it easier to slide two panels into each other in the event of certain deformations of the panels.

[0017] Preferably, said further longitudinal tongue and said further end tongue have a distal portion from said portion with parallel side faces that narrows in the direction of the free end of the respective tongue.

[0018] The free end of the tongues on the foam panel can thus easily be inserted into their respective groove, after which these tongues are centred in their groove, and the panel ends up in the correct position where the tongues on the cladding panel are correctly positioned in the respective grooves in this panel. It is thus easy and effortless to slide the panels together.

[0019] In a further preferred embodiment of the system according to the invention, said end groove is also formed in the cladding panel by an outer end groove wall, which is provided with said finishing layer, and by an inner end groove wall, which is fully supported by the foam panel and having a portion which projects beyond the outer end groove wall. Preferably, the inner end groove wall will project beyond the outer end groove wall over such a distance that the inner end groove wall will have a length that is substantially equal to the depth of said further end groove in the foam panel that is located on the same side of the panel as said end groove.

[0020] In this embodiment, the insertion of the tongue of the foam panel into the groove on the end side of the panel is also simplified because one can here have the tongue on the end side of the cladding panel guided along the inner groove wall of the groove in the end side of the cladding panel.

[0021] In a yet further preferred embodiment of the system according to the invention, the cladding panel has

an underside through which it is attached on an upper side of the foam panel, the underside of the cladding panel having a circumferential edge which substantially coincides with the circumferential edge of the upper side of the foam panel.

[0022] The upper side of the foam panel is thus completely protected against possible deformations or damage.

[0023] Further advantages and particulars of the invention will become apparent from the following description of a preferred embodiment of an insulation and finishing system according to the invention. However, this description is only given as an example and is not intended to limit the scope of protection as defined by the claims. The reference signs given in the description relate to the appended drawings wherein:

Figure 1 is a top view of one of the panels of an insulation and finishing system according to the invention, in which only the groove in the cladding panel is shown in dashed lines;

Figure 2, on a larger scale, represents a cross-sectional view according to line II-II through the panel of Figure 1;

Figure 3, on a larger scale, represents a longitudinal section according to line III-III through the panel of Figure 1;

Figure 4 represents the same cross-sectional view as shown in Figure 2, but at the location of the joint between two panels; and

Figure 5 represents the same longitudinal section as shown in Figure 3, but at the location of the joint between two panels.

[0024] The invention, in general, relates to a system for insulating (thermally and/or acoustically) and finishing walls, in particular rooms, attics or other spaces inside a building. The term 'wall(s)' comprises both side walls and upper walls (ceilings) and possibly even lower walls (for example, when only the lower wall of an attic needs to be insulated instead of the roof itself). The system is usually applied to spaces that are located under the roof. The system consists of rectangular insulation and finishing panels which are to be attached to the walls. To simplify the attachment of the panels to the walls, vertical laths are usually screwed to the walls at regular distances. If it concerns a ceiling that is formed by the roof structure, the panels can be directly screwed to the roof structure itself. Optionally, laths can also be applied here, to fill the roof structure in such a way as to obtain a flat surface. The laths are usually made of wood but it is also possible to use metal studs.

[0025] The panels are each constructed from a thermally and/or acoustically insulating foam panel 1, which at the upper side, seen according to the figures, is covered with a flat, solid cladding panel 2. This solid cladding panel 2 consists of a material in which tongues and grooves can be provided. This can be done by cutting

out, for example, by milling. The cladding panel 2 is preferably a wooden panel. The term 'wooden panel' should be interpreted broadly to comprise all ligneous panels such as fibreboards, three-ply wood or multi-ply boards, OSB (oriented strand board) and HDF (high-density fibreboard) and MDF (medium-density fibreboard) panels, with preference given to MDF panels. The latter consist of dried wood fibres which are connected to each other by means of a resin and which are pressed together to form a panel with a medium-hard density, in particular, up to a density of 500 to 1000 kg/m³.

[0026] The cladding panel 2 has an upper side which is provided with a finishing layer 3. This may consist of a coat of paint or, for example, of a veneer layer, but preferably of a melamine layer. The finishing layer 3 need not form the final finishing of the panels, but may, for example, afterwards, after installation of the panels, itself still be painted in a colour of choice. The cladding panel 2 will preferably have a total thickness d₁ (including the thickness of the finishing layer 3), which is between 5 and 25 mm, and preferably between 6 and 18 mm.

[0027] The foam panel 1 may be manufactured from various types of rigid foam, for example, from rigid expanded polystyrene (EPS) foam, from extruded polystyrene (XPS) foam, from phenolic foam (PF) or melamine foam, or from polyurethane (PUR) foam, but preference is given to polyisocyanurate (PIR) foam, which has a good thermal insulation rating, and can provide the necessary rigidity at a relatively low density. The hardness of the rigid foam is preferably such that the foam panel 1 has a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of greater than 80 kPa, preferably of greater than 100 kPa. The thickness d of the foam panel 1 should preferably be greater than 2 cm. This thickness D can, for example, go up to 10 cm in order to obtain a better insulation.

[0028] The foam panel 1 may be made of different types of flexible foam, or a combination of rigid foam and flexible foam. The foam panel 1 may in particular include a hard foam panel in combination with a flexible foam panel. The flexible foam panel 1 may, for example, be cut from large blocks of foam. Preferably, however, agglomerated foam will be used. Such a foam may be produced by cutting/shredding pieces of waste foam into foam flakes and by then glueing these foam flakes to each other. This can be done by means of a liquid adhesive that is applied to the foam flakes. Preferably, however, use is made of adhesive in the form of fusible fibres which are mixed with the foam flakes and that glue the foam flakes together when the fusible fibres are heated. The fibres are preferably made up of a core having around it a layer of glue (hot-melt adhesive), which melts when heated. Such adhesive fibres are described, for example, in FR 3,013,354 and in FR 3,013,344. The use of adhesive fibres offers the advantage that the foam flakes do not need to be compressed as strongly when being glued together, thus allowing for lower densities.

[0029] 'Flexible foam' and 'flexible foam panel' in the

present description and claims refer to a foam or a panel that is so flexible that the foam panel has a compressive strength, measured according to EN 826:2013 at a strain of 10%, of less than 40 kPa. Preferably, this compressive strength will be less than 30 kPa, and more preferably, less than 20 kPa. A) However, the compressive strength of the flexible foam panel will preferably be greater than 1 kPa, more preferably greater than 2 kPa, and most preferably greater than 3 kPa. The flexible foam panel will furthermore preferably have a density which is greater than 40 kg/m³, preferably greater than 50 kg/m³, more preferably greater than 60 kg/m³ and most preferably greater than 70 kg/m³. The flexible foam panel will preferably include a polyurethane foam.

[0030] Because the foam panel 1 and the cladding panel 2 are rectangular, they each have a first 4, 4' and a second longitudinal side 5, 5', and a first 6, 6' and a second end side 7, 7'.

[0031] The first longitudinal side 4 of the cladding panel 2 is provided with a longitudinal groove 8, while the second longitudinal side 5 of the cladding panel 2 is provided with a longitudinal tongue 9 that fits into the longitudinal groove 8 of an adjacent panel. The first end side 6 of the cladding panel 2 is provided with an end groove 10, while the second end side 7 of the cladding panel 2 is provided with an end tongue 11 that fits into the end groove 10 of an adjacent panel.

[0032] The first longitudinal side 4' of the foam panel 1 is provided with a longitudinal groove 12, while the second longitudinal side 5' of the foam panel 1 is provided with a longitudinal tongue 13 that fits into the longitudinal groove 12 of an adjacent panel. The first end side 6' of the foam panel 1 is provided with an end groove 14, while the second end side 7' of the foam panel 1 is provided with an end tongue 15 that fits into the end groove 14 of the adjacent panel.

[0033] An effective seal is obtained due to the tongue-and-groove joint between both the cladding panels 2 and the foam panels 1 of the interlocking insulation and finishing panels, thus avoiding thermal bridges, without the need to apply draught strips or joint sealing strips in the gaps between the foam panels 1.

[0034] In the embodiment shown in the figures, the first longitudinal side 4 of the cladding panel 2 and the first longitudinal side 4' of the foam panel 1 are located on the same side of the panel, and the first end side 6 of the cladding panel 2 and the first end side 6' of the foam panel 1 are also located on the same side of the panel. This means that the tongues of the cladding panel and of the foam panel are located on the same side of the panel, as are the grooves. The advantage of this is that the tongues of the foam panel do not protrude or only do so minimally under the cladding panel, while the bottom of the cladding panel is fully supported by the upper side of the foam panel. Indeed, the lower side of the cladding panel 2 preferably has a circumferential edge which substantially coincides with the circumferential edge of the upper side of the foam panel 1. In Figures 2 and 3, these

coinciding circumferential edges are indicated with the reference sign 20.

[0035] The longitudinal groove 8 in the cladding panel 2 is formed by an outer longitudinal groove wall 16, which is provided on the outside of the finishing layer 3, and by an inner longitudinal groove wall 17, which is fully supported by the foam panel 1. The outer longitudinal groove wall 17 is provided to, as shown in Figure 4, fit against the cladding panel 2 of an adjacent panel. The inner longitudinal groove wall 17 has a length L_1 which is greater than the length L_2 of the outer longitudinal groove wall 16 such that a portion of the inner longitudinal groove wall 17 extends beyond the outer longitudinal groove wall 16. The difference between the two lengths L_1 and L_2 in this case is preferably at least 15 mm, more preferably at least 20 mm, such that the inner longitudinal groove wall 17 projects beyond the outer longitudinal groove 16 over a distance equal to these length differences.

[0036] The protruding portion of the innermost longitudinal groove wall 17 is provided in order to be able to directly screw down the panels by means of screws 18 with countersunk heads through the cladding panel 2 and the foam panel 1. So as to apply the screws 18 in the right place on the projecting portion of the inner longitudinal groove wall 17, that is, at a location where the screw 18 would not be screwed through the longitudinal groove 12 in the foam panel 1, and also not against the edge of the finishing layer 3 such that it would be damaged by the head of the screw 18 when screwing it in, this protruding portion of the inner longitudinal groove wall 16 has a longitudinal groove 19 into which the tip of the screw 18 should be positioned. The longitudinal groove 12 in the foam panel 1 that is located below the inner longitudinal groove wall 16, has a depth D_1 which is preferably smaller than the distance from the longitudinal groove 19 to the free end of the inner longitudinal groove wall 17. As a result, the screws 18 can be screwed into the panel perpendicularly without blocking the longitudinal groove 12 in the foam panel 1.

[0037] In Figure 4, the joint between two panels is shown along the longitudinal sides thereof. In this figure, it is clear to see that, since the longitudinal groove 12 is located in the projecting portion of the inner longitudinal groove wall 17 is, the protruding portion of the inner longitudinal groove wall 17 and the screws 18 applied therein are hidden from view when an adjacent panel with the longitudinal tongue 9 of the cladding panel 2 is introduced into the longitudinal groove 12 of the adjacent cladding panel 2.

[0038] In the figures, the longitudinal tongue 13 of the underlying foam panel 1 has a portion 21 with parallel lateral faces and further includes a distal portion 22 which narrows in the direction of the free end of the tongue 13. The portion 21 with parallel lateral faces is provided to, up to a predetermined depth D_2 of the longitudinal groove 12 in the foam panel 1, make contact with the lateral walls thereof in such a way that no air can flow between the abutting foam panels 1, in spite of the fact that a gap

remains between these foam panels so that the cladding panels 2 can always be attached abutting perfectly against each other. The longitudinal tongue 9 in the cladding panel 2 has a length L_3 which is substantially equal to the depth D_2 over which the longitudinal tongue 13 makes contact with the walls of the longitudinal groove 12 in such a way that the tongues 9, 13 of the cladding panel and of the foam panel can easily be slid into their grooves 8, 12 simultaneously. Due to the narrowing distal portion 22 of the longitudinal tongue 13 in the foam panel 1, when two adjacent panels are slid into each other, an automatic centring of the two panels relative to each other is obtained, allowing the longitudinal tongues to easily be pushed into the longitudinal grooves.

[0039] As can be seen in Figures 3 and 5, the end groove 10 in the cladding panel 2 is formed by an outer end groove wall 23, which is provided on the outside of the finishing layer 3, and by an inner end groove wall 24, which is fully supported by the foam panel 1. The outer end groove wall 23 is provided to, as shown in Figure 5, fit against the cladding panel 2 of an adjacent panel. The inner end groove wall 24 has a length L_4 which is greater than the length L_5 of the outer end groove wall 23 such that a portion of the inner end groove wall 24 extends beyond the outer end groove wall 23. Preferably, the inner end groove wall 24 will project beyond the outer end groove wall 23 over such a distance that the length L_4 of the inner end groove wall 24 is substantially equal to the depth D_3 of the end groove 14 in the foam panel 1. As can be seen in Figure 3, the end tongue 15 of the foam panel 1 is located on the other side of the panel substantially completely under the end tongue 11 of the cladding panel 1, such that it does not protrude and consequently cannot be damaged in the packaging. In other words, as a result, the cladding panel and the foam panel have substantially the same width. The additional overlap between the end tongue 11 of the cladding panel and the inner end groove wall 23 further provides an extra barrier against drafts and further provides an additional guide surface when sliding the panels together along their end sides.

[0040] In the figures, the end tongue 15 of the underlying foam panel 1 has a portion 25 with parallel lateral faces and further includes a distal portion 26 which narrows in the direction of the free end of the tongue 15. The portion 25 with parallel lateral faces is provided to, up to a predetermined depth D_4 of the end groove 14 in the foam panel 1, make contact with the lateral walls thereof in such a way that no air can flow between the abutting foam panels 1, in spite of the fact that a gap remains between these foam panels so that the cladding panels 2 can always be attached abutting perfectly against each other. The end tongue 11 in the cladding panel 2 has a length L_6 which is substantially equal to the length L_3 of the longitudinal tongue 9 and also to the depth D_4 over which the end tongue 15 of the foam panel 1 makes contact with the walls of the end groove 14 in such a way that the tongues 11, 15 of the cladding panel and of the

foam panel can easily be slid into their grooves 10, 14 simultaneously. Due to the narrowing distal portion 26 of the end tongue 15 in the foam panel 1, when two adjacent panels are slid into each other, an automatic centring of the two panels relative to each other is obtained, allowing the end tongues to easily be pushed into the end grooves.

Claims

1. A system for insulating and finishing walls, having rectangular panels which fit into each other via a tongue-and-groove joint and that are constructed from an insulating foam panel (1) made of a rigid foam, said foam panel being covered with a flat, solid cladding panel (2) which has an upper side provided with a finishing layer (3), said cladding panel (2) and said foam panel (1) each having a first longitudinal (4, 4') and a first end side (6, 6') and a second longitudinal (5, 5') and a second end side (7, 7'), wherein the first longitudinal side (4) of the cladding panel (2) is provided with a longitudinal groove (8), the second longitudinal side (5) with a longitudinal tongue (9), the first end side (6) with an end groove (10) and the second end side (7) with an end tongue (11), with said longitudinal tongue (9) fitting into said longitudinal groove (8), and said end tongue (11) into said end groove (10) to form said tooth-and-groove joint between the panels, wherein said tongue-and-groove joint is a double tongue-and-groove joint, the first longitudinal side (4') of the rigid foam panel (1) being provided with a further longitudinal groove (12), the second longitudinal side (5') with a further longitudinal tongue (13), the first end side (6') with a further end groove (14) and the second end side (7') with a further end tongue (15), said further longitudinal tongue (13) fitting into said further longitudinal groove (12), and said further end tongue (15) into said further end groove (14), to form a further tongue-and-groove joint between the panels, and wherein said longitudinal groove (8) in the cladding panel (2) is formed by an outer longitudinal groove wall (16), which is provided with said finishing layer (3), and by an inner longitudinal groove wall (17), which is fully supported by the foam panel (1) and having a portion which projects beyond the outer longitudinal groove wall (16), **characterised in that** said system further includes screws (18) with countersunk heads in order to screw said panels through the protruding portion of the inner longitudinal groove wall (17) of the cladding panel (2) and through the foam panel (1) against said wall.
2. System according to claim 1, **characterised in that** said foam panel (1) has a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of greater than 80 kPa, preferably of greater

than 100 kPa.

3. System according to claim 1 or 2, **characterised in that** said foam panel (1) is made of polyisocyanurate foam, of polyurethane foam, or polystyrene foam, preferably polyisocyanurate foam. 5
4. A system for insulating and finishing walls, having rectangular panels which fit into each other via a tongue-and-groove joint and that are constructed from an insulating foam panel (1) covered with a flat, solid cladding panel (2) which has an upper side provided with a finishing layer (3), said cladding panel (2) and said foam panel (1) each having a first longitudinal (4, 4') and a first end side (6, 6') and a second longitudinal (5, 5') and a second end side (7, 7'), wherein the first longitudinal side (4) of the cladding panel (2) is provided with a longitudinal groove (8), the second longitudinal side (5) with a longitudinal tongue (9), the first end side (6) with an end groove (10) and the second end side (7) with an end tongue (11), with said longitudinal tongue (9) fitting into said longitudinal groove (8), and said end tongue (11) into said end groove (10) to form said tooth-and-groove joint between the panels, 10
wherein said tongue-and-groove joint is a double tongue-and-groove joint, the first longitudinal side (4') of the foam panel (1) being provided with a further longitudinal groove (12), the second longitudinal side (5') with a further longitudinal tongue (13), the first end side (6') with a further end groove (14) and the second end side (7') with a further end tongue (15), said further longitudinal tongue (13) fitting into said further longitudinal groove (12), and said further end tongue (15) into said further end groove (14), to form a further tongue-and-groove joint between the panels, and 20
wherein said longitudinal groove (8) in the cladding panel (2) is formed by an outer longitudinal groove wall (16), which is provided with said finishing layer (3), and by an inner longitudinal groove wall (17), which is fully supported by the foam panel (1) and having a portion which projects beyond the outer longitudinal groove wall (16), **characterised in that** said foam panel (1) comprises a flexible foam panel with a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of less than 40 kPa, and said system further has screws (18) with countersunk heads in order to screw said panels through the protruding portion of the inner longitudinal groove wall (17) of the cladding panel (2) and through the foam panel (1) against said wall. 25
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5. System according to claim 4, **characterised in that** said flexible foam panel comprises an agglomerated foam. 55
6. System according to claim 4 or 5, **characterised in**

that said flexible foam panel has a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of less than 30 kPa, preferably of less than 20 kPa, and more preferably of less than 10 kPa.

7. System according to any of claims 4 to 6, **characterised in that** said flexible foam panel has a compressive strength, measured according to EN 826:2013 at a strain of 10 %, of greater than 1 kPa, preferably of greater than 2 kPa, and more preferably of greater than 3 kPa.
8. System according to any of claims 4 to 7, **characterised in that** the flexible foam panel has a density which is greater than 40 kg/m³, preferably greater than 50 kg/m³, more preferably greater than 60 kg/m³ and most preferably greater than 70 kg/m³.
9. System according to any of claims 1 to 8, **characterised in that** said first longitudinal side (4) of the cladding panel (2) is located on the same side of the panel as the first longitudinal side (4') of the foam panel (1), and said first end side (6) of the cladding panel (2) is located on the same side of the panel as the first end side (6') of the foam panel (1).
10. System according to claim 9, **characterised in that** said screws (18) are provided to be screwed through the inner longitudinal groove wall (17) at a distance from the free end of the inner longitudinal groove wall (17) that is greater than the depth (D₁) of said further longitudinal groove (12), where, at said distance from the free end of the inner longitudinal groove (17) a longitudinal groove (19) is preferably provided to which the screws (18) can be applied.
11. System according to any of claims 1 to 10, **characterised in that** the cladding panel (2) has an underside through which it is attached on an upper side of the foam panel (1), the underside of the cladding panel (2) having a circumferential edge (20) which substantially coincides with the circumferential edge (20) of the upper side of the foam panel (1).
12. System according to any of claims 1 to 11, **characterised in that** said foam panel (1) has a thickness (d₂) of at least 2 cm, and preferably of at least 3 cm.
13. System according to any of claims 1 to 12, **characterised in that** said cladding panel (2) has a thickness (d₁) of between 5 and 25 mm, preferably between 6 and 18 mm.
14. System according to any of claims 1 to 13, **characterised in that** the outer longitudinal groove wall (16) of said longitudinal groove (8) has a free end which is provided in order to connect against the cladding panel (2) of an adjacent panel.

15. System according to any of claims 1 to 14, **characterised in that** the protruding portion of the inner longitudinal groove wall (17) of said longitudinal groove (8) projects over a distance of at least 15 mm, preferably over a distance of at least 20 mm, beyond the outer longitudinal groove wall (16) of said longitudinal groove (8).

16. System according to any of claims 1 to 15, **characterised in that** said panels are screwed against said wall by means of said screws (18).

Patentansprüche

1. Ein System für die Wärmedämmung und Verkleidung von Wänden mit rechteckigen Platten, welche über eine Nut-und-Feder-Verbindung ineinander passen und die aus einer wärmedämmenden Schaumplatte (1) bestehend aus einem Hartschaum aufgebaut sind, wobei die erwähnte Schaumplatte mit einer flachen, festen Deckplatte (2) bedeckt ist, die eine Oberseite versehen mit einer Verkleidungsschicht (3) aufweist, wobei die erwähnte Deckplatte (2) und die erwähnte Schaumplatte (1) jeweils einer ersten Längs- (4, 4') und eine erste Endseite (6, 6') und eine zweite Längs- (5, 5') und eine zweite Endseite (7, 7') aufweisen, wobei die erste Längsseite (4) der Deckplatte (2) mit einer länglichen Nut (8), die zweite Längsseite (5) mit einer länglichen Feder (9), die erste Endseite (6) mit einer Endnut (10) und die zweite Endseite (7) mit einer Endfeder (11) versehen sind, wobei die erwähnte längliche Feder (9) in die erwähnte längliche Nut (8) passt, und die erwähnte Endfeder (11) in die erwähnte Endnut (10) passt, um die erwähnte Nut-und-Feder-Verbindung zwischen den Platten zu bilden, wobei die erwähnte Nut-und-Feder-Verbindung eine doppelte Nut-und-Feder-Verbindung ist, da die erste Längsseite (4') der Hartschaumplatte (1) mit einer weiteren länglichen Nut (12), die zweite Längsseite (5') mit einer weiteren länglichen Feder (13), die erste Endseite (6') mit einer weiteren Endnut (14) und die zweite Endseite (7') mit einer weiteren Endfeder (15) versehen sind, wobei die erwähnte weitere längliche Feder (13) in die erwähnte weitere längliche Nut (12), und die erwähnte weitere Endfeder (15) in die erwähnte weitere Endnut (14) passt, um eine weitere Nut-und-Feder-Verbindung zwischen den Platten zu bilden, und wobei die erwähnte längliche Nut (8) in der Deckplatte (2) durch eine äußere längliche Nutenwandung (16) gebildet ist, welche mit der erwähnten Verkleidungsschicht (3) versehen ist, und durch eine innere längliche Nutenwandung (17), welche voll durch die Schaumplatte (1) unterstützt wird und einen Abschnitt aufweist, der über die äußere längliche Nutenwandung (16) hinausragt,

dadurch gekennzeichnet, dass

das erwähnte System ferner Schrauben (18) mit versenkten Köpfen umfasst, um die erwähnten Platten durch den vorragenden Abschnitt der inneren länglichen Nutenwandung (17) der Deckplatte (2) und durch die Schaumplatte (1) an die erwähnte Wand zu schrauben.

2. System nach Anspruch 1, **dadurch gekennzeichnet, dass** die erwähnte Schaumplatte (1) eine Druckfestigkeit, gemessen nach EN 826:2013 bei einer Belastung von 10 %, von mehr als 80 kPa hat, bevorzugt mehr als 100 kPa.

3. System nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** die erwähnte Schaumplatte (1) aus Polyisocyanuratschaum, oder Polyurethanschaum, oder Polystyrolschaum, bevorzugt Polyisocyanuratschaum hergestellt ist.

4. Ein System für die Wärmedämmung und Verkleidung von Wänden mit rechteckigen Platten, welche über eine Nut-und-Feder-Verbindung ineinander passen und die aus einer wärmedämmenden Schaumplatte (1) aufgebaut sind, bedeckt mit einer flachen, festen Deckplatte (2), die eine Oberseite versehen mit einer Verkleidungsschicht (3) aufweist, wobei die erwähnte Deckplatte (2) und die erwähnte Schaumplatte (1) jeweils einer ersten Längs- (4, 4') und eine erste Endseite (6, 6') und eine zweite Längs- (5, 5') und eine zweite Endseite (7, 7') aufweisen, wobei die erste Längsseite (4) der Deckplatte (2) mit einer länglichen Nut (8), die zweite Längsseite (5) mit einer länglichen Feder (9), die erste Endseite (6) mit einer Endnut (10) und die zweite Endseite (7) mit einer Endfeder (11) versehen sind, wobei die erwähnte längliche Feder (9) in die erwähnte längliche Nut (8) passt, und die erwähnte Endfeder (11) in die erwähnte Endnut (10) passt, um die erwähnte Nut-und-Feder-Verbindung zwischen den Platten zu bilden, wobei die erwähnte Nut-und-Feder-Verbindung eine doppelte Nut-und-Feder-Verbindung ist, da die erste Längsseite (4') der Schaumplatte (1) mit einer weiteren länglichen Nut (12), die zweite Längsseite (5') mit einer weiteren länglichen Feder (13), die erste Endseite (6') mit einer weiteren Endnut (14) und die zweite Endseite (7') mit einer weiteren Endfeder (15) versehen sind, wobei die erwähnte weitere längliche Feder (13) in die erwähnte weitere längliche Nut (12), und die erwähnte weitere Endfeder (15) in die erwähnte weitere Endnut (14) passt, um eine weitere Nut-und-Feder-Verbindung zwischen den Platten zu bilden, und wobei die erwähnte längliche Nut (8) in der Deckplatte (2) durch eine äußere längliche Nutenwandung (16) gebildet ist, welche mit der erwähnten Verkleidungsschicht (3) versehen ist, und durch eine in-

nere längliche Nutenwandung (17), welche voll durch die Schaumplatte (1) unterstützt wird und einen Abschnitt aufweist, der über die äußere längliche Nutenwandung (16) hinausragt,

dadurch gekennzeichnet, dass

die erwähnte Schaumplatte (1) eine Platte aus flexiblem Schaum mit einer Druckfestigkeit, gemessen nach EN 826:2013 bei einer Belastung von 10 %, von weniger als 40 kPa umfasst und dadurch, dass das erwähnte System ferner Schrauben (18) mit versenkten Köpfen umfasst, um die erwähnten Platten durch den vorragenden Abschnitt der inneren länglichen Nutenwandung (17) der Deckplatte (2) und durch die Schaumplatte (1) an die erwähnte Wand zu schrauben.

5. System nach Anspruch 4, **dadurch gekennzeichnet, dass** die erwähnte Platte aus flexiblem Schaum einen agglomerierten Schaum umfasst.

6. System nach Anspruch 4 oder 5, **dadurch gekennzeichnet, dass** die erwähnte Platte aus flexiblem Schaum eine Druckfestigkeit, gemessen nach EN 826:2013 bei einer Belastung von 10 %, von weniger als 30 kPa hat, bevorzugt weniger als 20 kPa, und noch besser weniger als 10 kPa.

7. System nach irgendeinem der Ansprüche 4 bis 6, **dadurch gekennzeichnet, dass** die erwähnte Platte aus flexiblem Schaum eine Druckfestigkeit, gemessen nach EN 826:2013 bei einer Belastung von 10 %, von mehr als 1 kPa hat, bevorzugt mehr als 2 kPa, und noch besser mehr als 3 kPa.

8. System nach irgendeinem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** die Platte aus flexiblem Schaum eine Dichte aufweist, die höher ist als 40 kg/m³, bevorzugt höher als 50 kg/m³, noch besser höher als 60 kg/m³ und am besten höher als 70 kg/m³.

9. System nach irgendeinem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** die erwähnte erste Längsseite (4) der Deckplatte (2) an derselben Seite der Platte liegt wie die erste Längsseite (4') der Schaumplatte (1), und die erwähnte erste Endseite (6) der Deckplatte (2) an derselben Seite der Platte liegt wie die erste Endseite (6') der Schaumplatte (1).

10. System nach Anspruch 9, **dadurch gekennzeichnet, dass** die erwähnten Schrauben (18) bereitgestellt sind, um durch die innere längliche Nutenwandung (17) in einem Abstand vom freien Ende der inneren länglichen Nutenwandung (17) geschraubt zu werden, der größer ist als die Tiefe (D₁) der erwähnten weiteren länglichen Nut (12), wo, im erwähnten Abstand vom freien Ende der inneren länglichen Nut (17) bevorzugt eine längliche Nut (19) be-

reitgestellt ist, in der die Schrauben (18) angebracht werden können.

11. System nach irgendeinem der Ansprüche 1 bis 10, **dadurch gekennzeichnet, dass** die Deckplatte (2) eine Unterseite hat, durch die sie an einer Oberseite der Schaumplatte (1) befestigt wird, wobei die Unterseite der Deckplatte (2) einen umlaufenden Rand (20) hat, der im Wesentlichen mit dem umlaufenden Rand (20) der Oberseite der Schaumplatte (1) zusammenfällt.

12. System nach irgendeinem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** die erwähnte Schaumplatte (1) eine Dicke (d₂) von mindestens 2 cm und bevorzugt von mindestens 3 cm hat.

13. System nach irgendeinem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** die erwähnte Deckplatte (2) eine Dicke (d₁) von zwischen 5 und 25 mm hat, bevorzugt zwischen 6 und 18 mm.

14. System nach irgendeinem der Ansprüche 1 bis 13, **dadurch gekennzeichnet, dass** die äußere längliche Nutenwandung (16) der erwähnten länglichen Nut (8) ein freies Ende hat, welches bereitgestellt ist, um mit der Deckplatte (2) einer angrenzenden Platte verbunden zu werden.

15. System nach irgendeinem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** der vorragende Abschnitt der inneren länglichen Nutenwandung (17) der erwähnten länglichen Nut (8) über einen Abstand von mindestens 15 mm, bevorzugt über einen Abstand von mindestens 20 mm, über die äußere längliche Nutenwandung (16) der erwähnten länglichen Nut (8) hinausragt.

16. System nach irgendeinem der Ansprüche 1 bis 15, **dadurch gekennzeichnet, dass** die erwähnten Platten mittels der erwähnten Schrauben (18) an die erwähnte Wand geschraubt sind.

Revendications

1. Système d'isolation et de finition de murs, ayant des panneaux rectangulaires qui s'ajustent les uns dans les autres via un assemblage à rainure et languette et qui sont construits à partir d'un panneau en mousse isolant (1) réalisé en une mousse rigide, ledit panneau en mousse étant couvert d'un panneau de vêture plein et plat (2), qui a un côté supérieur pourvu d'une couche de finition (3), ledit panneau de vêture (2) et ledit panneau en mousse (1) ayant chacun un premier côté longitudinal (4, 4') et un premier côté d'extrémité (6, 6') et un second côté longitudinal (5, 5') et un second côté d'extrémité (7, 7'), dans lequel

le premier côté longitudinal (4) du panneau de vêture (2) est pourvu d'une rainure longitudinale (8), le second côté longitudinal (5) d'une languette longitudinale (9), le premier côté d'extrémité (6) d'une rainure d'extrémité (10) et le second côté d'extrémité (7) d'une languette d'extrémité (11), ladite languette longitudinale (9) s'ajustant dans ladite rainure longitudinale (8), et ladite languette d'extrémité (11) dans ladite rainure d'extrémité (10) pour former ledit assemblage à rainure et languette entre les panneaux, dans lequel ledit assemblage à rainure et languette est un double assemblage à rainure et languette, le premier côté longitudinal (4') du panneau en mousse rigide (1) étant pourvu d'une rainure longitudinale supplémentaire (12), le second côté longitudinal (5') d'une languette longitudinale supplémentaire (13), le premier côté d'extrémité (6') d'une rainure d'extrémité supplémentaire (14) et le second côté d'extrémité (7') d'une languette d'extrémité supplémentaire (15), ladite languette longitudinale supplémentaire (13) s'ajustant dans ladite rainure longitudinale supplémentaire (12), et ladite languette d'extrémité supplémentaire (15) dans ladite rainure d'extrémité supplémentaire (14), pour former un assemblage à rainure et languette supplémentaire entre les panneaux, et dans lequel ladite rainure longitudinale (8) dans le panneau de vêture (2) est formée par une paroi de rainure longitudinale extérieure (16), qui est pourvue de ladite couche de finition (3), et par une paroi de rainure longitudinale intérieure (17), qui est totalement supportée par le panneau en mousse (1) et ayant une portion qui dépasse au-delà de la paroi de rainure longitudinale extérieure (16),

caractérisé en ce que

ledit système comporte en outre des vis (18) avec des têtes coniques afin de visser lesdits panneaux à travers la portion saillante de la paroi de rainure longitudinale intérieure (17) du panneau de vêture (2) et à travers le panneau en mousse (1) contre ledit mur.

2. Système selon la revendication 1, **caractérisé en ce que** ledit panneau en mousse (1) a une résistance à la compression, mesurée selon la norme EN 826:2013 à une déformation de 10 %, supérieure à 80 kPa, de préférence supérieure à 100 kPa.
3. Système selon la revendication 1 ou 2, **caractérisé en ce que** ledit panneau en mousse (1) est réalisé en mousse de polyisocyanurate, en mousse de polyuréthane, ou en mousse de polystyrène, de préférence en mousse de polyisocyanurate.
4. Système d'isolation et de finition de murs, ayant des panneaux rectangulaires qui s'ajustent les uns dans les autres via un assemblage à rainure et languette et qui sont construits à partir d'un panneau en mou-

se isolant (1) couvert d'un panneau de vêture plein et plat (2) qui a un côté supérieur pourvu d'une couche de finition (3), ledit panneau de vêture (2) et ledit panneau en mousse (1) ayant chacun un premier côté longitudinal (4, 4') et un premier côté d'extrémité (6, 6') et un second côté longitudinal (5, 5') et un second côté d'extrémité (7, 7'), dans lequel le premier côté longitudinal (4) du panneau de vêture (2) est pourvu d'une rainure longitudinale (8), le second côté longitudinal (5) d'une languette longitudinale (9), le premier côté d'extrémité (6) d'une rainure d'extrémité (10) et le second côté d'extrémité (7) d'une languette d'extrémité (11), ladite languette longitudinale (9) s'ajustant dans ladite rainure longitudinale (8), et ladite languette d'extrémité (11) dans ladite rainure d'extrémité (10) pour former ledit assemblage à rainure et languette entre les panneaux, dans lequel ledit assemblage à rainure et languette est un double assemblage à rainure et languette, le premier côté longitudinal (4') du panneau en mousse (1) étant pourvu d'une rainure longitudinale supplémentaire (12), le second côté longitudinal (5') d'une languette longitudinale supplémentaire (13), le premier côté d'extrémité (6') d'une rainure d'extrémité supplémentaire (14) et le second côté d'extrémité (7') d'une languette d'extrémité supplémentaire (15), ladite languette longitudinale supplémentaire (13) s'ajustant dans ladite rainure longitudinale supplémentaire (12), et ladite languette d'extrémité supplémentaire (15) dans ladite rainure d'extrémité supplémentaire (14), pour former un assemblage à rainure et languette supplémentaire entre les panneaux, et dans lequel ladite rainure longitudinale (8) dans le panneau de vêture (2) est formée par une paroi de rainure longitudinale extérieure (16), qui est pourvue de ladite couche de finition (3), et par une paroi de rainure longitudinale intérieure (17), qui est totalement supportée par le panneau en mousse (1) et ayant une portion qui dépasse au-delà de la paroi de rainure longitudinale extérieure (16),

caractérisé en ce que

ledit panneau en mousse (1) comprend un panneau en mousse flexible avec une résistance à la compression, mesurée selon la norme EN 826:2013 à une déformation de 10 %, inférieure à 40 kPa, et ledit système a en outre des vis (18) avec des têtes coniques afin de visser lesdits panneaux à travers la portion saillante de la paroi de rainure longitudinale intérieure (17) du panneau de vêture (2) et à travers le panneau en mousse (1) contre ledit mur.

5. Système selon la revendication 4, **caractérisé en ce que** ledit panneau en mousse flexible comprend une mousse agglomérée.
6. Système selon la revendication 4 ou 5, **caractérisé en ce que** ledit panneau en mousse flexible a une résistance à la compression, mesurée selon la nor-

me EN 826:2013 à une déformation de 10 %, inférieure à 30 kPa, de préférence inférieure à 20 kPa, et plus préférentiellement inférieure à 10 kPa.

7. Système selon l'une quelconque des revendications 4 à 6, **caractérisé en ce que** ledit panneau en mousse flexible a une résistance à la compression, mesurée selon la norme EN 826:2013 à une déformation de 10 %, supérieure à 1 kPa, de préférence supérieure à 2 kPa et plus préférentiellement supérieure à 3 kPa. 5
8. Système selon l'une quelconque des revendications 4 à 7, **caractérisé en ce que** le panneau en mousse flexible a une masse volumique qui est supérieure à 40 kg/m³, de préférence supérieure à 50 kg/m³, plus préférentiellement supérieure à 60 kg/m³, et le plus préférentiellement à 70 kg/m³. 10
9. Système selon l'une quelconque des revendications 1 à 8, **caractérisé en ce que** ledit premier côté longitudinal (4) du panneau de vêture (2) est situé sur le même côté du panneau que le premier côté longitudinal (4') du panneau en mousse (1), et ledit premier côté d'extrémité (6) du panneau de vêture (2) est situé sur le même côté du panneau que le premier côté d'extrémité (6') du panneau en mousse (1). 15 20 25
10. Système selon la revendication 9, **caractérisé en ce que** lesdites vis (18) sont prévues pour être vissées à travers la paroi de rainure longitudinale intérieure (17) à une distance de l'extrémité libre de la paroi de rainure longitudinale intérieure (17) qui est supérieure à la profondeur (D₁) de ladite rainure longitudinale supplémentaire (12), où, à ladite distance de l'extrémité libre de la rainure longitudinale intérieure (17) une rainure longitudinale (19) est de préférence prévue à laquelle peuvent être appliquées les vis (18). 30 35 40
11. Système selon l'une quelconque des revendications 1 à 10, **caractérisé en ce que** le panneau de vêture (2) a un côté inférieur par le biais duquel il est fixé sur un côté supérieur du panneau en mousse (1), le côté inférieur du panneau de vêture (2) ayant un bord circonférentiel (20) qui coïncide sensiblement avec le bord circonférentiel (20) du côté supérieur du panneau en mousse (1). 45
12. Système selon l'une quelconque des revendications 1 à 11, **caractérisé en ce que** ledit panneau en mousse (1) a une épaisseur (d₂) d'au moins 2 cm, et de préférence d'au moins 3 cm. 50
13. Système selon l'une quelconque des revendications 1 à 12, **caractérisé en ce que** ledit panneau de vêture (2) a une épaisseur (d₁) entre 5 et 25 mm, de préférence entre 6 et 18 mm. 55

14. Système selon l'une quelconque des revendications 1 à 13, **caractérisé en ce que** la paroi de rainure longitudinale extérieure (16) de ladite rainure longitudinale (8) a une extrémité libre qui est prévue afin de se raccorder contre le panneau de vêture (2) d'un panneau adjacent.

15. Système selon l'une quelconque des revendications 1 à 14, **caractérisé en ce que** la portion saillante de la paroi de rainure longitudinale intérieure (17) de ladite rainure longitudinale (8) dépasse sur une distance d'au moins 15 mm, de préférence sur une distance d'au moins 20 mm, au-delà de la paroi de rainure longitudinale extérieure (16) de ladite rainure longitudinale (8).

16. Système selon l'une quelconque des revendications 1 à 15, **caractérisé en ce que** lesdits panneaux sont vissés contre ledit mur au moyen desdites vis (18).

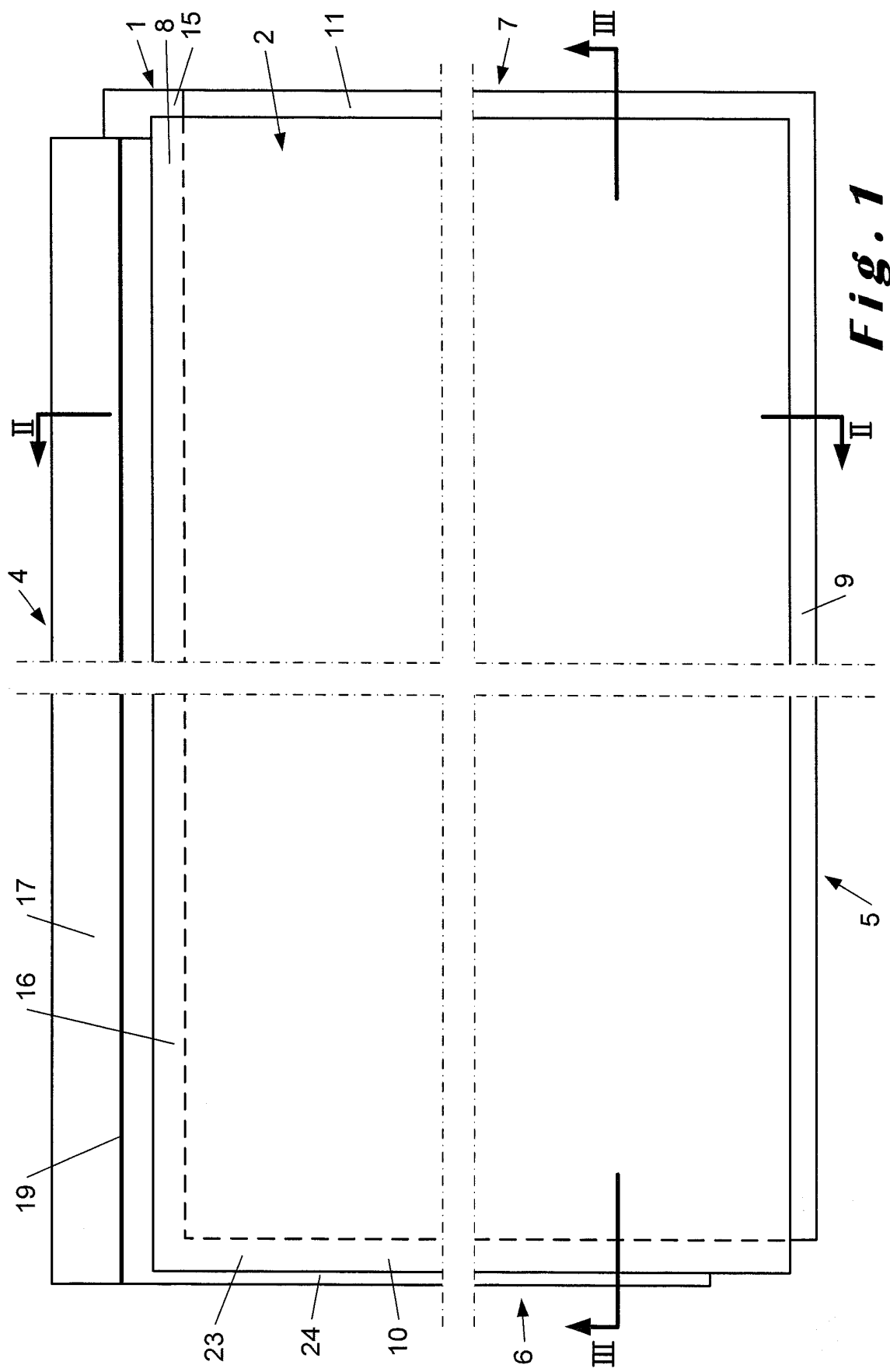
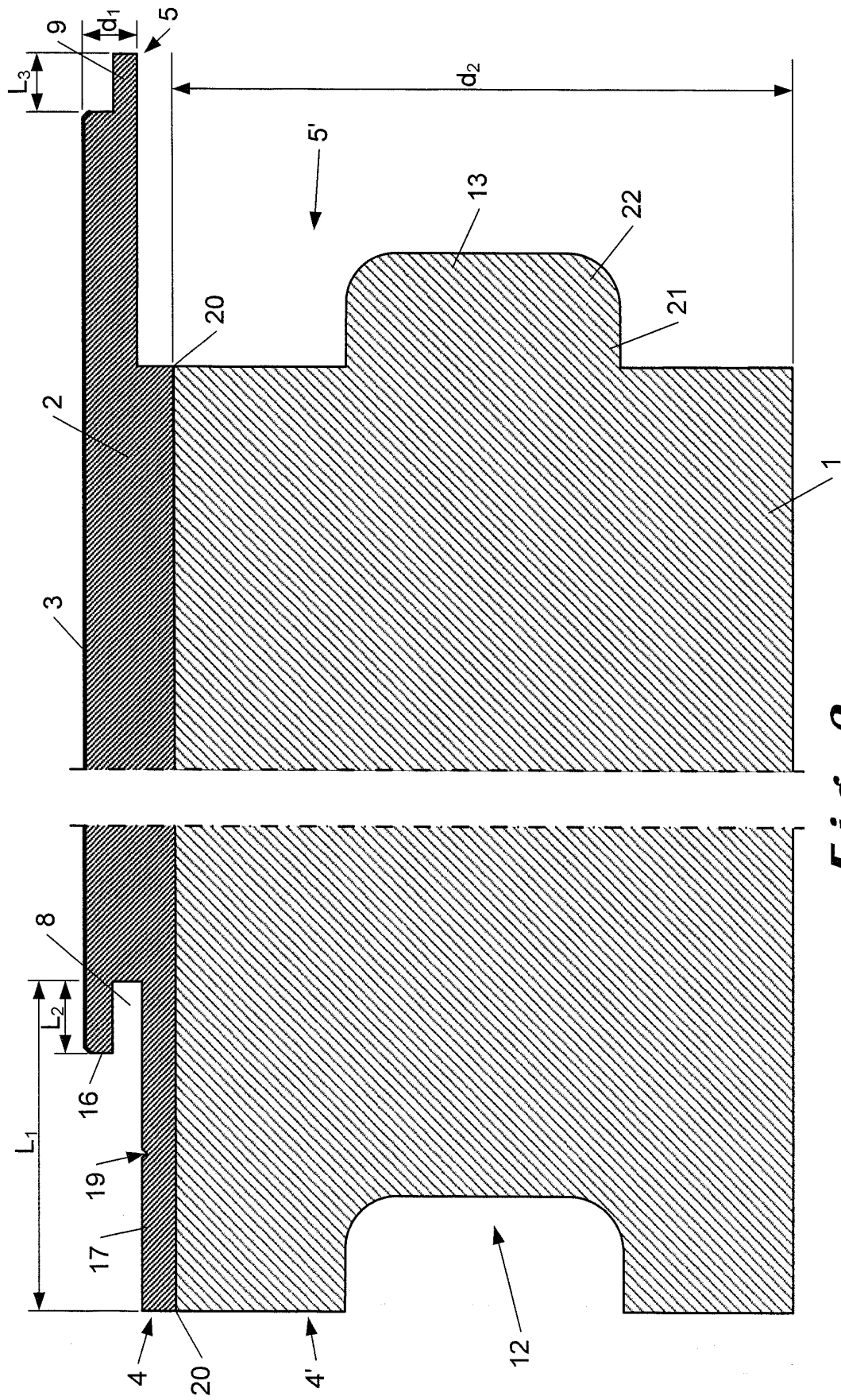
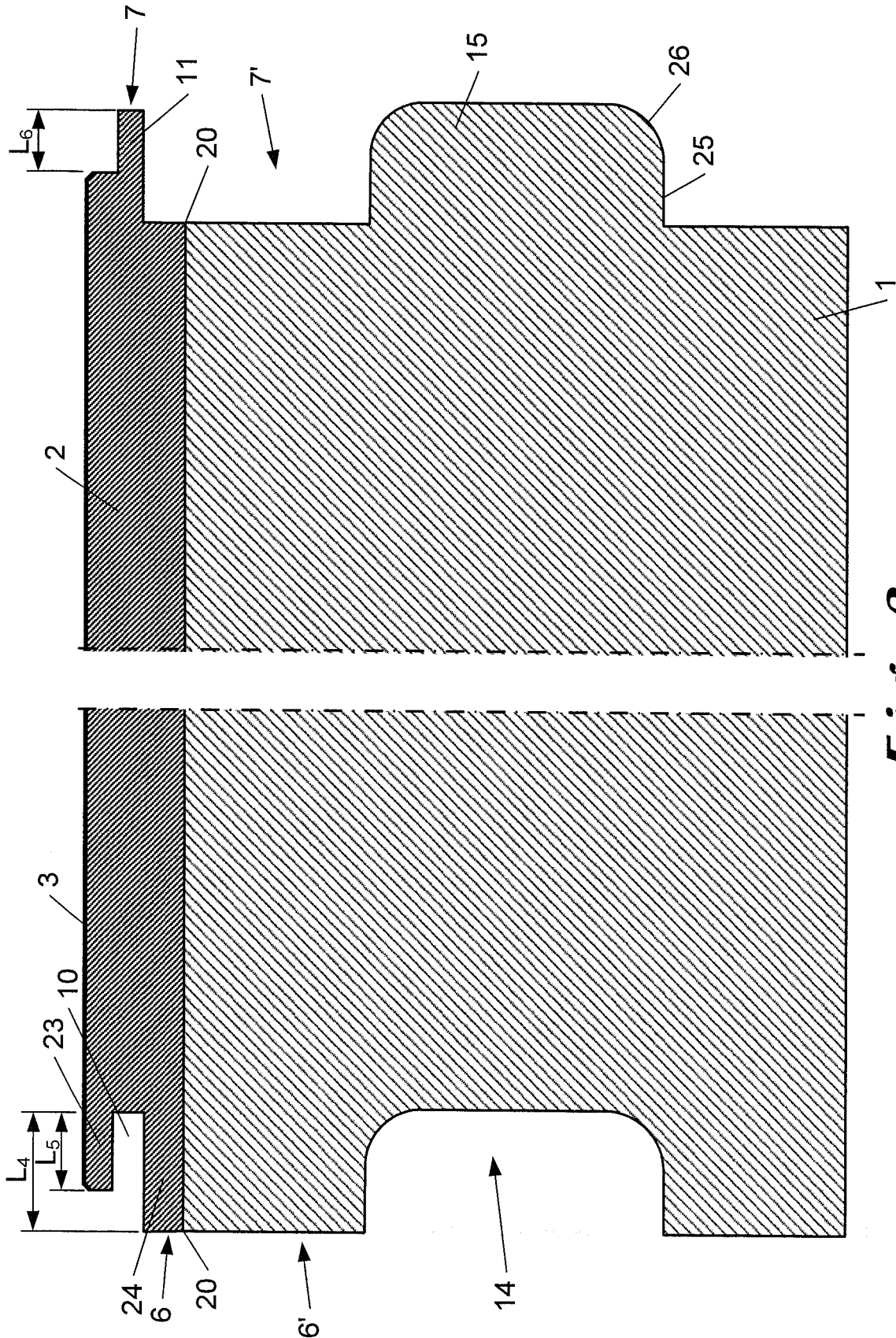
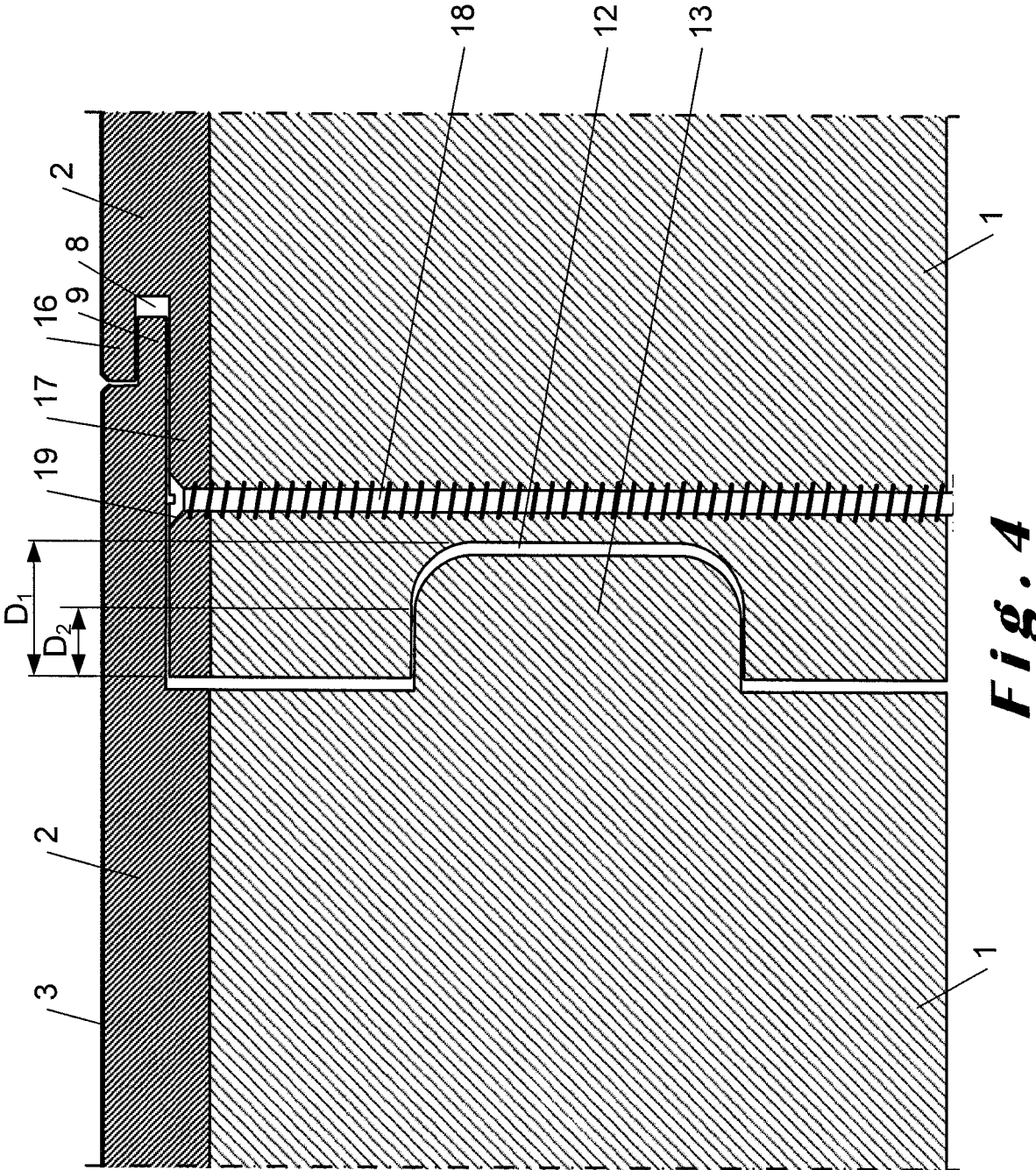


Fig. 1







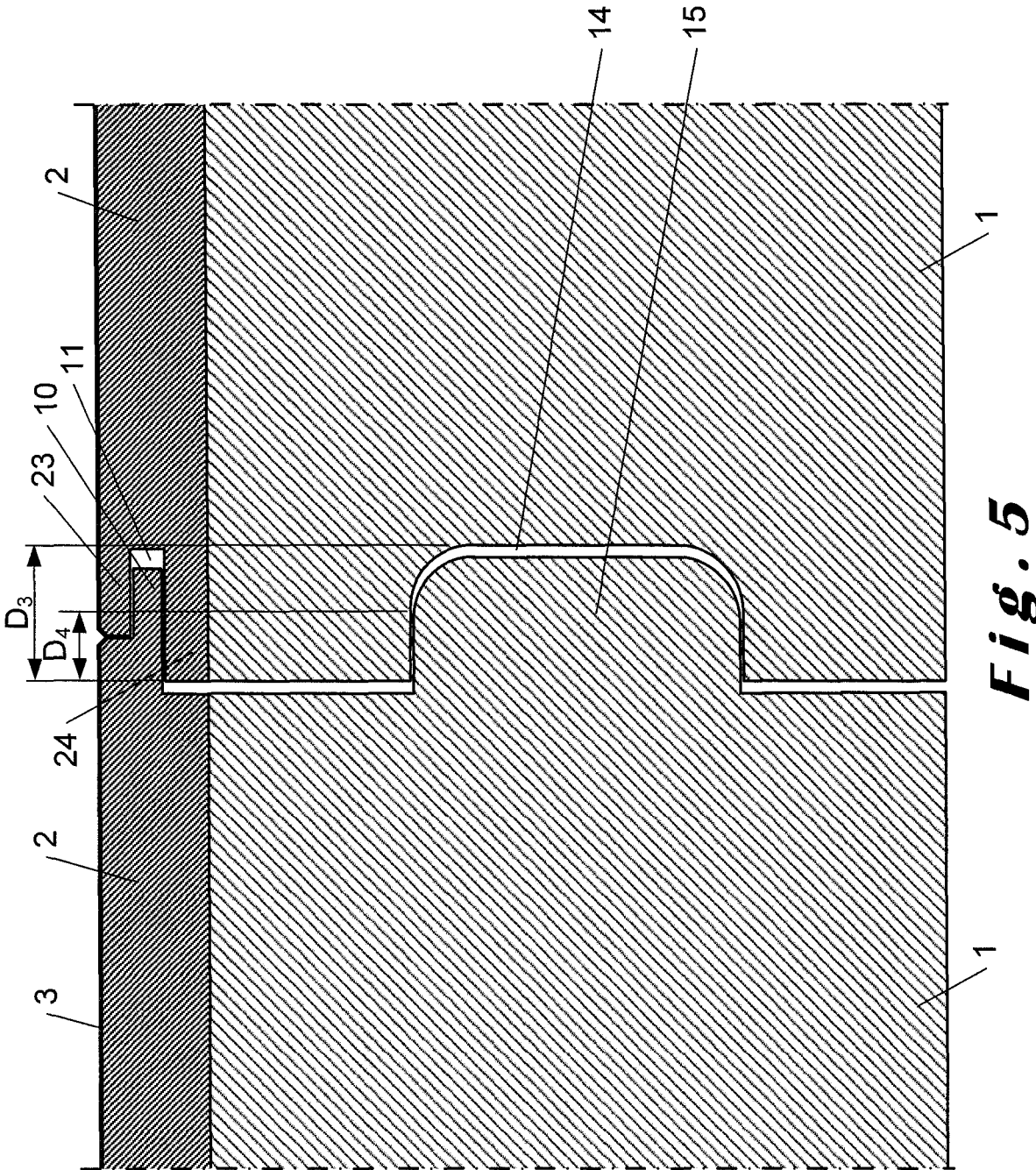


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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