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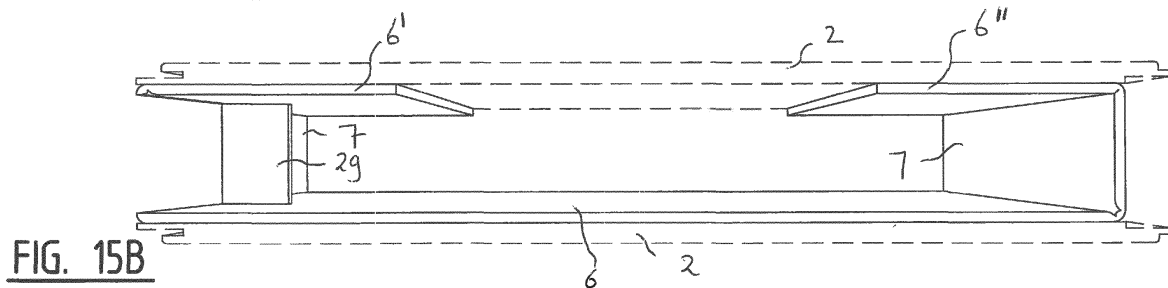
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(54) **Wall element**

(57) A wall element comprising two outer layers extending at least substantially parallel to each other and an intermediate layer connected thereto, which wall element can be moved between a folded position, in which the outer layers are close to each other, and an unfolded position, in which the outer layers are spaced from each other, said intermediate layer comprising first parts which are connected to a respective outer layer and second parts which extend between said first parts, a special

feature being the fact that the intermediate layer has a rectangular cross-section in the unfolded position, wherein the first parts extend parallel to the outer layers in the folded and unfolded positions, wherein the second parts extend perpendicularly to the first parts in the unfolded position, wherein the second parts extend parallel to the first parts in the folded position, and wherein each second part is pivotally connected to at least one of the first parts.



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Description

[0001] The invention relates to a wall element comprising two outer layers extending at least substantially parallel to each other and an intermediate layer connected thereto, which wall element can be moved between a folded position, in which the outer layers face each other, and an unfolded position, in which the outer layers are spaced from each other, said intermediate layer comprising first parts which are connected to a respective outer layer and second parts which extend between said first parts.

[0002] An element is known from Australian patent specification No. AU 511833, for example, which describes an insulation panel comprising two outer layers and intermediate strips connected thereto, which outer layers are movable between a first position, in which the outer layers are closely juxtaposed, and a second position, in which they are spaced from each other. A drawback of the known element is that it does not have sufficient constructional stiffness for being used as a sturdy wall element. An additional drawback is the fact that the wall part can unintentionally collapse from the second position to the first position.

[0003] It is an object of the invention to overcome the drawbacks of the prior art. It is in particular an object of the invention to provide a wall element which has a very high flexural and tensile strength and which can be folded or unfolded in a simple and/or efficient manner without the possibility of this taking place unintentionally.

[0004] In order to achieve that object, a wall element of the kind described in the introduction is according to the invention characterised in that the intermediate layer has a rectangular cross-section in the unfolded position, wherein the first parts extend parallel to the outer layers in the folded and unfolded positions, wherein the second parts extend perpendicularly to the first parts in the unfolded position, wherein the second parts extend parallel to the first parts in the folded position, and wherein each second part is pivotally connected to at least one of the first parts. As a result, use can be made in a simple and/or efficient manner of a standard element, for example for forming a wall, for each desired thickness of the wall, wherein the maximum thickness is the sum of the length of the second parts and the thicknesses of the first parts and of the outer layers. In folded position, the wall element takes up less space, so that the wall elements can be efficiently stored and/or transported. This saves costs and reduces the burden on the environment. In unfolded position, the wall element can preferably be fixed in position by providing an insert between the first and the second parts, in particular an insert in the form of a piece of insulation material, such as rock wool. In another preferred embodiment, a first part and/or a second part comprise(s) a lip that can be bent outward, which lip functions to fix the wall element in the unfolded position. As a result, separate fixation means are not required, so that such means need not be brought along separately, which

leads to a further reduction of the transport and storage costs. By fixing the wall element in a position between the folded and the unfolded position or in said folded or said unfolded position, unintentional folding of the construction element, for example as a result of a force being exerted thereon, is not possible. This is important, for example, if several wall elements are used for forming a wall, which wall elements are interconnected, since the connecting of wall elements can only take place if said wall elements are in the same position.

[0005] Preferably, the outer layers are staggered relative to the first parts of the wall element, so that the outer layers project relative to the first parts of the wall element at one short end thereof so as to form a mounting opening, and so that the first parts project relative to the outer layers at the other short end of the wall element so as to form a mounting projection. To connect adjacent wall elements together, the mounting projection of one element is inserted into the mounting opening of the other wall element.

[0006] It is noted that the wall element cannot be used exclusively to form a wall, as the wall element is also suitable for use as a ceiling element and/or as an insulation element.

[0007] In a preferred embodiment of a wall element according to the invention, the intermediate layer comprises at least two panels, wherein each panel has a U-shaped cross-section in the unfolded position, wherein the first parts form the bases of the U-shaped cross-sections, wherein the second parts form the legs of the U-shaped cross-sections, and wherein second parts facing each other of the panels are interconnected. In particular, the two panels are each formed from one blank.

[0008] In another preferred embodiment of a wall element according to the invention, one second part of each panel is pivotally connected to the first part thereof along two spaced fold lines in the panel, wherein the other second part of each panel is pivotally connected to the first part thereof along one fold line in the panel. In particular, the spacing between the spaced fold lines in the panel ranges between 1.5 and 3 times the thickness of the blank, preferably it is about 2 times the thickness of the blank.

[0009] In another preferred embodiment of a wall element according to the invention, the intermediate layer is formed from one blank. Preferably, second parts facing each other of the blank are connected on one side of the wall element, wherein the inward-facing second part is pivotally connected to one first part along two spaced fold lines in the blank, and wherein the outward-facing second part is pivotally connected to the other first part along one fold line in the blank.

[0010] In another preferred embodiment of a wall element according to the invention, the second part of the blank is pivotally connected to said one first part on the other side of the wall element along one fold line in the blank, and said second part is pivotally connected to said other first part along two spaced fold lines in the blank.

In particular, the spacing between the spaced fold lines in the panel ranges between 1.5 and 3 times the thickness of the blank, preferably it is about 2 times the thickness of the blank.

[0011] In another preferred embodiment of a wall element according to the invention, each second part is pivotally connected to both first parts, wherein each second part is pivotally connected to one of the first parts along two spaced fold lines, and wherein each second part is pivotally connected to the other first part along one fold line.

[0012] In another preferred embodiment of a wall element according to the invention, the outer layers are made of a material selected from the group consisting of wood, gypsum, metal and plastic. Preferably, the intermediate layer is made of a cellulosic material, such as paper/cardboard.

[0013] The invention will now be explained in more detail with reference to figures illustrated in a drawing, in which:

- Figure 1 is a perspective view of two interconnected wall elements according to a first preferred variant of the invention;
- Figures 2 a 3 are perspective views of a wall element of figure 4 in an unfolded position and a folded position, respectively;
- Figures 4 and 5 are side views of the wall element of figures 2 and 3 in an unfolded position and a folded position, respectively;
- Figures 6, 7 and 8 are perspective views of a separate outer layer (figure 6) and a separate intermediate layer (figures 7 and 8), respectively, of the wall element of figures 2 and 3;
- Figures 9 and 10 correspond to figures 4 and 5, in this case, however, relating to a wall element according to a second preferred variant of the invention, however;
- Figures 11 and 12 relate to a wall element according to a third preferred variant, showing a side view of the wall element in an unfolded position (figure 11) thereof and a top plan view of a blank of a separate intermediate layer used therewith, respectively;
- Figures 13 and 14 correspond to figures 11 and 12, in this case relating to a fourth preferred variant, however;
- Figures 15 and 16 correspond to figures 13 and 14, in this case relating to a fifth preferred variant, however.

[0014] As indicated, figure 1 is a perspective view of two interconnected, identical wall elements 1 according to a first preferred variant of the invention. Each wall element 1 is made up of two parallel outer layers 2 of gypsum and an intermediate layer 3 comprising several layers of corrugated cardboard, which is glued together with said outer layers. The outer layers 2 are staggered relative to the intermediate layer 3 of the wall element 1. As

a result, the outer layers 2 project relative to the intermediate layer 3 at one short end of the wall element 1 so as to form a mounting opening 4, whilst the intermediate layer 3 projects relative to the outer layers 2 at the other short end of the wall element 1 so as to form a mounting projection 5. With respect to figure 1, the mounting projection 5 of one wall element 1 is inserted into the mounting opening 4 of the other wall element 1 for connecting adjacent wall elements 1 together.

[0015] The wall element 1 can be moved between a folded position, in which the outer layers 2 are close to each other (figure 3), and an unfolded position, in which the outer layers 2 are spaced from each other (figure 2). Referring to figures 2 and 3, the intermediate layer 3 comprises first parts 6, which are glued to a respective outer layer 2, and second parts 7, which extend between the first parts 6. As drawn, the first parts 6 extend parallel to the outer layers 2 in the folded position (figure 5) and in the unfolded position (figure 4). The second parts 7 extend perpendicular to the first parts 6 in the unfolded position (figure 4), however, and parallel to the first parts 6 in the folded position (figure 5). Each of the second parts 7 is pivotally connected to at least one of the first parts 6.

[0016] Further referring to figures 4 and 5, the intermediate layer 3 comprises two panels 8, 9, each formed from one blank. In the unfolded position (figure 4), each panel 8, 9 has a U-shaped cross-section, with the first parts 6 forming the bases of the U-shaped cross-sections and the second parts 7 forming the legs of the U-shaped cross-sections. Second parts 7 facing each other of the panels 8, 9 are connected.

[0017] Figure 6 relates to a separate outer layer 2 of gypsum. Figure 7 relates to a non-folded panel 8, 9 of a few layers of corrugated cardboard, each consisting of a flat sub-layer 10 and a corrugated sub-layer 11, which are glued together. As shown in figure 7, one second part 7' of each panel 8, 9 is pivotally connected to the first part 6 thereof along two spaced fold lines 12, 13 in the panel 8, 9. By contrast, the other second part 7'' of each panel 8, 9 is pivotally connected to the first part 6 thereof along one fold line 14 in the panel 8, 9.

[0018] Figures 8, 9 and 10 relate to another preferred variant according to the invention, in which the intermediate layer 3 is made of one blank. In the unfolded position (figure 9) second parts 7', 7'' facing each other of the blank are connected on one side of the wall element 1. The inward-facing second part 7' thereof is pivotally connected to the first part 6' along two spaced fold lines 15, 16 in the blank. The outward-facing second part 7'' thereof is pivotally connected to the other first part 6'' along one fold line 17 in the blank. The second part 7''' of the blank on the other side of the wall element (1) is pivotally connected to the first parts 6', 6'' along one fold line 18 (part 6') and two fold lines 19, 20 (part 6'') in the blank (figure 8).

[0019] Figures 11 and 12 relate to a third preferred variant of the wall element 1, in which corresponding parts are indicated by the same numerals. The wall ele-

ment 1 comprises outer layers 2 and an intermediate layer 3, which outer layers 2 are staggered relative to the intermediate layer 3 in this variant as well. The intermediate layer 3 comprises one blank with first parts 6 and second parts 7, whose functions correspond to those of preceding preferred variants. Also in this case the blank is provided with two pairs of spaced fold lines (21, 22; 24, 25) and two single fold lines (23, 26), wherein said pairs of fold lines (21, 22; 24, 25) are located diagonally opposite each other and said single fold lines (23, 26) are likewise located diagonally opposite each other. As a result, the first parts 6 and the second parts 7 can optimally pivot relative to each other, without the presence of overlapping parts in the unfolded position of the wall element 1, as is the case in figures 4 and 9. The upper first part 6 of the blank is to that end provided with a cut, as shown. Said cut thus not play a part (any more) once the outer layers 2 are mounted. At least one of the second parts 7 comprises a lip 27 which can be bent outward and which functions to fix the wall element 2 in the unfolded position thereof. An insert in the form of rock wool may be provided before or after transport.

[0020] Figures 13 and 14 relate to a fourth preferred variant and correspond to figures 11 and 12, with corresponding parts being indicated by the same numerals. The fourth preferred variant shown therein is identical to the third preferred variant shown in figures 11 and 12, with this difference that this variant does not comprise a lip 27 that can be bent outward from at least one of the second parts 27. Instead, a fold line 28 is provided in at least one of the second parts 7, so that a wing 29 that can be folded inward is formed in the second part 7 in question for fixing the wall element 2 in the unfolded position. It is noted that the fold line 28 need not necessarily be positioned in the centre of the second part 7 in question.

[0021] Figures 15 and 16 relate to a fifth preferred variant and correspond to figures 13 and 14, with corresponding parts being indicated by the same numerals. The fifth preferred variant shown therein is identical to the fourth preferred variant shown in figures 13 and 14, with this difference that the cut in the upper first part 6 is much larger. The upper first part 6 is in this case actually formed by spaced parts 6', 6'' thereof.

[0022] The invention is not limited to the embodiments shown herein, but it also extends to other preferred variants that fall within the scope of the appended claims.

Claims

1. A wall element (1) comprising two outer layers (2) extending at least substantially parallel to each other and an intermediate layer (3) connected thereto, which wall element (1) can be moved between a folded position, in which the outer layers (2) face each other, and an unfolded position, in which the outer layers (2) are spaced from each other, said interme-

mediate layer (3) comprising first parts which are connected to a respective outer layer (2) and second parts (7) which extend between said first parts, **characterised in that** the intermediate layer (3) has a rectangular cross-section in the unfolded position, wherein the first parts (6) extend parallel to the outer layers (2) in the folded and unfolded positions, wherein the second parts (7) extend perpendicularly to the first parts (6) in the unfolded position, wherein the second parts (7) extend parallel to the first parts (6) in the folded position, and wherein each second part (7) is pivotally connected to at least one of the first parts (6).

2. A wall element (1) according to claim 1, wherein the intermediate layer (3) comprises at least two panels (8, 9), wherein each panel (8, 9) has a U-shaped cross-section in the unfolded position, wherein the first parts (6) form the bases of the U-shaped cross-sections, wherein the second parts (7) form the legs of the U-shaped cross-sections, and wherein second parts (7) facing each other of the panels (8, 9) are interconnected.
3. A wall element (1) according to claim 2, wherein the two panels (8, 9) are each formed from one blank.
4. A wall element (1) according to claim 3, wherein one second part (7') of each panel (8, 9) is pivotally connected to the first part (6) thereof along two spaced fold lines (12, 13) in the panel (8, 9), and wherein the other second part (7'') of each panel (8, 9) is pivotally connected to the first part (6) thereof along one fold line (14) in the panel (8, 9).
5. A wall element (1) according to claim 4, wherein the spacing between the spaced fold lines (12, 13) in the panel (8, 9) ranges between 1.5 and 3 times the thickness of the blank, preferably it is about 2 times the thickness of the blank.
6. A wall element (1) according to claim 1, wherein the intermediate layer (3) is formed from one blank.
7. A wall element (1) according to claim 6, wherein second parts (7', 7'') facing each other of the blank are connected on one side of the wall element (1), wherein the inward-facing second part (7') is pivotally connected to one first part (6') along two spaced fold lines (15, 16) in the blank, and wherein the outward-facing second part (7'') is pivotally connected to the other first part (6'') along one fold line (17) in the blank.
8. A wall element (1) according to claim 7, wherein the second part (7''') of the blank is pivotally connected to said one first part (6') on the other side of the wall element (1) along one fold line (18) in the blank, and

wherein said second part (7''') is pivotally connected to said other first part (6'') along two spaced fold lines (19, 20) in the blank.

9. A wall element (1) according to claim 7 or 8, wherein the spacing between the spaced fold lines in the panel (8, 9) ranges between 1.5 and 3 times the thickness of the blank, preferably it is about 2 times the thickness of the blank. 5
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10. A wall element (1) according to claim 6, wherein each second part (7) is pivotally connected to both first parts (6), wherein each second part (7) is pivotally connected to one of the first parts (6) along two spaced fold lines (21, 22; 23, 25), and wherein each second part (7) is pivotally connected to the other first part (6) along one fold line (23, 26). 15
11. A wall element (1) according to claim 10, wherein at least one of the second parts (7) comprises a lip (27) that can be bent outward, which lip functions to fix the wall element (1) in the unfolded position. 20
12. A wall element (1) according to claim 10 or 11, wherein at least one of the second parts (7) is provided with a fold line (28) for forming a wing (29) that can be folded inward, which wing functions to fix the wall element (1) in the unfolded position. 25
13. A wall element (1) according to claim 10, 11 or 12, wherein at least one of said first parts (6) comprises two spaced parts (6', 6''). 30
14. A wall element (1) according to any one of the preceding claims 1 - 13, wherein the outer layers (2) are made of a material selected from the group consisting of wood, gypsum, metal and plastic. 35
15. A wall element (1) according to any one of the preceding claims 1 - 14, wherein the intermediate layer (3) is made of a cellulosic material, such as paper/cardboard. 40

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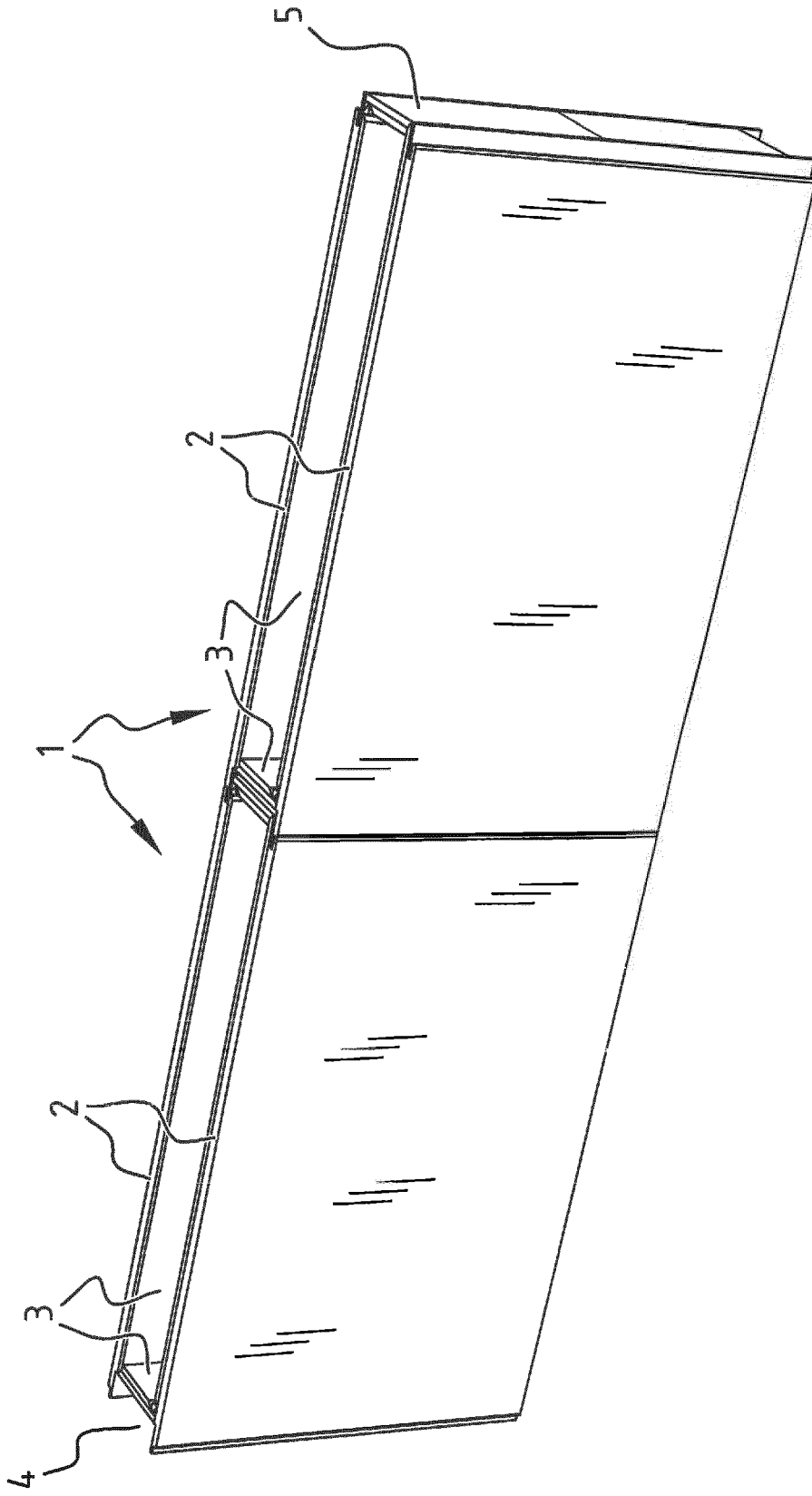


FIG. 1

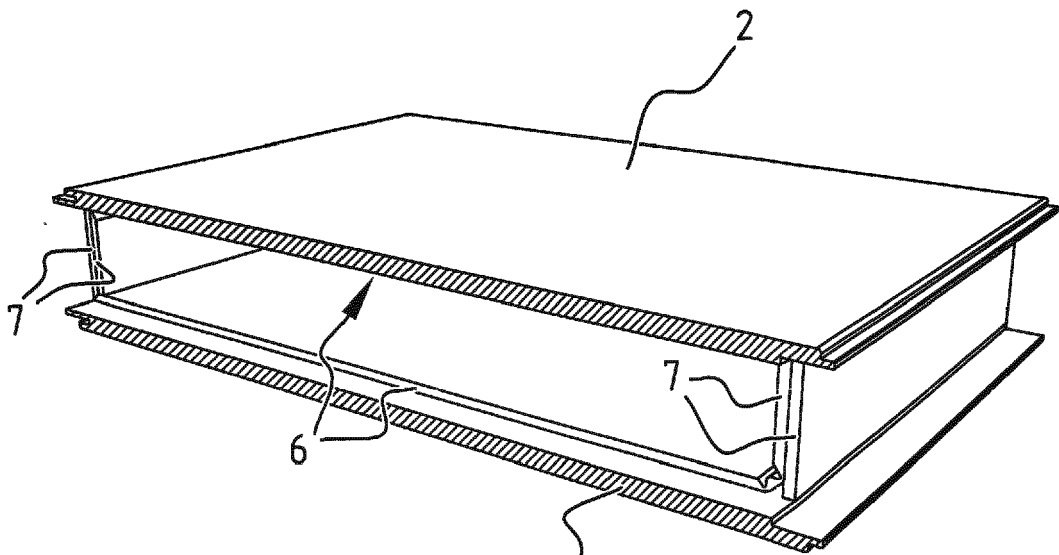


FIG. 2

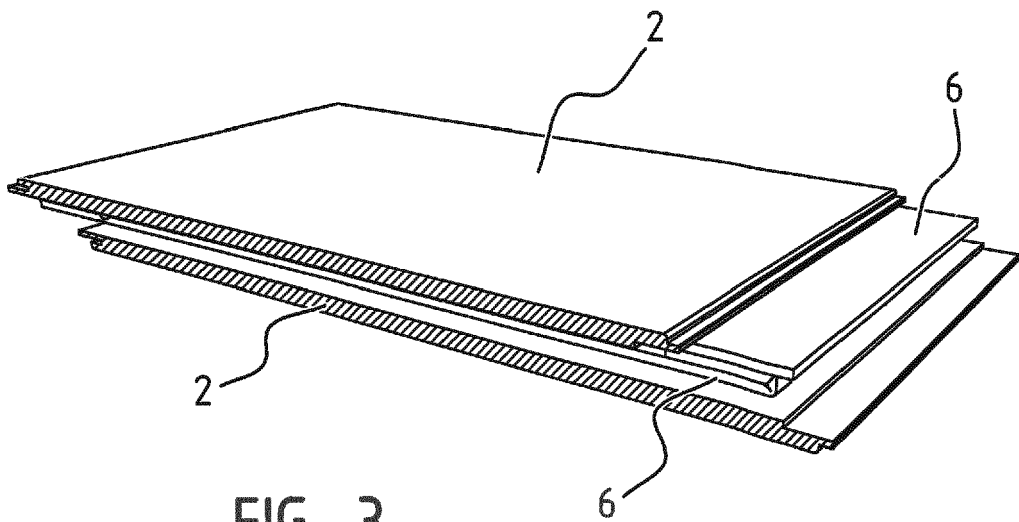


FIG. 3

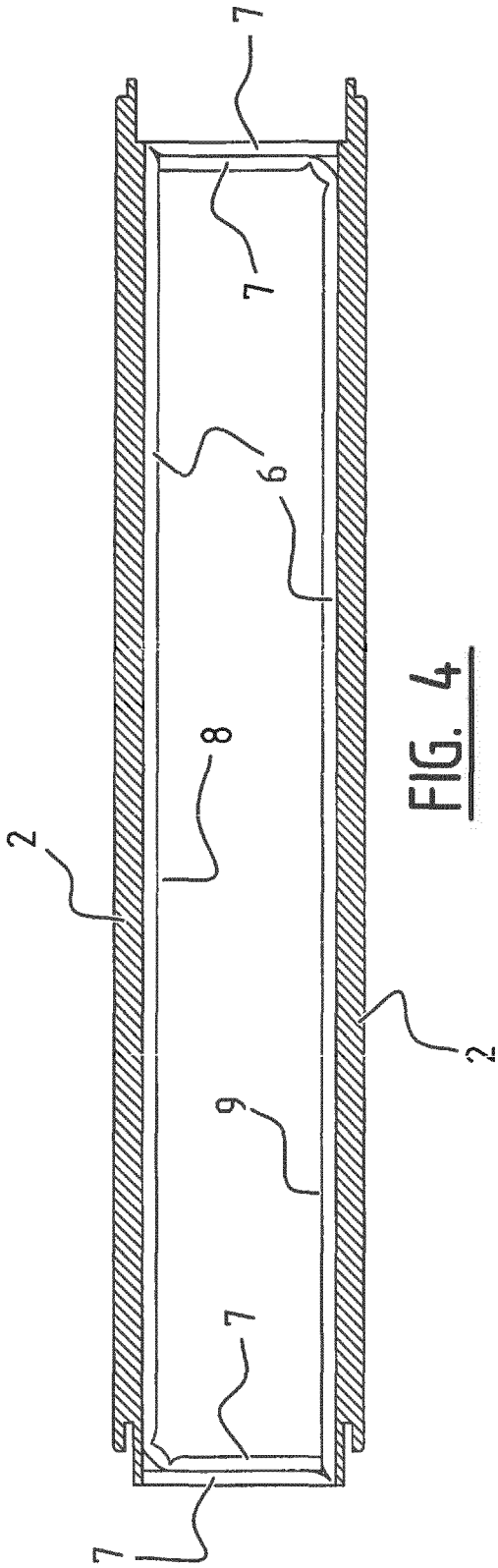


FIG. 4

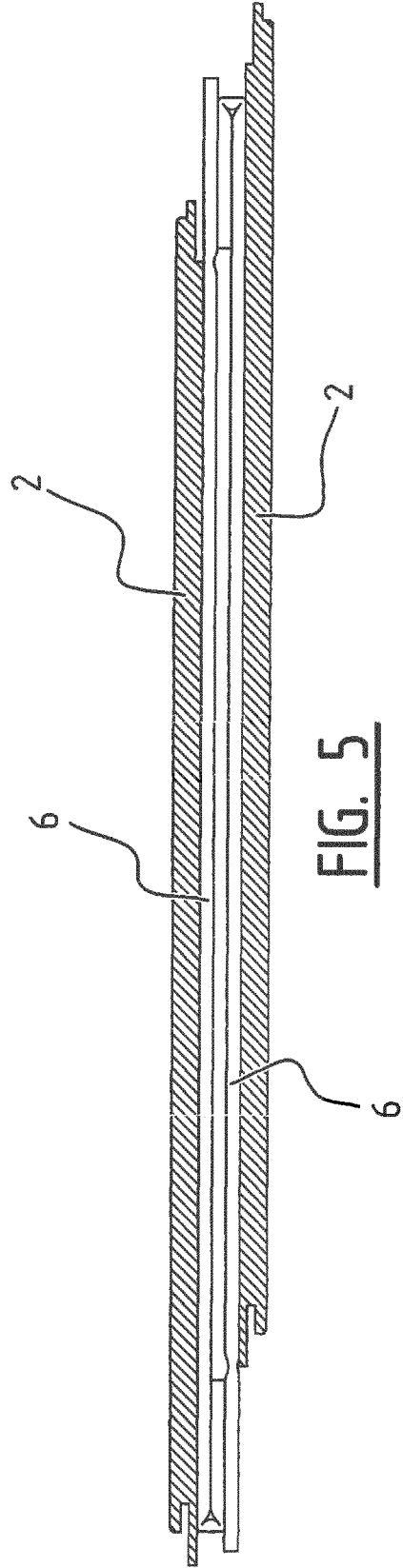


FIG. 5

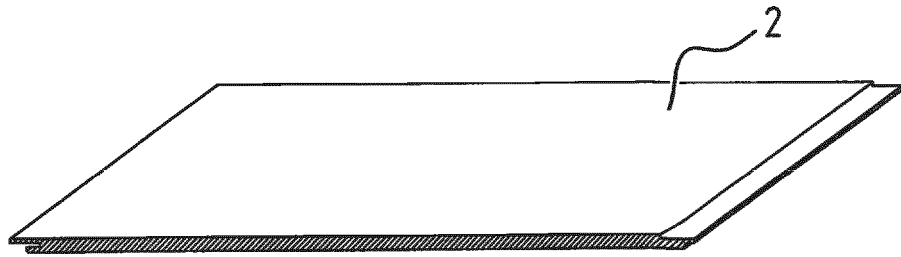


FIG. 6

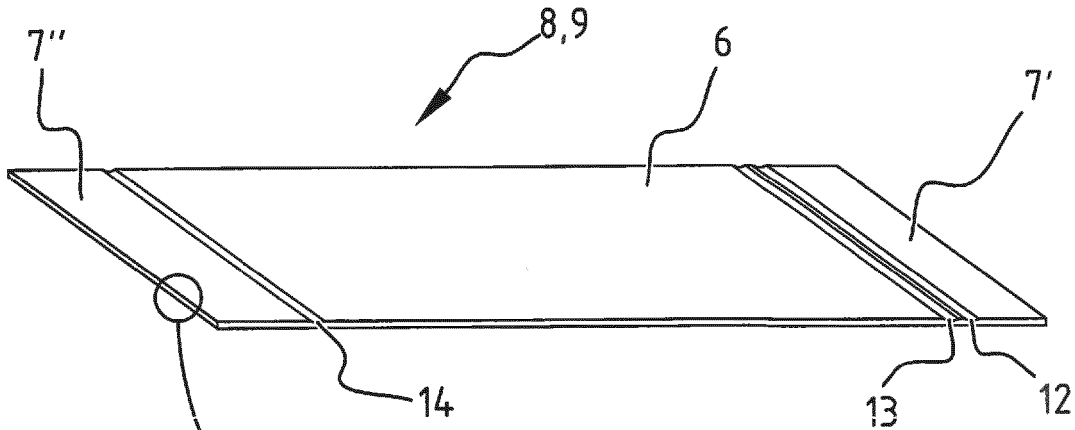


FIG. 7

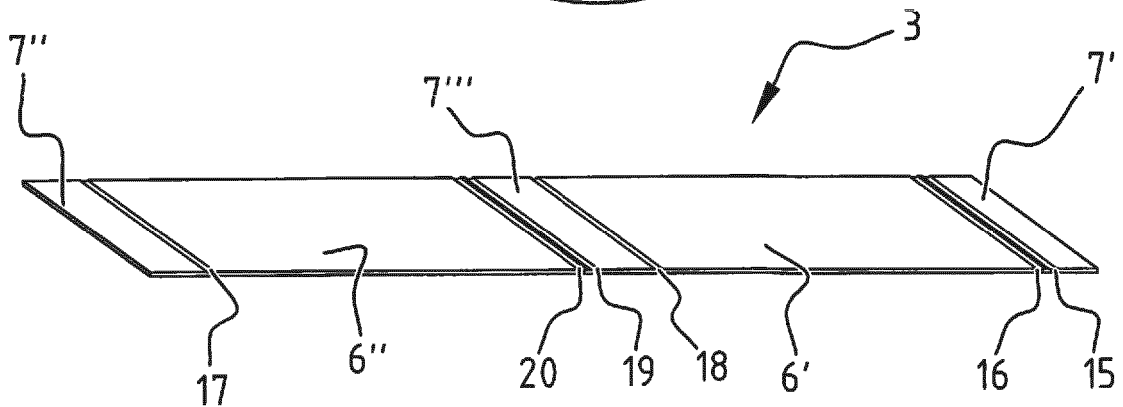


FIG. 8

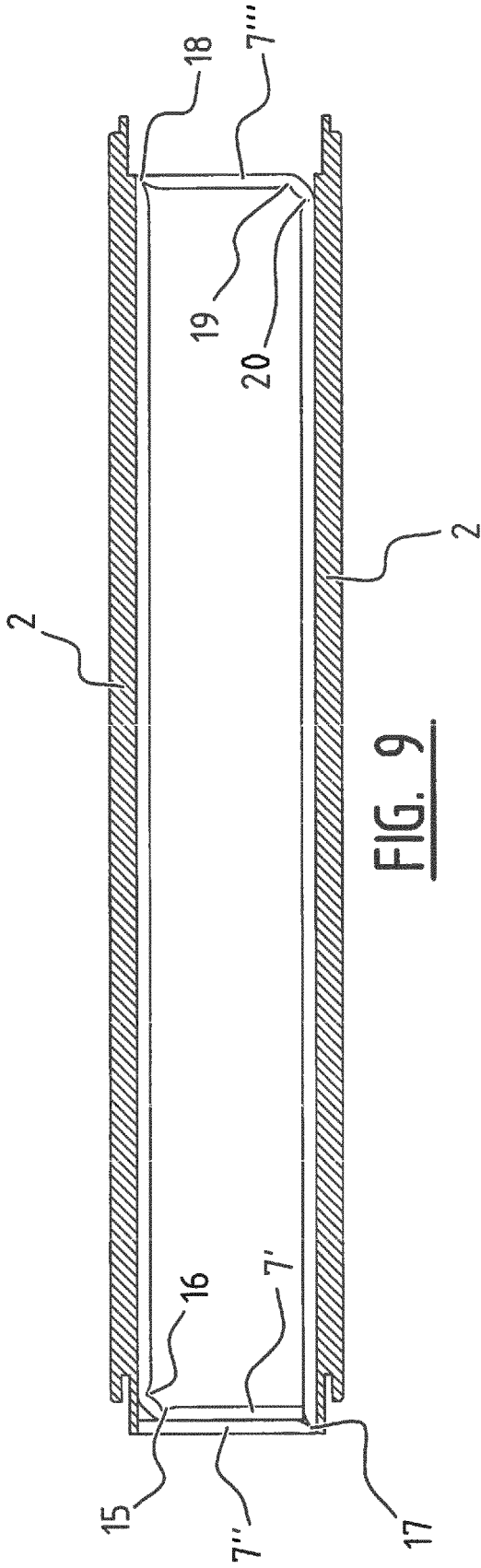


FIG. 9

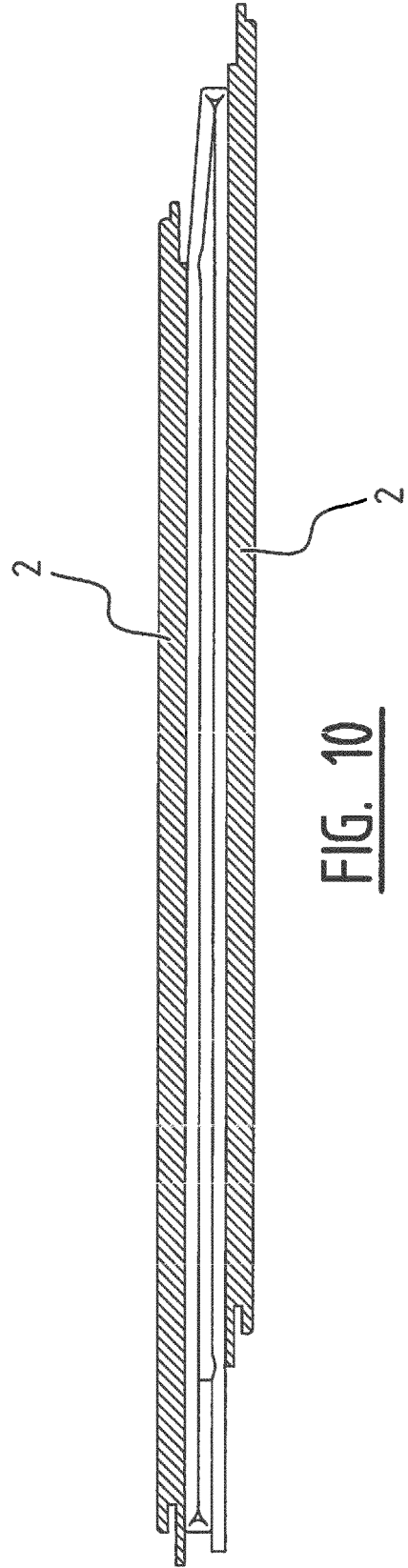
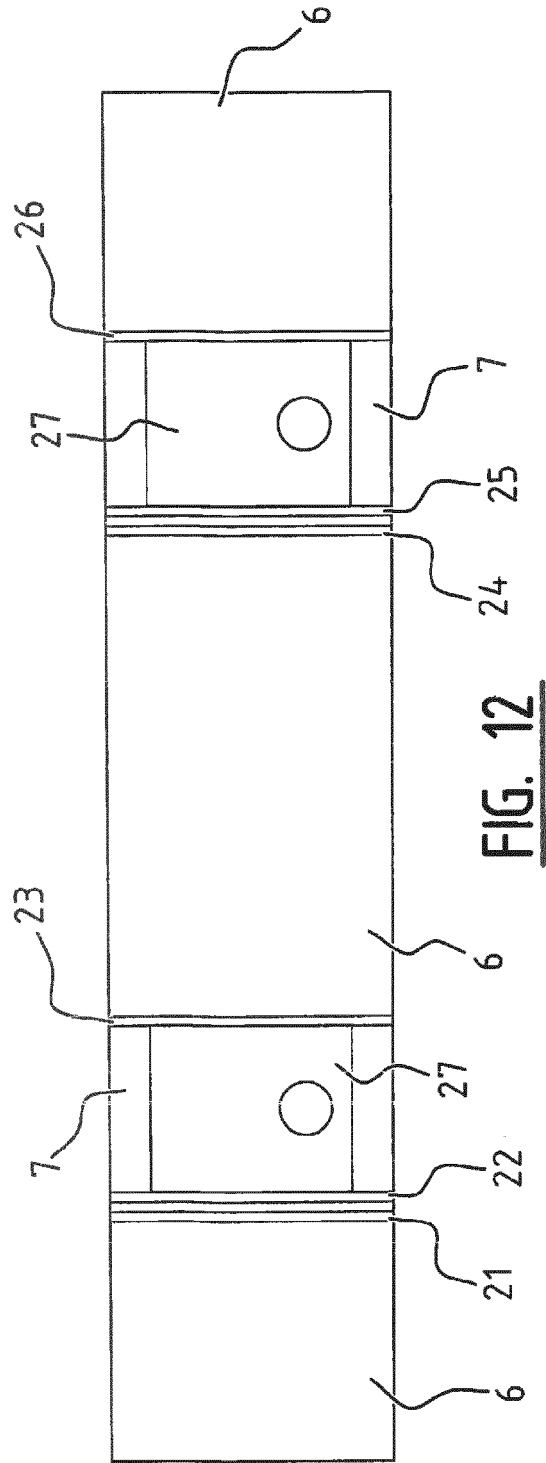
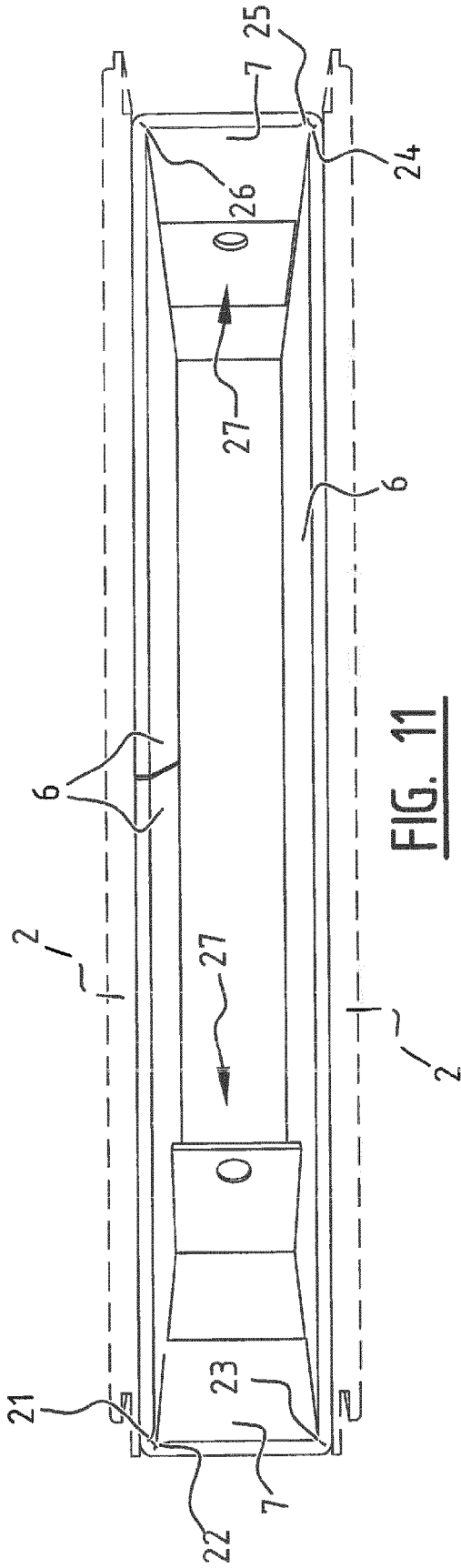


FIG. 10



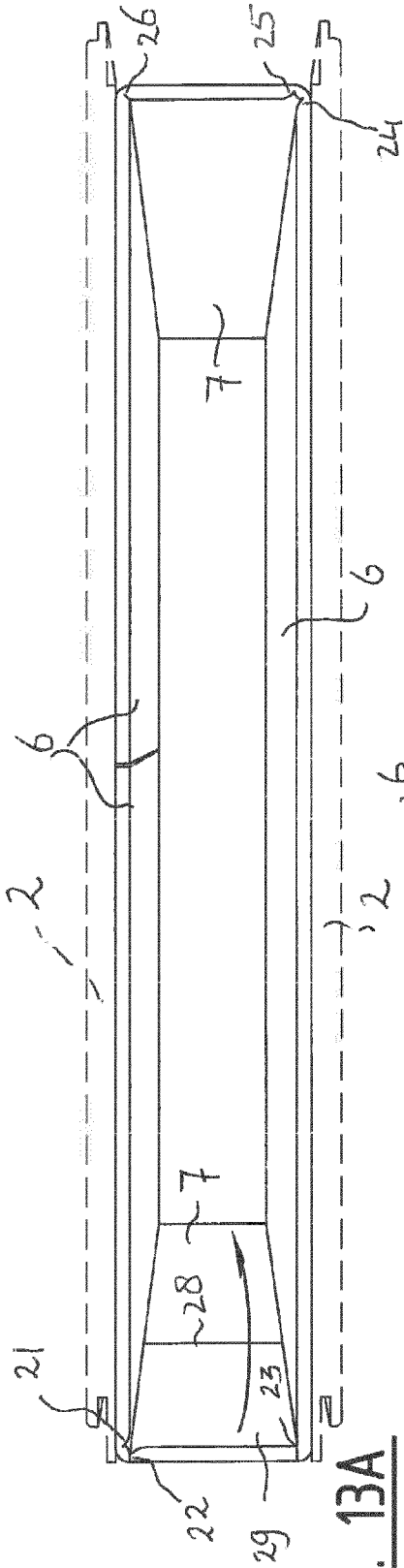


FIG. 13A

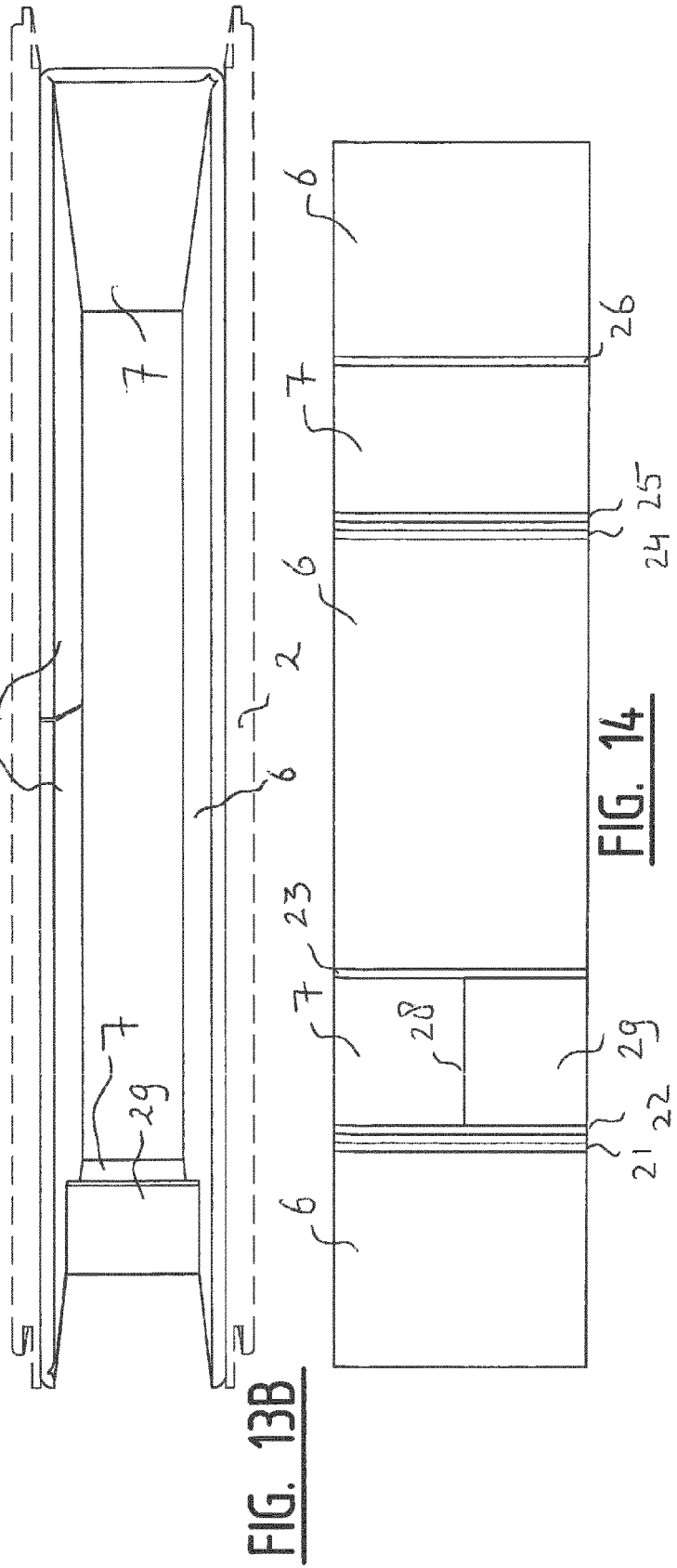


FIG. 13B

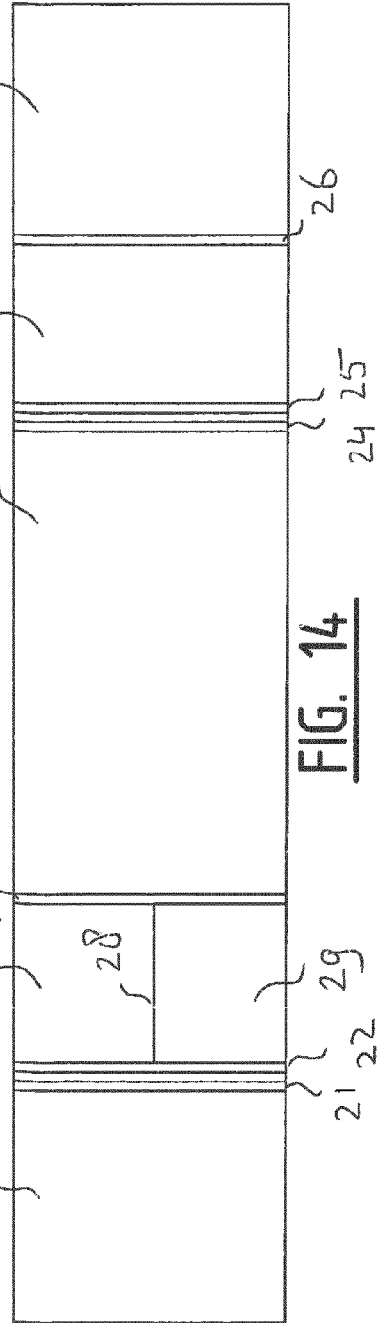


FIG. 14

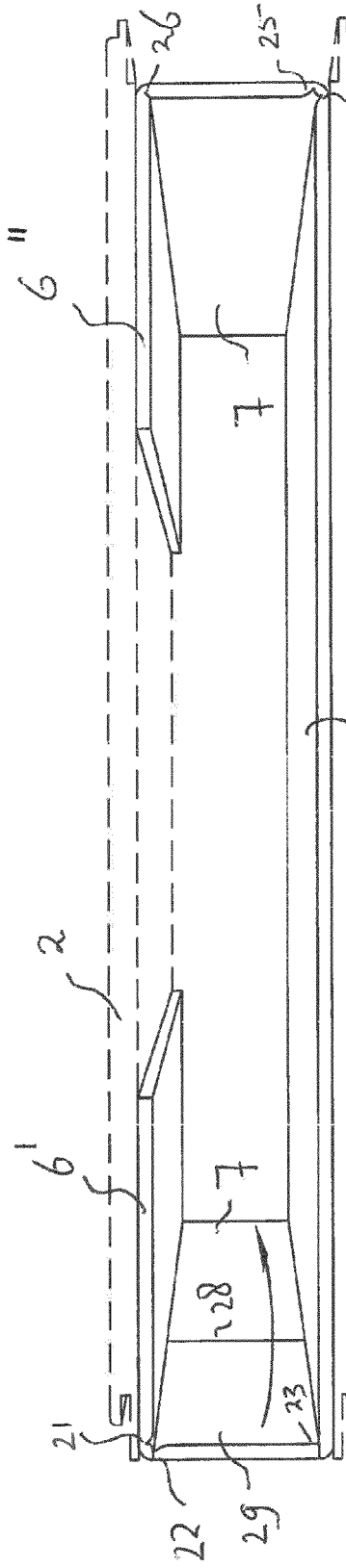


FIG. 15A

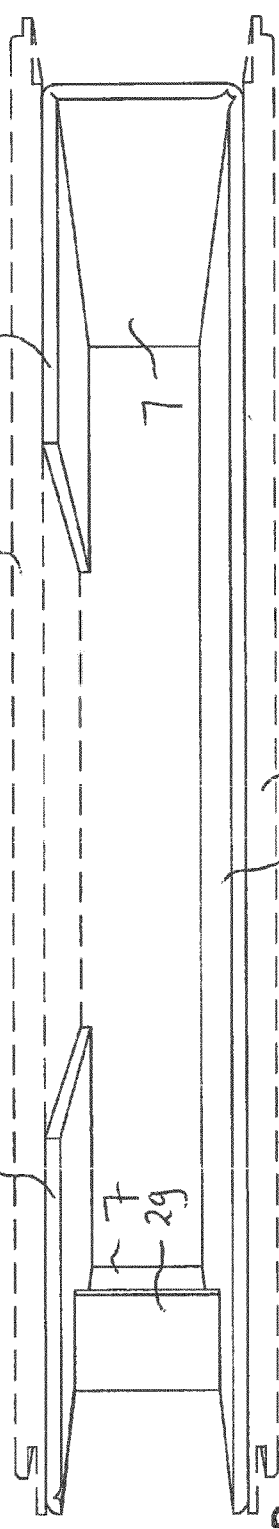


FIG. 15B

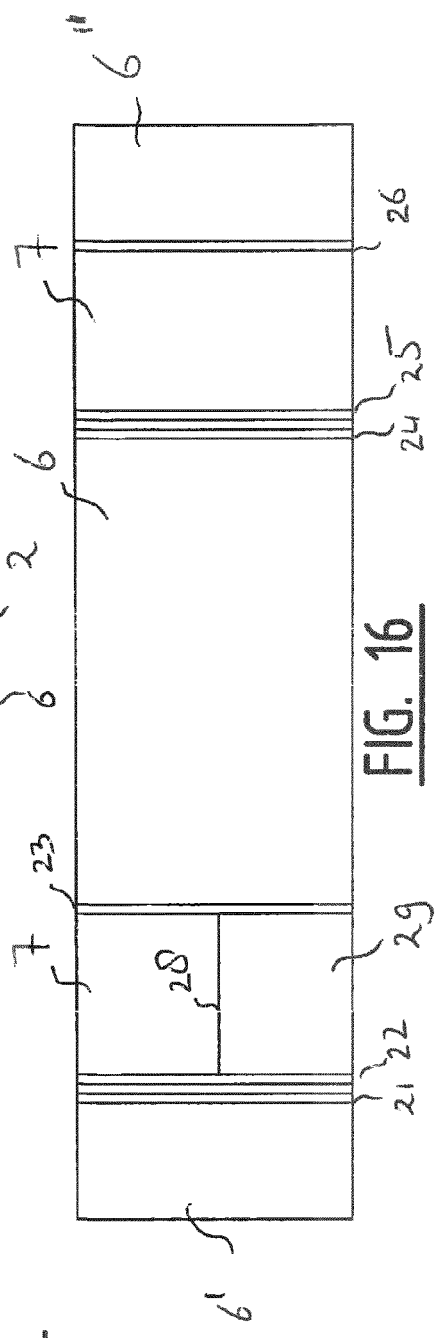


FIG. 16



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Application Number
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 27 February 2014	Examiner Galanti, Flavio
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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