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(54) **Door, panel for a door and method of manufacturing a panel**

(57) Door which can be moved in vertical direction, comprising at least two substantially rectangular panels (3) which extend in horizontal direction over substantially the width of the door (2) and which are connected for mutual pivoting. The panels (3) extend in closed position of the door (2) in a substantially vertical plane wherein the upper panel (3) rests on the panel (3) located there-under. The panels (3) comprise plates (7,8) between which foam (9) is arranged. The plates (7,8) have a corrugated cross-section.

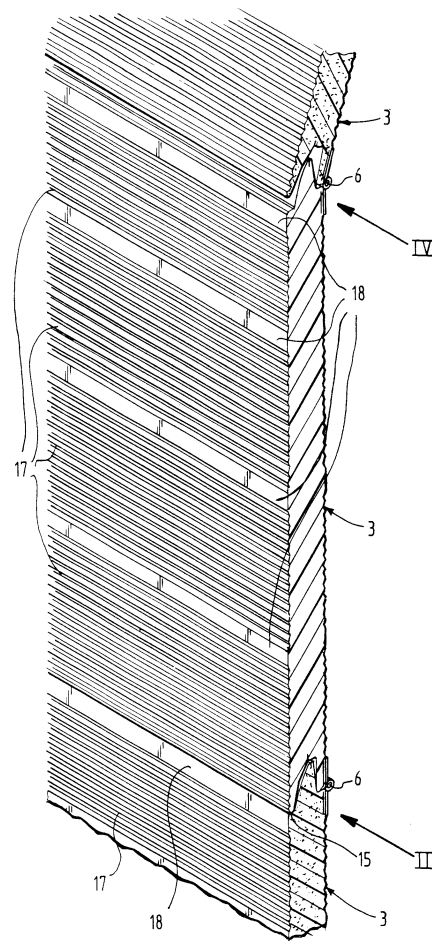


FIG. 2

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Description

[0001] The invention relates to a door which can be moved in vertical direction, comprising at least two substantially rectangular panels which extend in horizontal direction over substantially the width of the door and which are connected for mutual pivoting, which panels extend in closed position of the door in a substantially vertical plane wherein the upper panel rests on the panel located thereunder, wherein at least one panel is provided on both its outer surface and its inner surface with a plate, i.e. material shaped as a layer, which plates have outer sides which coincide with the outer respectively inner surface of the panel and have inner sides which are mutually facing, wherein at least one of the plates is manufactured from a first material, between which plates a second material is arranged.

[0002] Such doors can be used to close off larger passages, wherein in the opened position the door extends in a horizontal plane above the passage. During closing the panels, which are guided in rails on either side of the passage, are tilted, starting with the bottom panel. During the tilting the panels pivot relative to each other.

[0003] The inner surface of the panel lies on the side of the door which is directed toward the side where the opened door is situated and the outer surface on the other side of the panel which is generally directed outward when the door is arranged in the outside wall of a building.

[0004] In such a door the panels must have a great strength in order to also achieve sufficient rigidity of the door in the case of wider doors where long panels are used. The panels therefore preferably have a relatively great thickness. So as to nevertheless limit the weight of the door, the panels are constructed from two plates between which a light material, for instance foam, is arranged. The panels thereby have a relatively low weight but are extremely rigid.

[0005] When the door is closed the panels rest one on top of another, so that the lower panels in particular are pushed against each other with a relatively great force. It is important here that the panels fit together properly, so that they make mutual contact with a sufficiently large surface area, thereby limiting the surface pressure. In order to achieve this, the form and dimension of the panel must meet high standards.

[0006] The invention has for its object to provide a door wherein, when door is closed, the panels fit together well and/or wherein the rigidity of the panels in width direction of the door, i.e. in longitudinal direction of the panel, is increased.

For this purpose according to the invention said second material is more flexible than said first material, wherein in a vertical cross-section perpendicularly of the panel the plate of the first material has at least locally a corrugated form. In preference the first material is metal and/or the second material is a foam.

[0007] Preferably the corrugated form is composed by

horizontal extending straight ribs. By giving the plate forming the surface of the panel a corrugated form the plate becomes more rigid in the direction of the corrugations, while in the direction perpendicular thereto the rigidity is reduced. Both plates preferably have a corrugated form.

[0008] In the plane of the plate forming the surface of the panel the plate has a certain flexibility in a direction perpendicular to the corrugations. The panel thereby has a greater rigidity in longitudinal direction but is flexible in transverse direction such that the panels can always fit together well, even if the dimensioning is slightly inaccurate.

[0009] The corrugated form is preferably such that the inner side of the plate locally extends further outward relative to the panel than parts of the outer side of the plate. This means that the height of the corrugation is greater than the thickness of the plate. This will be further elucidated with reference to the embodiment.

[0010] In a preferred embodiment the corrugated form is a zigzag shape with substantially flat parts of the plate between bent parts of the plate. Such a plate is simple to manufacture.

[0011] Both plates preferably have at least locally a corrugated form and both plates are manufactured from said first material, preferably metal.

[0012] In a preferred embodiment the plate has a corrugated form over a number of strips extending in horizontal direction. Preferably two or more such strips are present on a plate, and aside each strip a flat portion is present. In a preferred embodiment such flat portion extends along the upper edge of a panel. Thereby it is hard to see the individual panels when the door is closed. So, the closed door looks like a door made out of one piece material, i.e. stronger than it is in fact.

[0013] The invention further relates to a panel for a door, which panel is provided on both its outer surface and its inner surface with a plate, wherein the plates have outer sides which coincide with the outer respectively the inner surface of the panel and have inner sides which are mutually facing, wherein at least one of the plates is manufactured from a first material, between which plates is arranged a second material which is more flexible than said first material, wherein the plate of the first material has at least locally a corrugated form in a cross-section perpendicularly of the panel.

[0014] The invention also relates to a method of manufacturing a panel for a door, wherein between two plates, wherein at least one of the plates is manufactured from a first material, is arranged a second material which is more flexible than said first material, wherein the plate of the first material has at least locally a corrugated form in a cross-section perpendicularly of the panel.

[0015] For the purpose of elucidating the invention an embodiment of a door will be described with reference to the drawing.

[0016] Figure 1 shows schematically a door in per-

spective view; figure 2 shows a part of a door in perspective view; figures 3 and 4 are cross-sections at the position of the connection between two panels of the door, and figure 5 shows a detail of figure 3.

[0017] The figures are only schematic representations of the embodiment.

[0018] Figure 1 shows a wall 1 with a rectangular opening with vertical edges 5 in which is arranged a door 2. Door 2 comprises panels 3 which extend in horizontal direction over the entire width of door 2. Each panel 3 is provided at each end with a guide wheel 4, which guide wheels 4 are only shown in figure 1 on the right-hand side of door 2.

[0019] Guide wheels 4 run in rails (not shown) which extend along the vertical edges 5 of the opening and bend toward horizontal parts close to the upper part of the opening. Door 2 can thereby be displaced between a closed position, wherein panels 3 of door 2 close off the opening, and an opened position wherein panels 3 of door 2 are displaced along the rail such that they extend in a horizontal plane located above the opening.

[0020] During displacement of door 2 from the closed to the open position and vice versa, the panels 3 pivot mutually, for which purpose they are mutually connected with hinges 6 (see figures 2-4). In the closed position of door 2 the panels 3 rest on each other.

[0021] Figure 2 shows a part of three panels 3. The lower two panels 3 are lying in the same plane and upper panel 3 makes an angle with the panel 3 situated thereunder.

[0022] According to figure 2 the outer side of the door 2 has a corrugated surface located in strips 17 and aside each strip there is a flat portion 18. One of the flat portions 18 extends along the upper edge of panel 3. When the door is closed it is hard to see where the panels 3 join each other.

[0023] Figures 3 and 4 show parts of two panels 3 at the position of hinge 6. In figure 3 the panels 3 lie in the same plane and in figure 4 they are placed at an angle.

[0024] Each panel 3 comprises two metal plates 7,8 between which is arranged foam material 9. Plates 7,8 are bent inward (towards one another) close to their edges and fixed to one another, this being indicated with reference numeral 10. This fixing can be a glue connection or can be effected with other clamping or connecting means. Plates 7,8 can also be fixed by the foam material 9 present between plates 7,8, so that no additional connecting means are necessary.

[0025] As shown in figures 3 and 4, upper panel 3 has on its edge a recess 11 into which extends a protruding part 12 of lower panel 3.

[0026] Hinge 6 is fixed against the inner surfaces of the two panels 3 by means of screws 13. The inner surface of panel 3 is understood to mean the side which is situated on the inside when the door is arranged in outer wall 1 of a building. This is the side where door 2 is situated in its open position.

[0027] As can be seen in figure 3, the two panels 3

rest on each other close to the inner surface where the plates 8 make mutual contact and close to the outer surface where plates 7 make mutual contact. These positions are indicated in figure 3 with reference numerals 14 respectively 15.

[0028] Metal plate 7 on the outer surface of each panel 3 and metal plate 8 on the inner surface of each panel 3 have a corrugated form in cross-section, at least over a part of the surface. Figure 5 shows that the height of the corrugation (h) is greater than the thickness (w) of the plate.

[0029] The corrugated form of plates 7,8 results in plate 7,8, and therewith panel 3, having a greater rigidity. There moreover results a certain flexibility in vertical direction (in closed position of the door) so that even in the case of small variations the panels 3 situated one above another can also support on each other at the positions indicated with reference numerals 14 and 15 in figure 3.

Claims

1. Door which can be moved in vertical direction, comprising at least two substantially rectangular panels (3) which extend in horizontal direction over substantially the width of the door (2) and which are connected for mutual pivoting, which panels (3) extend in closed position of the door (2) in a substantially vertical plane wherein the upper panel (3) rests on the panel (3) located thereunder, wherein at least one panel (3) is provided on both its outer surface and its inner surface with a plate (7,8), which plates have outer sides which coincide with the outer respectively inner surface of the panel (3) and have inner sides which are mutually facing, wherein at least one of the plates (7,8) is manufactured from a first material, between which plates (7,8) a second material (9) is arranged, which second material is more flexible than said first material, wherein in a vertical cross-section perpendicularly of the panel (3) the plate (7,8) of the first material has at least locally a corrugated form.
2. Door according to claim 1, characterized in that the corrugated form is composed by substantially horizontal extending straight ribs.
3. Door according to any of the preceding claims, characterized in that the corrugated form is such that the inner side of the plate (7,8) locally extends further outward relative to the panel (3) than parts of the outer side of the plate (7,8).
4. Door according to any of the preceding claims, characterized in that the corrugated form is a zigzag shape with substantially flat parts of the plate (7,8) between bent parts of the plate (7,8).

5. Door according to any of the preceding claims, characterized in that both plates (7,8) have locally a corrugated form.
6. Door according to any of the preceding claims, characterized in that both plates (7,8) are manufactured from said first material, preferably metal. 5
7. Door according to any of the preceding claims, characterized in that the plate (7,8) has a corrugated form over a number of strips (17) extending in horizontal direction and that aside each strip (17) a flat portion (18) is present. 10
8. Door according to claim 7, characterized in that said flat portion (18) extends along the upper edge of a panel (3). 15
9. Panel for a door (2) as claimed in any of the preceding claims, characterized in that the panel (3) is provided on both its outer surface and its inner surface with a plate (7,8), wherein the plates (7,8) have outer sides which coincide with the outer respectively the inner surface of the panel (3) and have inner sides which are mutually facing, wherein at least one of the plates (7,8) is manufactured from a first material, between which plates (7,8) is arranged a second material (9) which is more flexible than said first material, wherein the plate (7,8) of the first material has at least locally a corrugated form in a cross-section perpendicularly of the panel (3). 20 25 30
10. Method of manufacturing a panel (3) for a door (2) as claimed in any of the claims 1-8, characterized in that between two plates (7,8), wherein at least one of the plates (7,8) is manufactured from a first material, is arranged a second material (9) which is more flexible than said first material, wherein the plate (7,8) of the first material has at least locally a corrugated form in a cross-section perpendicularly of the panel (3). 35 40

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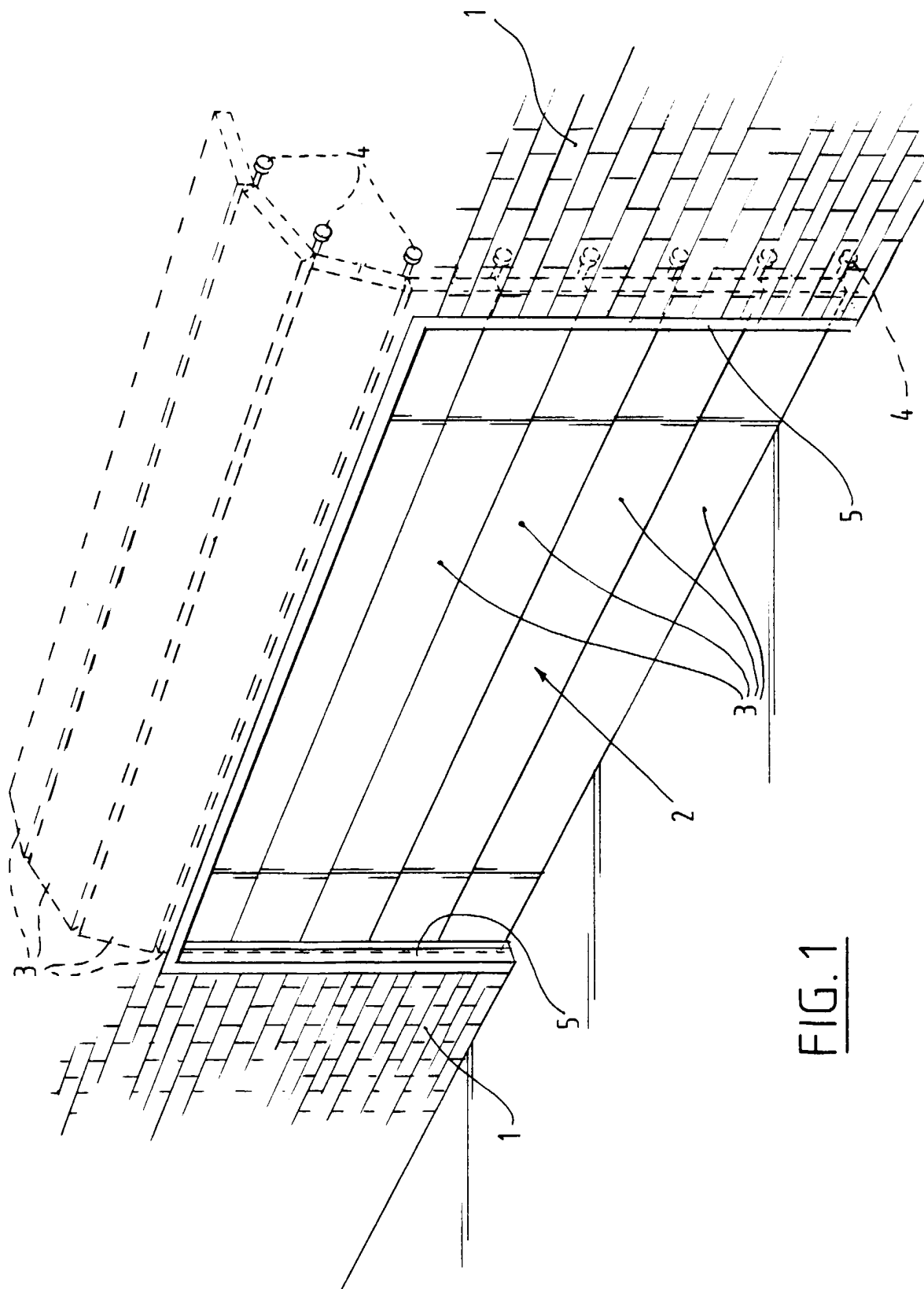


FIG. 1

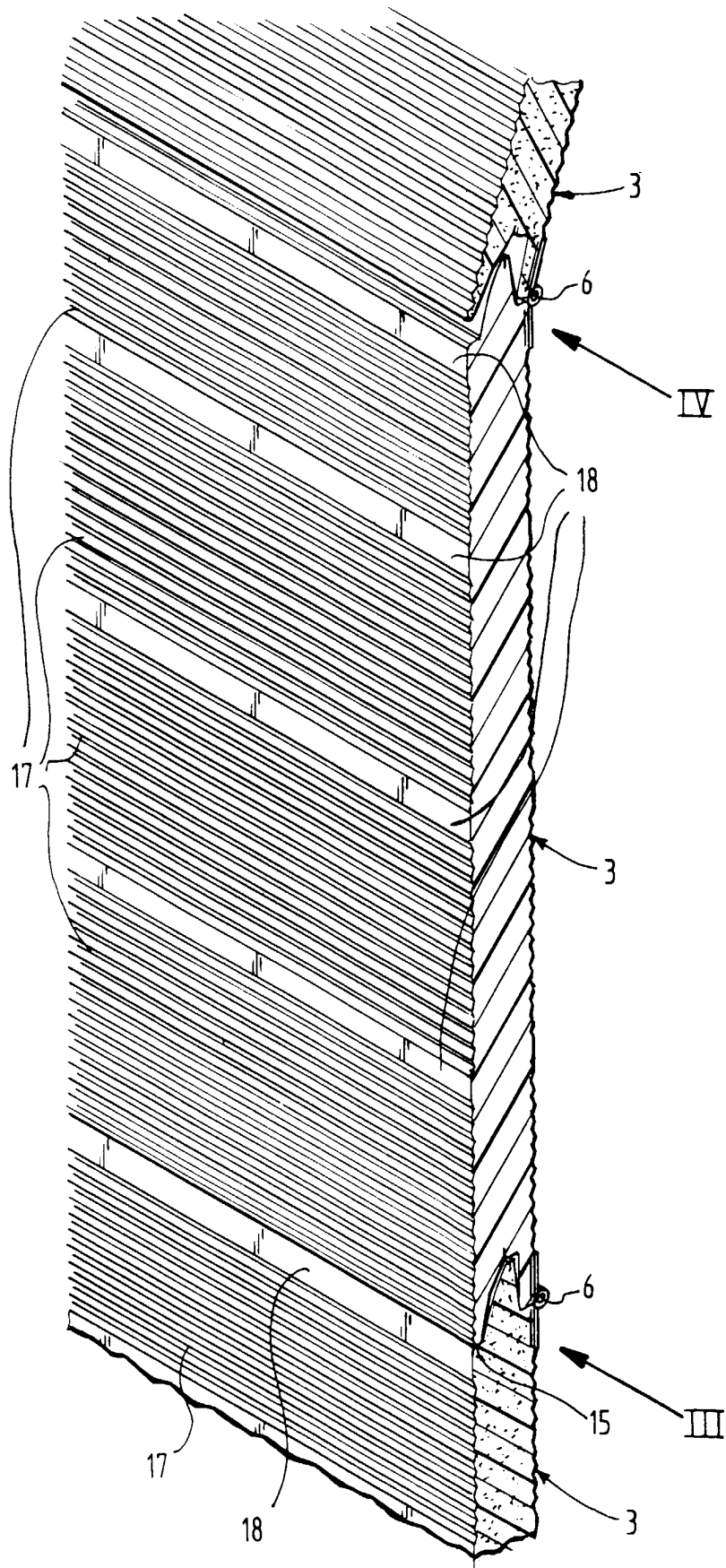


FIG. 2

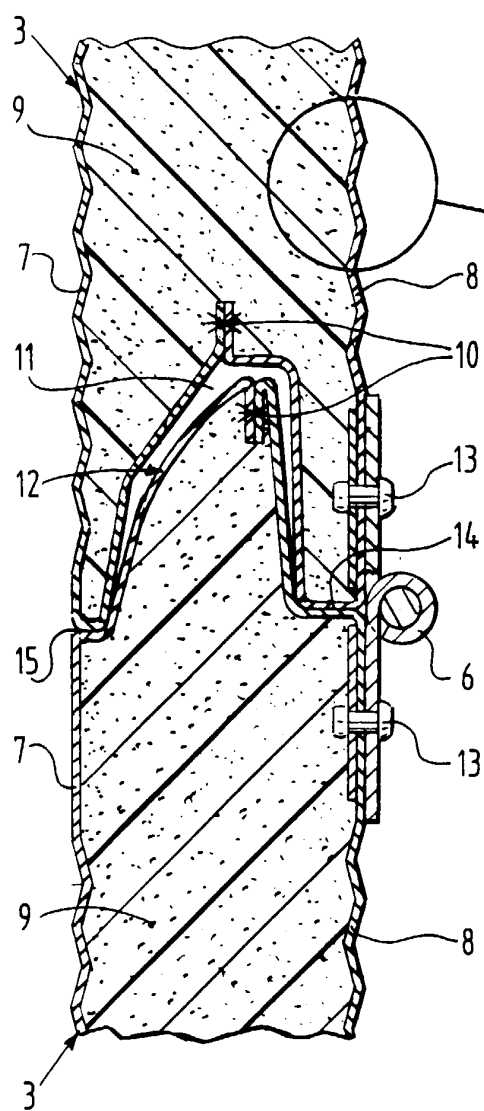


FIG. 3

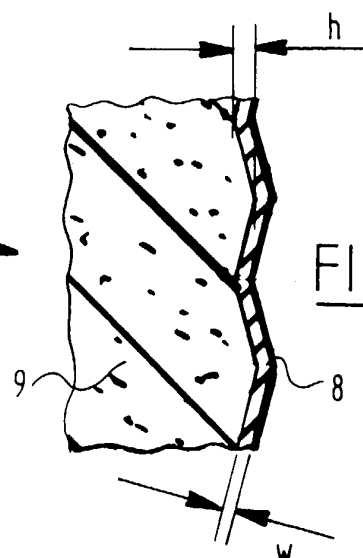


FIG. 5

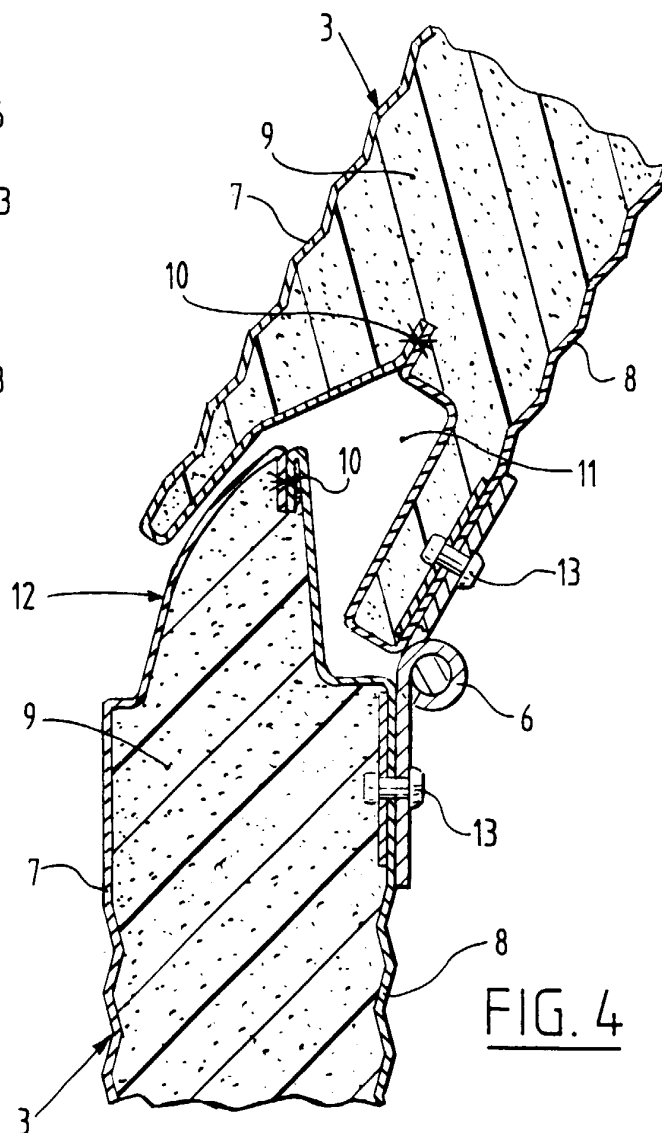


FIG. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 99 20 3469

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X	EP 0 370 376 A (HOERMANN KG) 30 May 1990 (1990-05-30) * column 3, line 42 - line 57 * * column 6, line 20 - line 51 * * column 9, line 48 - column 10, line 21 * * figures *	1-3, 6, 9, 10	
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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 15 March 2000	Examiner Depoorter, F
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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