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(54) **An assembly comprising a panel and a section, as well as a spring element, a panel, a section and a form strip suitable for being used in such an assembly**

(57) An assembly comprising at least one panel (5), which is provided with parallel first and second main surfaces (13,11), which assembly furthermore comprises at least one section (9) extending parallel to the main surfaces (13,11). The panel (5) is provided with at least one opening (15), which comprises a blind recess (17) extending transversely to the second main surface (11) of the panel (5) and a slot (19) positioned substantially parallel between the main surfaces (13,11) and extending from the recess (17). The panel (5) is connected to the section (9) by means of at least one spring element (7), which on the one hand comprises a supporting part (27) positioned within the slot (19) and extending parallel to the second main surface (11), and which on the other hand comprises a spring part (29) extending substantially transversely to the second main surface (11). The spring part (29) is in engagement with the section (9) under spring force. The spring part (29) comprises a first intermediate part, which extends substantially perpendicularly to the supporting part, and with an end part (27), which is connected to the end of the intermediate part remote from the supporting part (27), which end part includes an acute angle with the intermediate part.

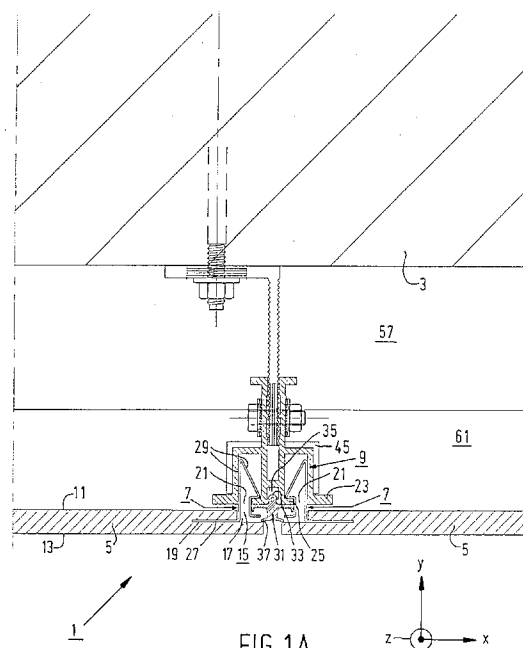


FIG. 1A

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Description

The invention relates to an assembly comprising at least one panel, which is provided with parallel first and second main surfaces, which assembly furthermore comprises at least one section extending parallel to said main surfaces, whereby the panel is provided with at least one opening, which comprises a blind recess extending transversely to the second main surface of the panel and a slot positioned substantially parallel between said main surfaces and extending from said recess, whereby said panel is connected to said section by means of at least one spring element, which on the one hand comprises a supporting part positioned within said slot and extending parallel to said second main surface, and which on the other hand comprises a spring part extending substantially transversely to said second main surface, whereby said spring part is in engagement with said section under spring force.

The invention furthermore relates to a spring element, a panel, a section and a form strip suitable for being used in such an assembly.

Assemblies of this type are for example used in mounting cladding panels on an outside wall of a building.

With a similar assembly known from DE-A1-28.48.432 the spring element comprises a supporting part and a spring part extending transversely thereto. The spring part comprises a bent part, which engages in a recess in the section. The panel can be removed from the section in a simple manner by pulling at the end 27 of the panel. The bent part is then moved out of the recess in the section against spring force. The fact that the panel can be removed in a simple manner is disadvantageous, however, because the panel can thus be removed from the section by vandals or be blown from said section under the influence of strong wind forces. This is undesirable, of course.

With another known assembly the panels are secured to an outside wall by means of bolts or screws, whereby in some cases a lath profile is fixed to the outside wall first, in which lath profile said bolts or screws are secured. The first main surface thereby forms the finish of the outside wall, whilst the second main surface faces the outside wall. This finish must comply with certain aesthetic requirements, among other things. The drawback of using screws or bolts as fasteners is that the screws and bolts are exposed to view from the side of the first main surface, which affects the outward appearance of said first main surface.

With another known assembly the panels are glued to a lath profile mounted on the outside wall. Although the appearance of the main surface is not affected in this manner, it is not possible under all circumstances to mount cladding panels by means of an adhesive. In those circumstances the panels need to be secured to the outside wall by mechanical means.

With another known assembly two horizontal rows

of hooks are secured to the second main surface of the panel, which hooks are subsequently hooked to sections which are horizontally secured to the outside wall. Because a relatively high positioning precision of the hooks with respect to the panel is required, the hooks are secured to the panel at the factory already. This will lead to an increased dimension of the panel in the direction transversely to the main surfaces and thus also to an increased volume of the panels being transported from the factory.

The object of the invention is to provide an assembly wherein a panel is mechanically fastened to a section, in such a manner that the fastening is substantially hidden from view, seen from said first main surface, whilst avoiding the aforesaid drawbacks.

This objective is accomplished with an assembly according to the invention in that the spring part of said spring element is connected with said supporting part, whereby said spring part comprises a first intermediate part, which extends substantially perpendicularly to said supporting part, and with an end part, which is connected to the end of the intermediate part remote from said supporting part, said end part including an acute angle with said intermediate part.

When connecting the panel to the section the end part is pivoted towards the intermediate part against spring force. As soon as the spring element has reached the desired position in the section, the end part springs out again and comes into engagement with the section. Pulling at the panel will only result in a stronger connection between end part and section. The panel can only be removed by pivoting the end part against spring force towards the intermediate part, using a tool which is specially adapted for that purpose. In this manner a construction for securing a panel to a section is provided which can be mounted in a simple manner but which can only be removed by means of a special tool.

The panel is mechanically secured to the section by means of the spring element. The opening provided in the panel is not exposed to view from the first main surface, so that the appearance of the first main surface being exposed to view is not affected. The spring element may be inserted into the slot just before the panel is mounted on the section, so that the transport volume of the panels is not limited. The sections may be mounted on the outside wall both horizontally and vertically.

One embodiment of the assembly according to the invention is characterized in that said opening is positioned near an edge of the second main surface, whereby said slot is present in a side of the panel which extends transversely to the main surface.

Such an opening can be formed in the panel in a simple manner, for example by means of a cutter. Another advantage is the fact that it is possible to use sections which are positioned between two adjoining panels, whereby spring elements of the adjoining panels are in engagement with the same section. This leads to a reduction of the number of sections that are required.

The known assembly, which comprises hooks, requires at least two sections per panel at all times.

Another embodiment of the assembly according to the invention is characterized in that said recess and said slot comprise concentric cylindrical segments.

Such a recess and slot can be formed in the panel in a simple manner, for example by means of a form cutter. Such openings are locally formed in the panel. By making the spring elements so that they fit the recess and slot, it becomes possible to position the spring element with respect to the panel.

Another embodiment of the assembly according to the invention is characterized in that said spring element is positioned completely within said first main surface, seen in elevational view of the first main surface.

As a result of this the spring element is not exposed to view from the first main surface.

Yet another embodiment of the assembly according to the invention is characterized in that the contact area between the supporting part of said spring element and the slot surface is maximized.

The result of this is that the force of gravity exerted on the panel is transmitted to the section in an optimal manner.

Another embodiment of the assembly according to the invention is characterized in that the end part of said spring element is provided with fastening means, which are in engagement with said section under spring force and which can be disengaged from said section against spring force.

The fastening means form an additional solid attachment of the panel to the section.

Yet another embodiment of the assembly according to the invention is characterized in that said section is provided with two parallel openings, in which spring elements of adjoining panels are positioned.

On average each panel is supported by only one section in this manner.

Another embodiment of the assembly according to the invention is characterized in that said section is provided with a toothed fixing groove extending transversely to said main surface.

The spacing between the section and the outside wall to which the assembly is fixed can be adjusted by means of said toothed fixing groove.

Yet another embodiment of the assembly according to the invention is characterized in that said section is provided with at least one opening bounded by edges, into which opening said spring element is inserted, whereby the end part of said spring element is in engagement with a side of an edge facing away from the main surface.

In this manner a solid fastening is obtained.

Another embodiment of the assembly according to the invention is characterized in that the part of said section located between said parallel openings is provided with a form strip extending parallel to said openings, which form strip abuts against the second main surface

of the panel under elastic deformation.

The elastic form strip, which is for example made of rubber, functions to keep the panel at a slight distance from the other part of the section, so that play and dimensional tolerances can be offset.

The invention will be explained in more detail below with reference to the drawings, in which:

Figures 1A - 1B are plan views of cross-sections of the assembly according to the invention;

Figure 2 is a front view of a detail of the assembly shown in Figure 1B;

Figures 3A, 3B, 3C show a spring element and a panel of the assembly of Figure 1A in various positions;

Figures 4A - 4E are details of the assembly shown in Figures 1A and 1B;

Figures 5A - 5B show further embodiments of a spring element according to the invention;

Figures 6A - 6B show yet further embodiments of a spring element according to the invention;

Figure 7 shows a device for forming an opening in a panel according to the invention;

Figures 8A and 8B are a plan view and a front view respectively of a supporting element;

Figures 11A, 11B and 11C show toothed sections; and

Figure 12 is a plan view of a cross-section of another assembly according to the invention.

In the Figures like parts are numbered alike.

Figures 1A and 1B each show a plan view of a cross-section of an assembly 1 mounted on an outside wall 3 of a building (not shown). The assembly 1 is provided with rectangular panels 5 made of plastic material, wood, or stone or a combination of these materials, which panels are attached by means of spring elements 7 to an aluminium section 9 extending in vertical z-direction. Figure 1A shows a section different from that of Figure 1B in order to illustrate various details of the assembly 1 more clearly. Panel 5 is provided with a first main surface 13 (exposed to view) and a second main surface 11, whereby an opening 15 is provided in said second main surface 11, which opening 15 comprises a recess 17 extending transversely to the second main surface 11 and a slot 19 positioned substantially parallel between said main surfaces. Each panel 5 has four openings 15, which are positioned in pairs on parallel sides of the panel 5.

Section 9 is provided with two parallel openings 21 extending in z-direction, said openings being bounded by edges 23, 25 of section 9. Section 9 is symmetrical with respect to a plane which is parallel to the z-axis and the y-axis.

Spring element 7 is provided with a supporting part 27, which is positioned within slot 19 and which extends parallel to the second main surface 11, and with a spring part 29, which extends substantially transversely to said

second main surface 11. Spring part 29 engages the edges 23, 25 of the section under spring force, whereby part of said spring part 29 is in engagement with a side of the edge 25 facing away from said second main surface 11. By moving spring part 29 against spring force in a direction opposite the x-direction it becomes possible to remove spring element 7 from the opening and to remove the panel from section 9, for example for repairs or replacement.

Section 9 is provided with a form strip 31 extending in z-direction, said form strip engaging in a slot 35 in section 9 under elastic deformation, by means of teeth 33. The form strip 31 of plastic material is furthermore provided with four projections 37 extending in z-direction, which abut against panels 5 under elastic deformation and which keep the panels spaced apart from the aluminium section.

Seen in z-direction, the panels 5 are supported by means of supporting elements 39, which supporting elements are illustrated more clearly in Figures 2, 8A and 8B. The supporting element 39 is positioned with a protrusion 41 within one of the regularly spaced-apart holes 43 provided in z-direction in section 9.

The sections 9 are interconnected in z-direction by means of U-shaped section 45, which is positioned within recesses (not shown) in sections 9 at the location of a transition from one section 9 to another.

Section 9 is provided with a toothed fixing groove 47 extending transversely to the main surface, said groove being in engagement with a toothed angle section 49, which is fixed to outside wall 3 by means of a bolt 51. The teeth enable a stepped adjustment in y-direction of section 9 with respect to the outside wall 3. After being adjusted section 9 is fixed with respect to angle section 49 by means of a bolt 53 and a nut 55.

A layer of insulation material 57 and a layer of air 61 are present between panels 5 and outside wall 3, as a result of which a satisfactory insulation and ventilation between panels 5 and outside wall 3 is obtained.

Figure 2 shows a cross-section of a front view of a supporting element 39 of the assembly 1 shown in Figures 1A and 1B. Supporting element 39 will be explained in more detail with reference to Figures 8A and 8B.

Figures 3A - 3C show various positions of the spring element 7 and the panel 5 of the assembly 1 illustrated in Figure 1A, Figures 3A and 3B showing a perspective rear view and perspective front view respectively of a panel 5 in non-assembled condition and a spring element 7, and Figure 3C showing a perspective rear view of a panel 5 with a spring element 7 inserted therein. The spring element 7 comprises the spring part 27, which is connected to an intermediate part 63 via flanged edges 65. The end of intermediate part 63 remote from supporting part 27 is connected, via a flanged edge 67, to an end part 69, which includes an acute angle with intermediate part 63. End part 69 is provided with a U-shaped part 71, which serves as a fastening means and which, in the situation shown in Figure 1A, is in en-

gagement with the edge 25 of section 9. The spring element 9 is furthermore provided with a recess 73, as a result of which end part 69 and U-shaped part 71 can be moved against spring force in the direction of supporting part 27 over a greater distance than would be possible if said recess were not present. The spring element 7 is made of a metal sheet, out of which element 7 is first cut and subsequently folded.

Figures 4A and 4C show a side view and a front view respectively of the spring element 7.

Figure 4B shows a section of a rear view of a part of the assembly 1 illustrated in Figure 1, showing panel 5 and the spring element 7 inserted therein. Opening 15 is provided with the recess 17 and the slot 19, which comprise concentric cylindrical segments. The height of the slot 19 in y-direction is slightly greater than the thickness of the supporting part 27, so that supporting part 27 can be inserted in slot 19 to fit therein. An optimum transmission of forces is obtained by maximizing the contact area of abutment between supporting part 27 and slot 19. Seen in elevational view of the first main surface 13, the spring element 7 is completely positioned within said first main surface 13, as a result of which the spring element 7 is not exposed to view from the side of said first main surface 13.

Figure 4D is a plan view of section 9.

Figure 4E is a plan view of an assembly 1 in assembled condition, wherein the spring elements 7 are inserted in the slots 19 of the openings 15 of the panels 5, and whereby subsequently panels 5 are secured to section 9 by means of spring elements 7, because spring elements 7 are inserted into openings 21 under elastic deformation, whereby the U-shaped parts 71 engage around the edges 25 of section 9.

Figures 5A - 5B show other embodiments of a spring element according to the invention. By varying the shape and the type of material other desired spring characteristics of the spring element 7 may be obtained.

Figures 6A and 6B show another embodiment of a spring element 7 according to the invention, whereby supporting part 27 is provided with additional supporting parts 73, thus further enlarging the surface area located within slot 19.

Figure 7 shows a device 75 for forming an opening 15 in a panel 5 according to the invention. The device 75 is provided with two cutter blades 77, 79, whereby the first cutter blade 77 is intended for forming the slot 19 and the second cutter blade is intended for forming the blind recess 17. The cutter blades 77, 79 are mounted concentrically between a shaft 81 of diameter D and a spacer 83. In order to form opening 15, panel 5 is placed on a support 85, after which the device 75 is moved in a direction opposite the x-direction while rotating in R-direction, and recess 17 and slot 19 are formed in panel 5 by means of cutters 77, 79. When the diameter of cutters 77, 79 is constant the dimensions of opening 15 in x-direction and z-direction are determined by diameter D of shaft 81. The depth of the opening 15

in panel 5 can be varied by varying diameter D. When the same section 9 and the same spring elements 7 are used, the use of a shaft 81 having a different diameter D will result in a different distance between the panels 5 in x-direction.

Figures 8A and 8B show a supporting element 39 of plastic material, which is positioned in an opening 43 in the edge 23 of section 9 via a protrusion 87. The square supporting element 39 is provided with four studs 89 positioned in the corner points, which embrace both sides of edge 23 in pairs. At their side facing the second main surface 11 the studs 89 are provided with supporting caps 91, which abut under deformation against the second main surface 11 of the panels 5. The supporting element 39 is furthermore provided with a supporting beam 93, which is positioned eccentrically with respect to protrusion 87, and by means of which the panel can be positioned in z-direction. A different position in z-direction of the panel 5 is obtained by rotating the supporting element 39 in R-direction and securing said supporting element in a different position in edge 23.

Figures 9 and 10 show other embodiments of a form strip 31 according to the invention.

Figure 11A shows another embodiment of a fixing groove 47 of a section 9 according to the invention, wherein only a limited number of teeth are formed in groove 47.

Figures 11B and 11C show other embodiments of an angle section 49, whereby the angle section 49 shown in Figure 11B is provided with surface-mounted teeth and the angle section 49 shown in Figure 11C is provided with recessed teeth.

When the panels are mounted on the outside wall, the angle sections 49 are fixed to the outside wall first, then sections 9 are positioned on angle sections 49 and secured thereto, after which the panels with the spring elements provided therein are snapped into sections 9.

Figure 12 is a plan view of a section of an assembly 1, wherein the spacing between the panels 5 and the outside wall 3 is smaller than is the case in the assembly shown in Figures 1A and 1B. Section 9 is directly fixed to the outside wall by means of bolts 97.

The sections 9 may also be mounted horizontally instead of vertically, whereby the opening 15 may be formed in the entire side wall.

Besides being provided in the side wall, opening 15 may also be provided in the second main surface 11. The supporting element may also be secured in the second main surface.

Besides being cylindrical the openings 15 may also be rectangular, for example.

The panels may be outside wall panels, ceiling panels or floor panels.

Claims

1. An assembly comprising at least one panel, which is provided with parallel first and second main surfaces, which assembly furthermore comprises at least one section extending parallel to said main surfaces, whereby the panel is provided with at least one opening, which comprises a blind recess extending transversely to the second main surface of the panel and a slot positioned substantially parallel between said main surfaces and extending from said recess, whereby said panel is connected to said section by means of at least one spring element, which on the one hand comprises a supporting part positioned within said slot and extending parallel to said second main surface, and which on the other hand comprises a spring part extending substantially transversely to said second main surface, whereby said spring part is in engagement with said section under spring force, characterized in that the spring part of said spring element (7) is connected to said supporting part (27), whereby said spring part comprises a first intermediate part (63), which extends substantially perpendicularly to said supporting part, and with an end part (69), which is connected to the end of the intermediate part remote from said supporting part, said end part (69) including an acute angle with said intermediate part (63).
2. An assembly according to claim 1, characterized in that said section is provided with at least one opening bounded by edges, into which opening said spring element is inserted, whereby the end part of said spring element is in engagement with a side of an edge facing away from the main surface.
3. An assembly according to claim 1 or 2, characterized in that said opening is positioned near an edge of the second main surface, whereby said slot is present in a side of the panel which extends transversely to the main surface.
4. An assembly according to any one of the preceding claims, characterized in that said recess and said slot comprise concentric cylindrical segments.
5. An assembly according to any one of the preceding claims, characterized in that said spring element is positioned completely within said first main surface, seen in elevational view of the first main surface.
6. An assembly according to any one of the preceding claims, characterized in that the contact area between the supporting part of said spring element and the slot surface is maximized.
7. An assembly according to any one of the preceding

claims, characterized in that the end part of said spring element is provided with fastening means, which are in engagement with said section under spring force and which can be disengaged from said section against spring force.

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8. An assembly according to any one of the preceding claims, characterized in that said section is provided with two parallel openings, in which spring elements of adjoining panels are positioned.

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9. An assembly according to any one of the preceding claims, characterized in that said section is provided with a toothed fixing groove extending transversely to said main surface.

15

10. An assembly according to claim 8, characterized in that the part of said section located between said parallel openings is provided with a form strip extending parallel to said openings, which form strip abuts against the second main surface of the panel under elastic deformation.

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11. A spring element suitable for being used in an assembly according to any one of the preceding claims.

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12. A panel suitable for being used in an assembly according to any one of the preceding claims.

30

13. A section suitable for being used in an assembly according to any one of the preceding claims.

14. A form strip suitable for being used in an assembly according to any one of the preceding claims.

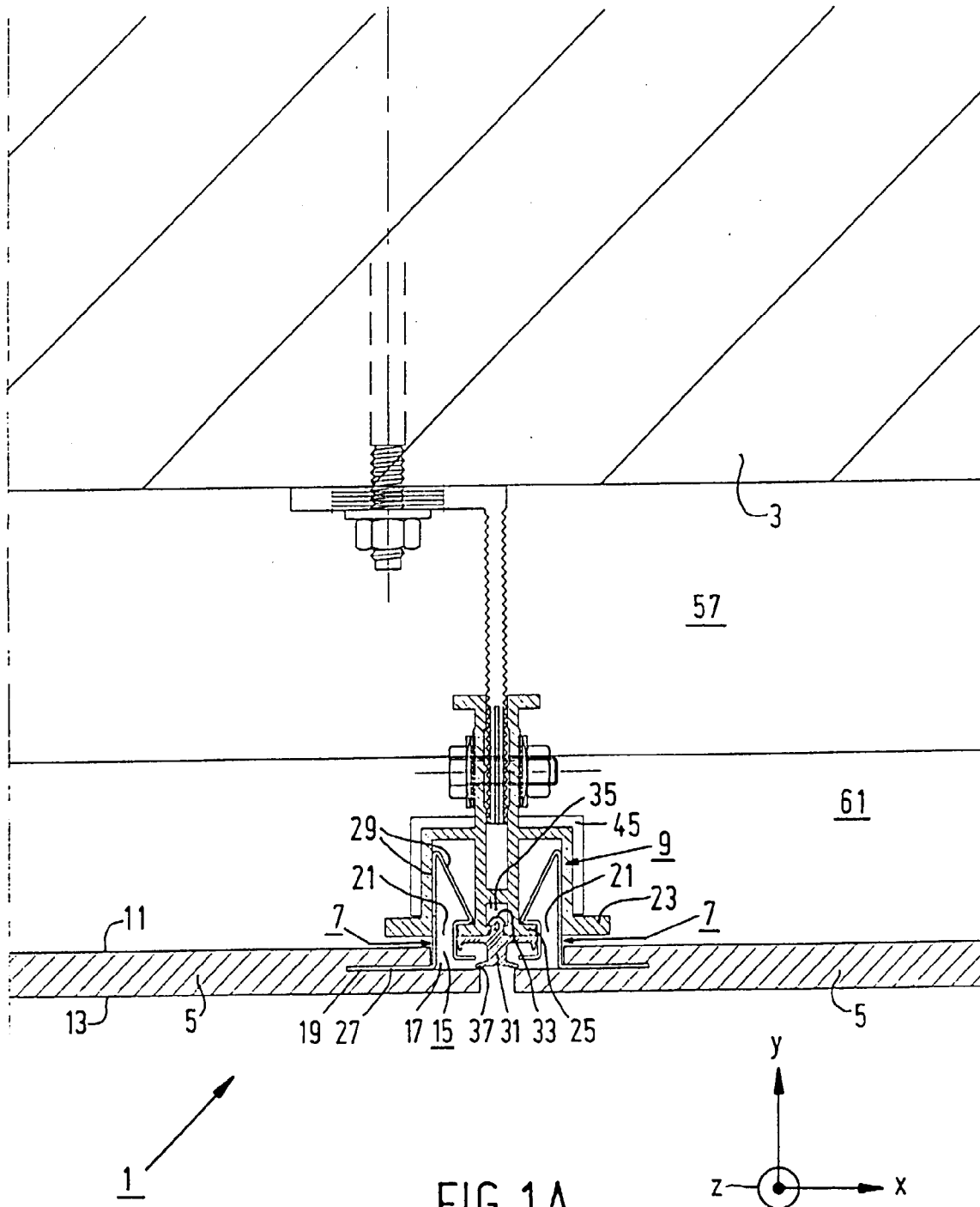
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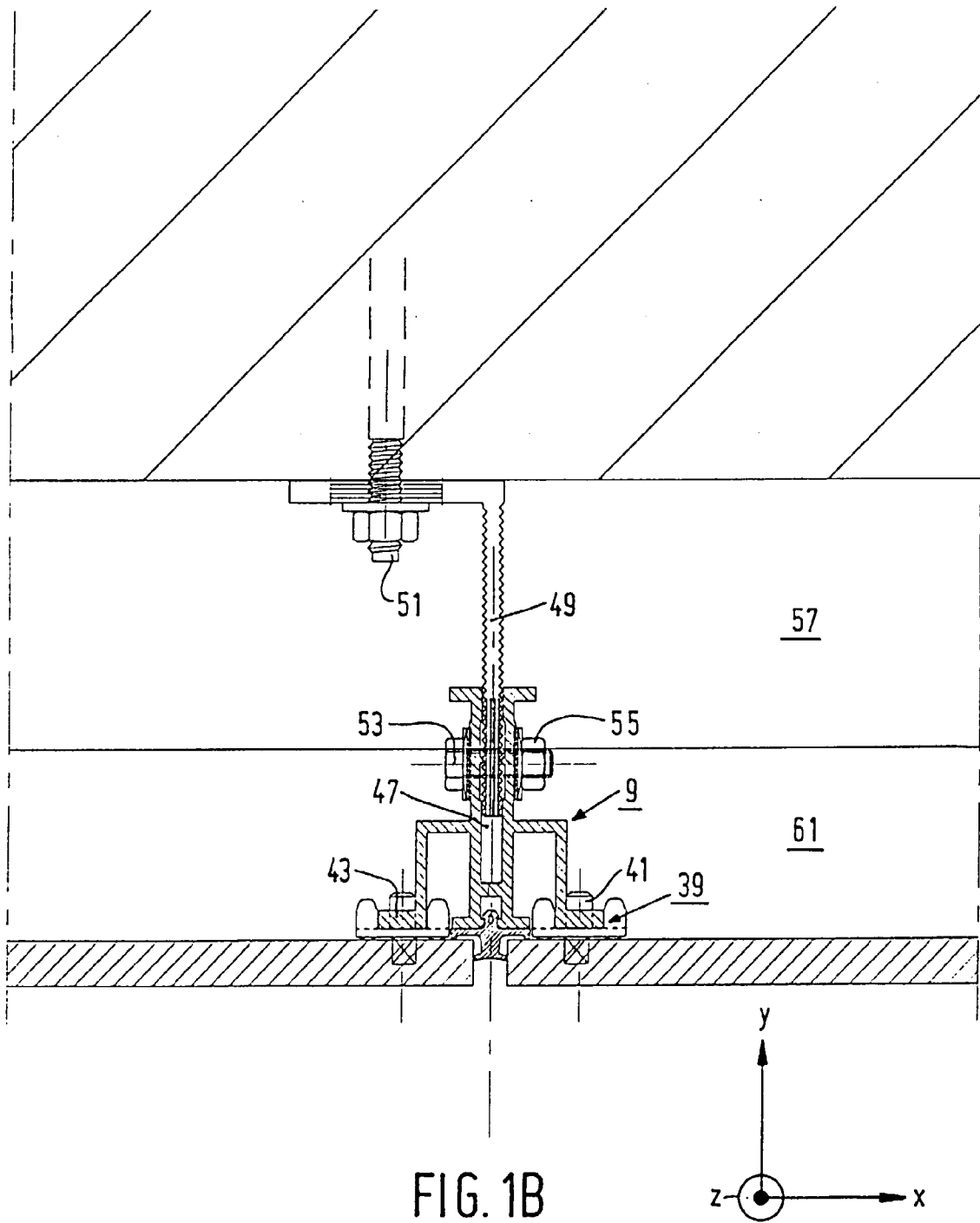
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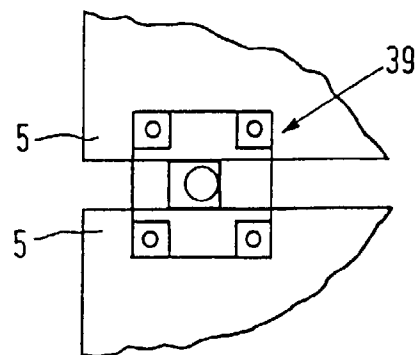


FIG. 2

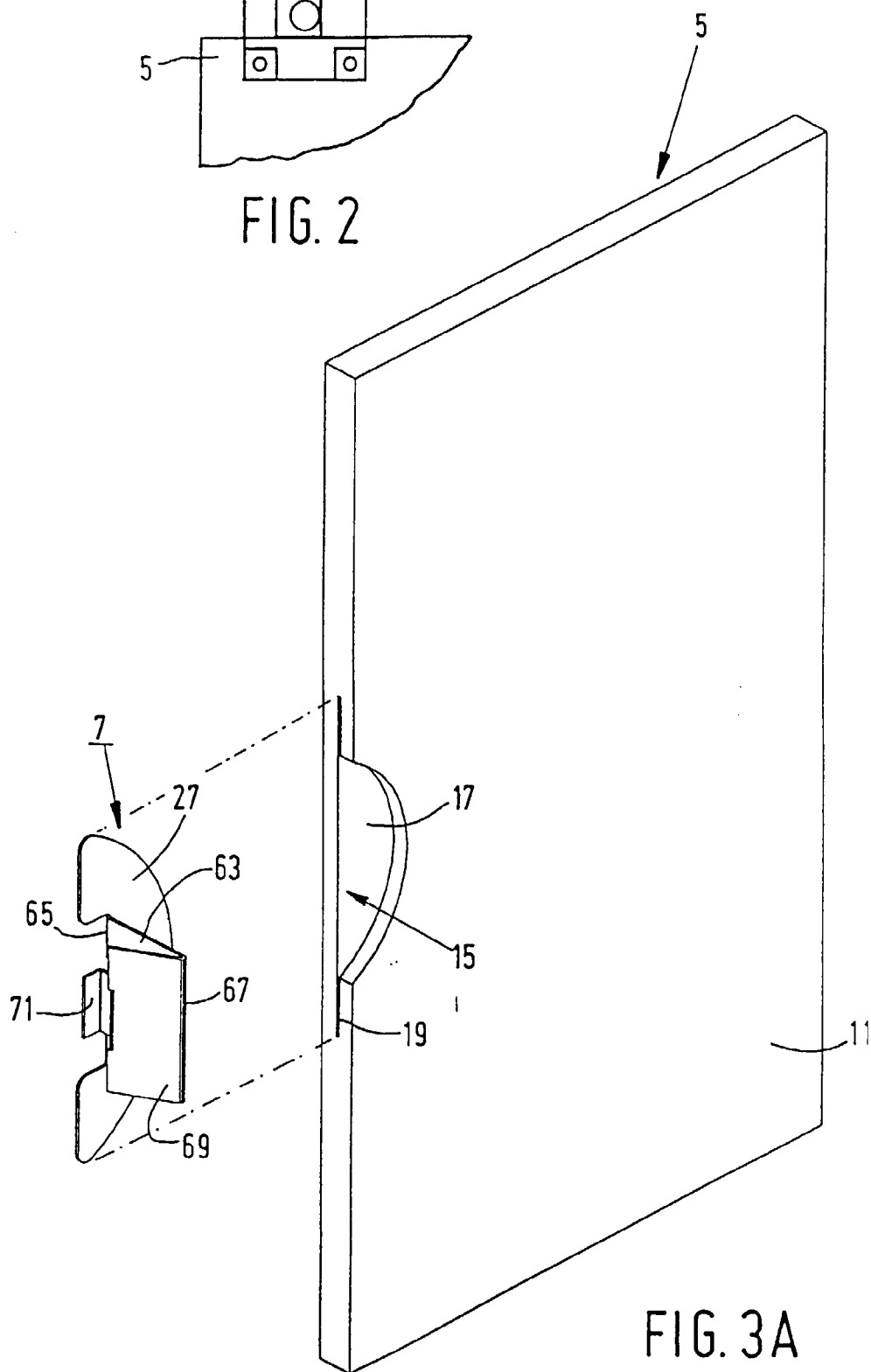


FIG. 3A

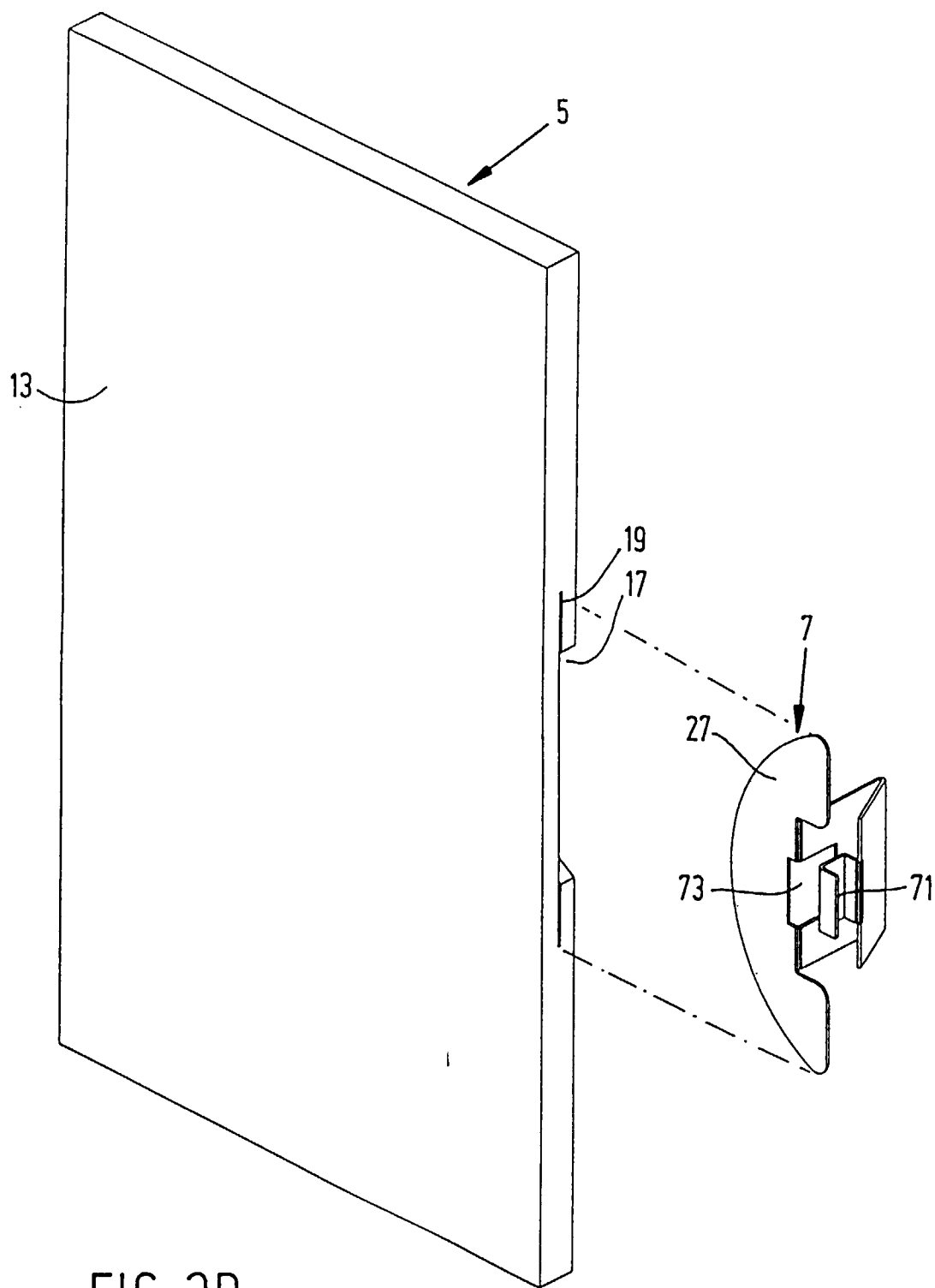


FIG. 3B

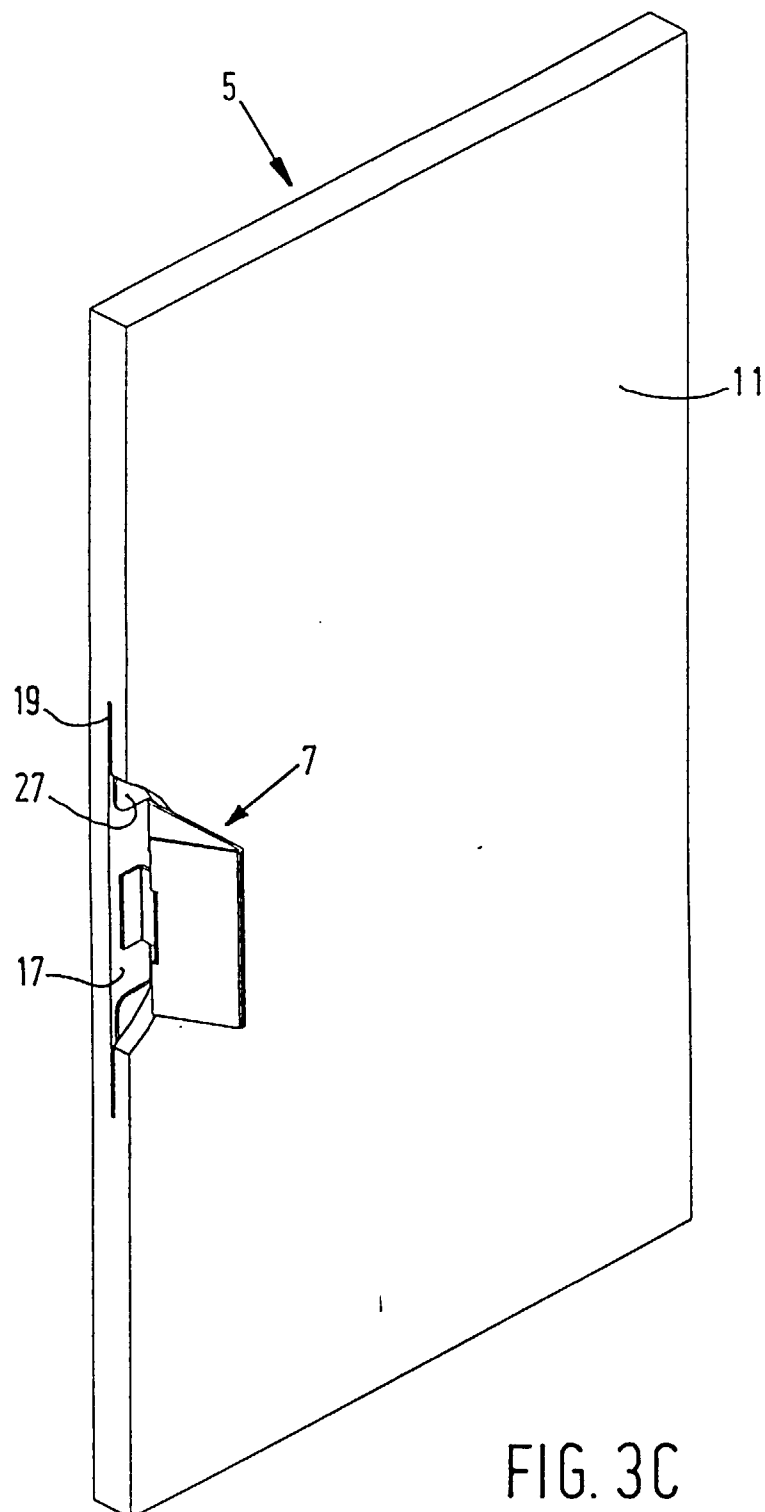


FIG. 4A

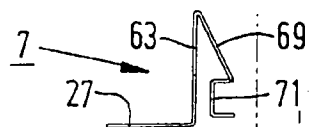


FIG. 4B

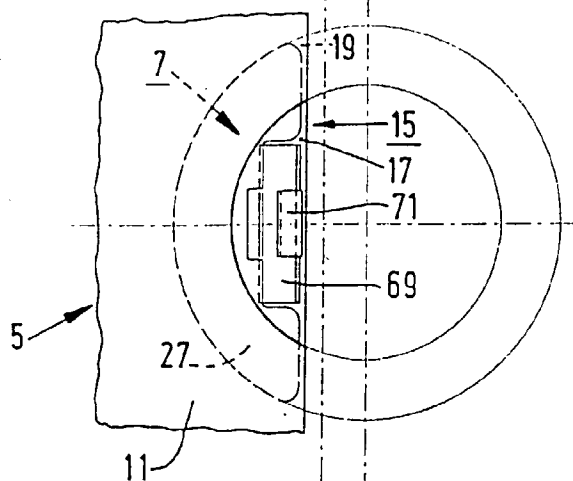


FIG. 4C

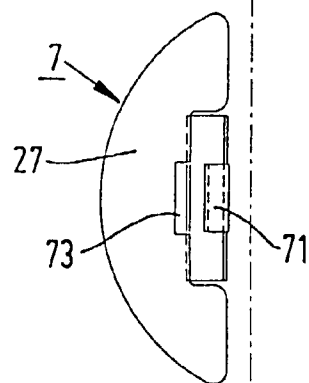


FIG. 4D

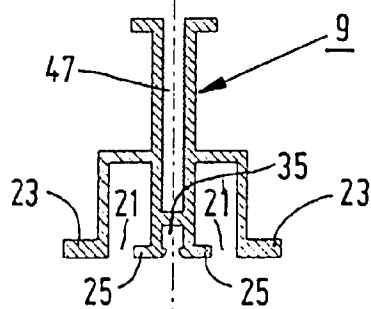
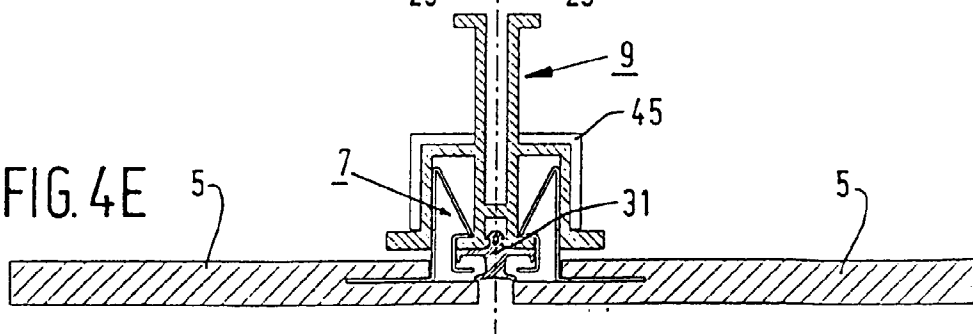


FIG. 4E



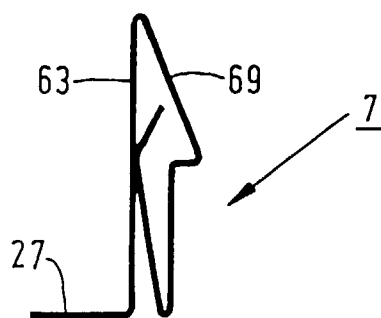


FIG. 5A

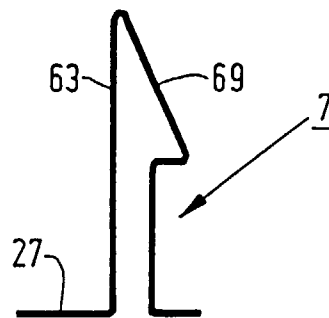


FIG. 5B

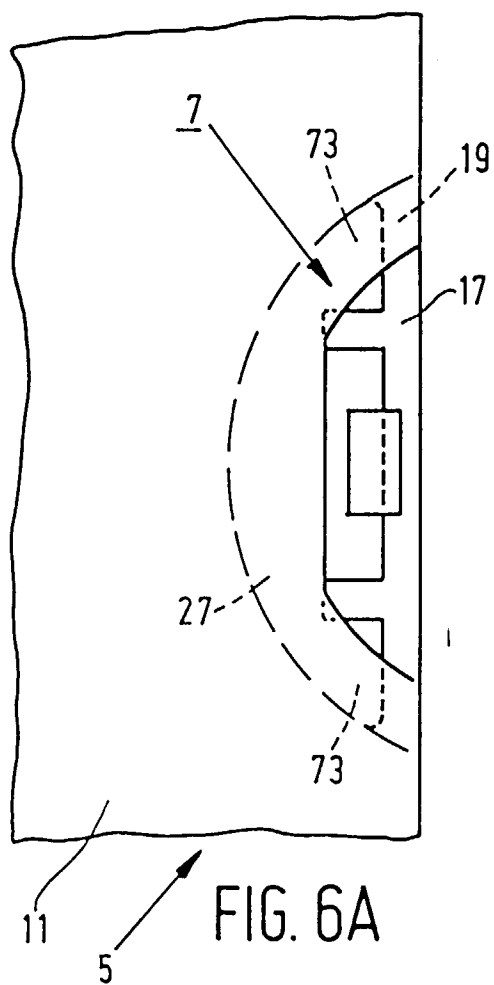


FIG. 6A

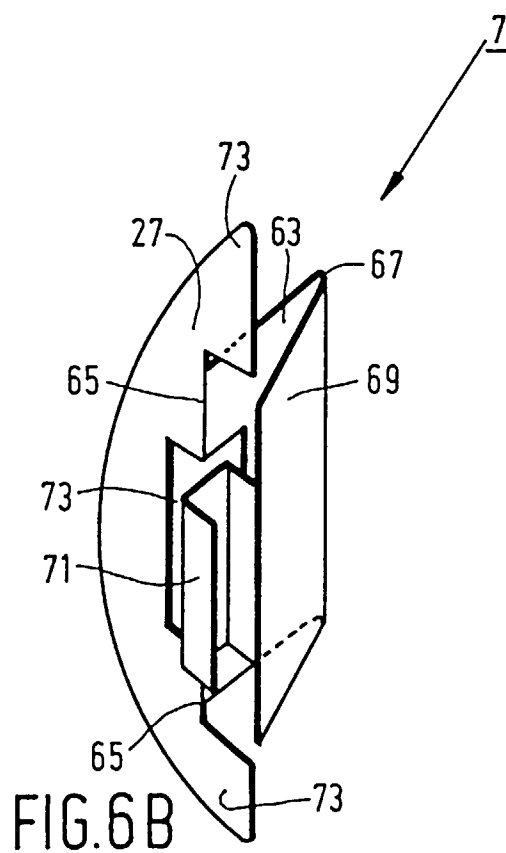


FIG. 6B

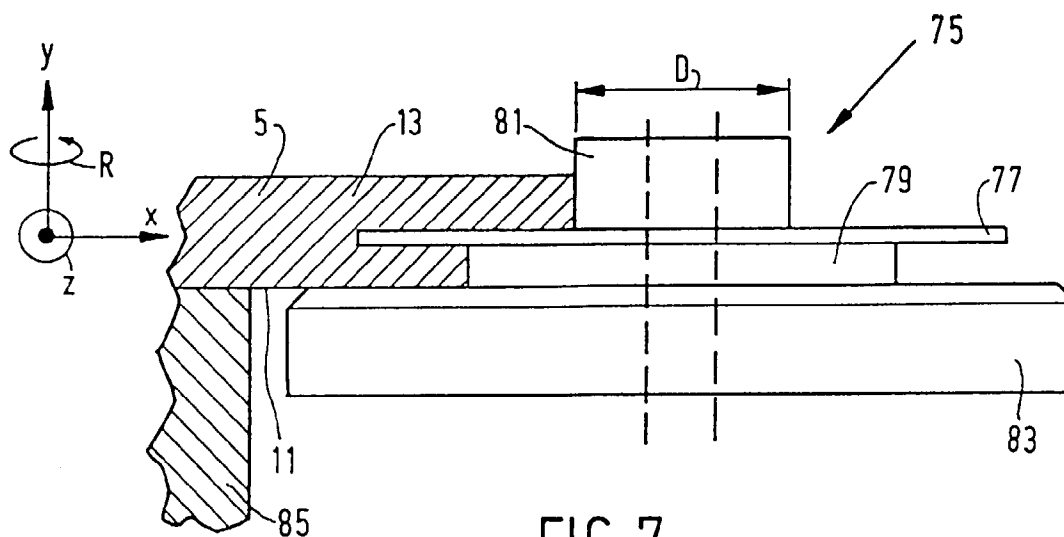


FIG. 7

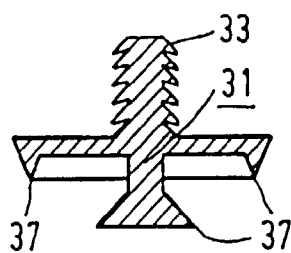


FIG. 9

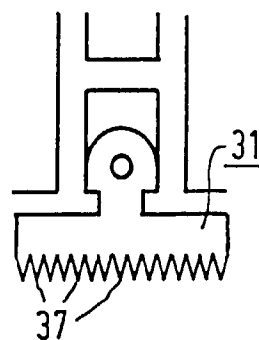


FIG. 10

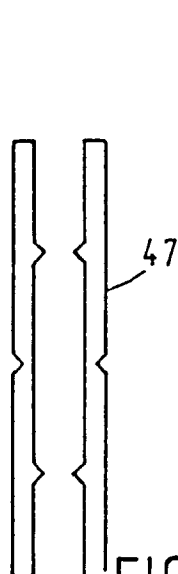


FIG. 11A

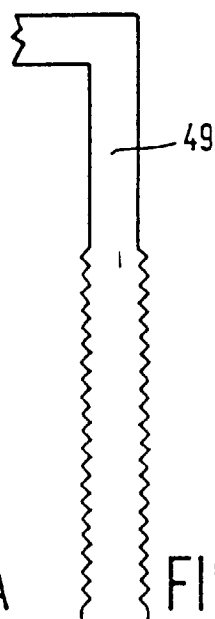


FIG. 11B

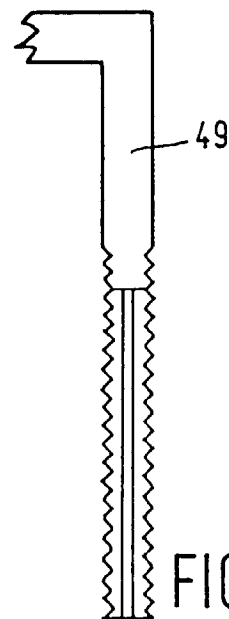
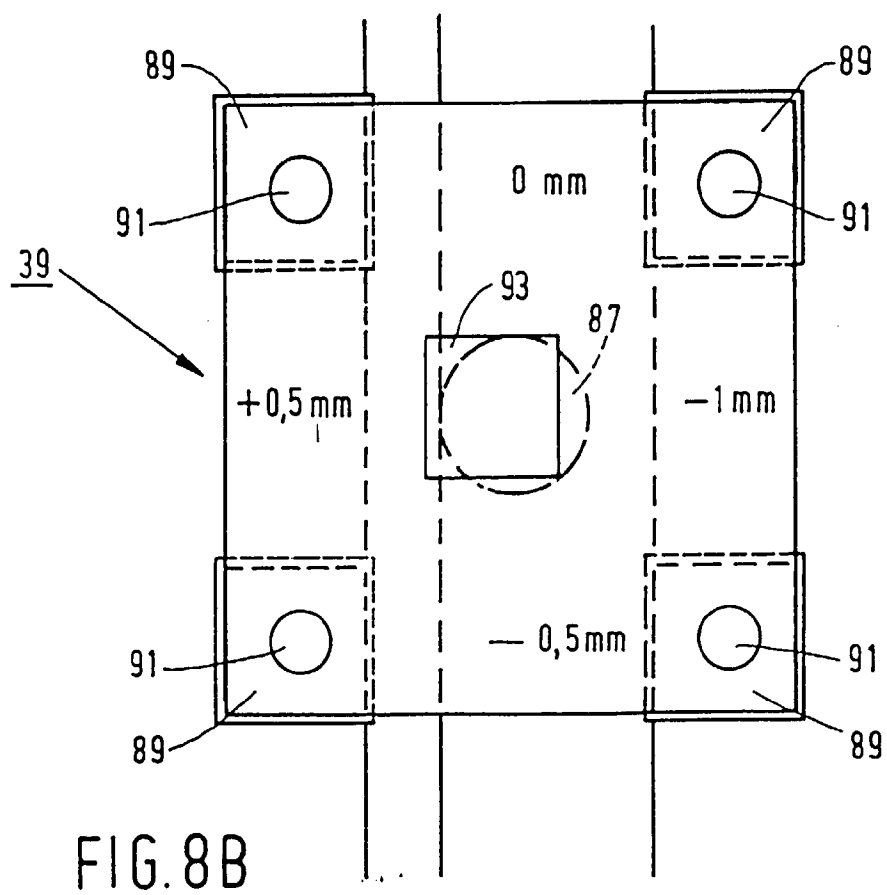
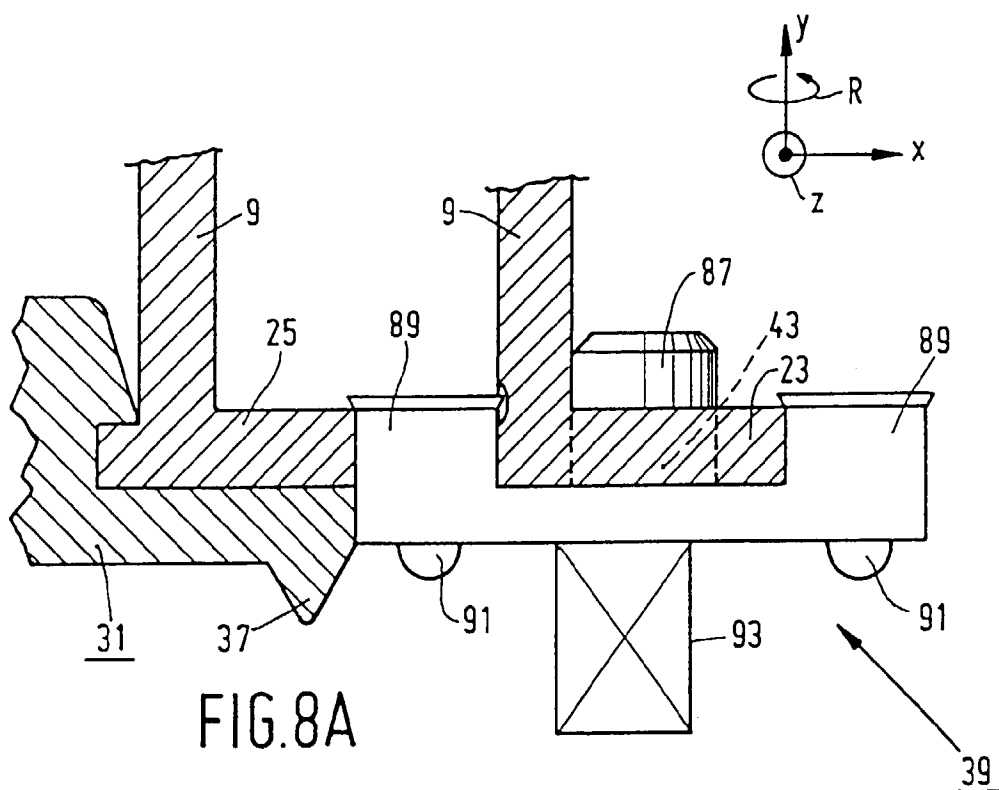


FIG. 11C



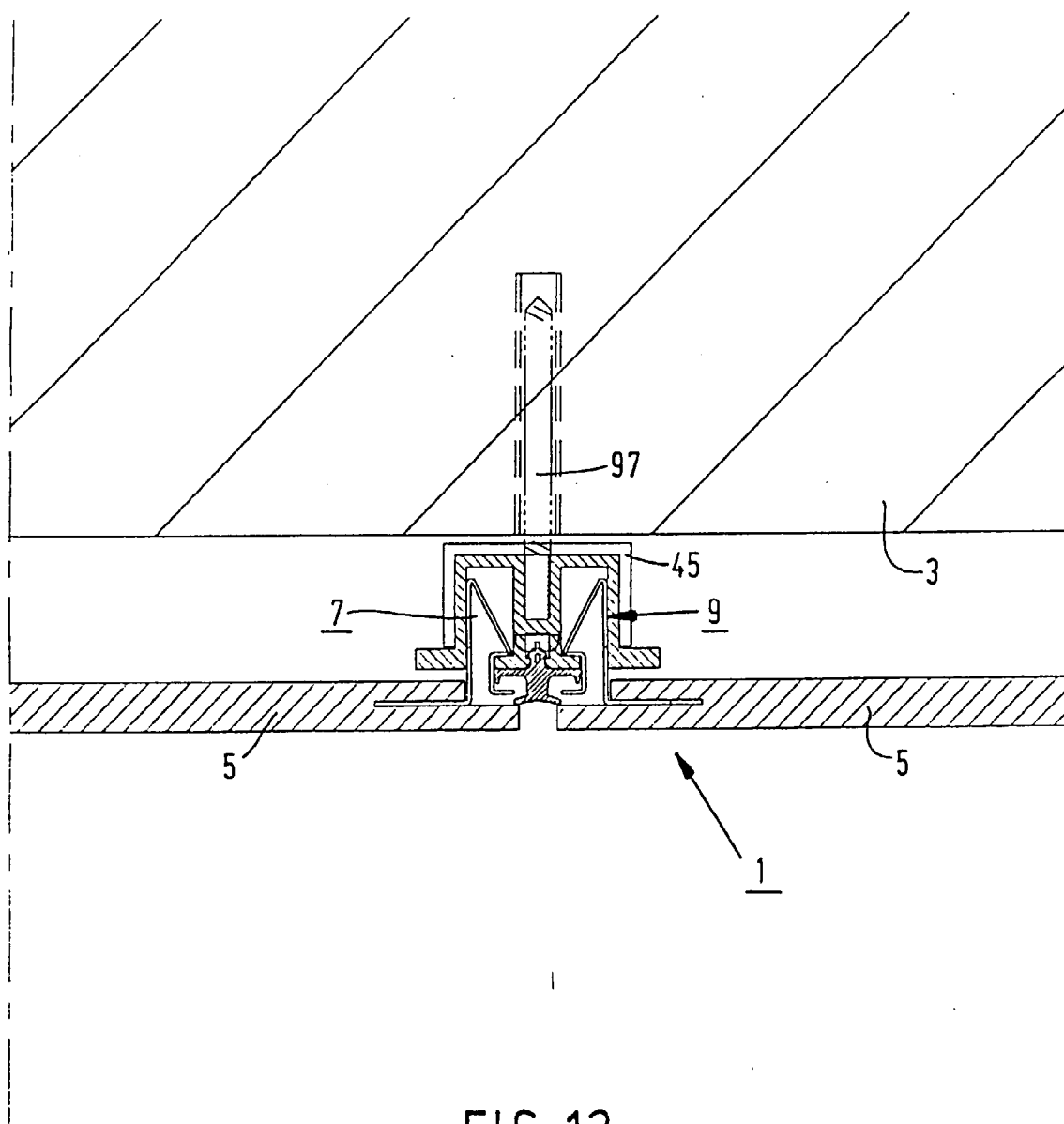


FIG. 12



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 96 20 0483

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
D,A	DE-A-28 48 432 (PONGS) * page 16, line 3 - page 21, line 20; figure 5 *	1-8, 11-13	E04F13/08
A	DE-U-94 12 272 (GEPAT S.A.) * page 6, line 22 - page 8, line 11; figures 1-3B *	1,3-6,12	
A	DE-A-16 84 060 (FA. FRITZ OSTERLOH) * page 3, line 27 - page 5, line 14; figures 1-3 *	1,2,7, 11,13	
A	US-A-2 005 427 (LENKE) 18 June 1935 * page 1, right-hand column, line 23 - page 3, left-hand column, line 66; figures 1-4 *	1,3,5,7, 11	
A	BE-A-693 214 (CARRIERES ET SCIERIES DE FRANCE) 3 July 1967 * page 4, line 10 - page 9, line 19; figures 1-5 *	1,3-6,12	TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04F
A	EP-A-0 391 737 (NORDERHAUG) 10 October 1990 * column 2, line 29 - column 3, line 29 * * column 3, line 51 - column 4, line 19 * * column 4, line 54 - column 5, line 32; figures 1-5 *	1,2,7, 10,13,14	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 19 June 1996	Examiner Ayiter, J
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