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## (54) Push-fit cladding system.

(57) Cladding panels 1 are provided with flexible fixing flaps 2 which correspond to slots 4 in the support rails 3 so that the panels may be fitted by merely pushing them onto the support rails; the flaps flexing out and clipping into the slots. The panels may be further secured by inserts into the joints between the panels preventing the flaps from slipping out of their slots. There would normally be only one fixing flap on each of two opposite panel sides, thus thermal expansion problems are avoided. As support rails are required only along the joints with fixing flaps, they are needed in one direction only; thus when vertical, they could span from floor to floor. The support rails may be formed to act as drainage for any water penetrating into the joints, thus reducing reliance on the joints' sealing gaskets.

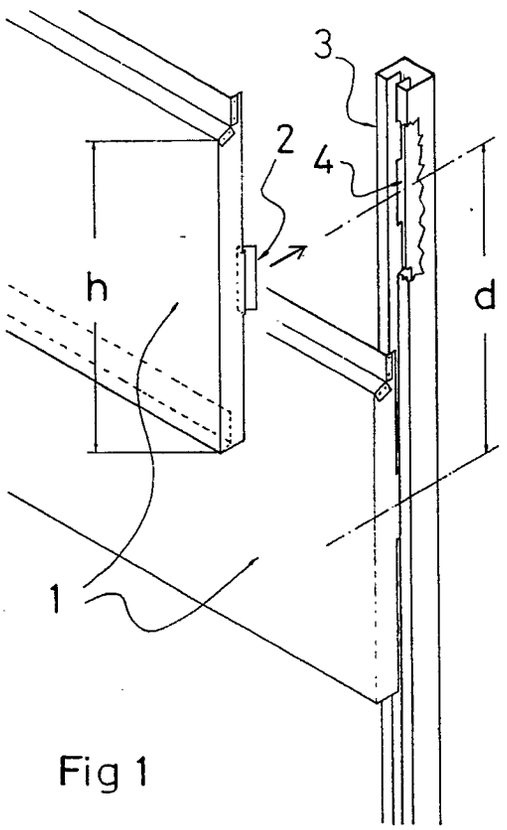


Fig 1

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# PUSH-FIT CLADDING SYSTEM

## GENERAL

The present invention concerns cladding; typically consisting of rectangular, cassette type panels made with sheet metal, fitted to vertical support rails and used as external cladding of buildings.

("Cassette type" refers to panels which have the external skin turned in at the edges, thus facilitating recessed joints. However, the present invention could feasibly be used with other panel forms. Other materials than metal might be used provided the fixing flaps are given the appropriate elasticity. Although the design is specially developed for external walls, it is also suitable for other cladding situations, such as internal partitioning and lining.)

The panels may be of single skin construction, with or without additional material to provide insulation and/or improved rigidity, or they may be of a "sandwich wall" type (see B below).

The present invention provides fast site fitting combined with a very effective, double (or even treble) defence method of resisting water ingress at the joints between adjacent panels:

Due to specially shaped flaps (typically one on each of a panel's two vertical sides), the panels are fitted by merely pushing them onto the support rails. The rails incorporate slots corresponding to the flaps and may (particularly when the rails are vertical) act as drainage channels for any water penetrating the primary water proofing (typically a gasket). The flaps are prevented from slipping out partly by their rigidity, but also by a special securing channel and/or an appropriate sealing gasket inserted into the joint between two panels.

The support rails are required only along those panel joints which have fixing flaps. A typical installation would thus have rails stretching from floor to floor without any other support structure. However, the present invention can be adapted so that the fixing flaps are on the horizontal joints or on joints in any direction.

The design of those panel joints which do not have fixing flaps (typically the horizontal joints), is of a more or less conventional type and is therefore not essential to the present invention.)

According to the invention there is provided a cladding panel fixing system comprising a push-fit cladding panel having flexible fixing flaps with hook effect on two or more sides and a support rail with slots corresponding to the fixing flaps, so that the panel can be fixed by merely pushing it onto the rail.

## DETAILED DESCRIPTION

Embodiments of the present invention are now described in detail, by way of example, with reference to the accompanying drawings (Figures 1-5 on three numbered sheets) in which;

Figure 1 shows a cladding panel fixing system according to the invention;

Figure 2 shows an alternative embodiment of a cladding panel fixing system according to the invention;

Figure 3 is a horizontal section through the fixing slots and flaps of the assembled cladding panel fixing system of Figure 2;

Figure 4 is a horizontal sectiont hrough the fixing slots and flaps of another cladding panel fixing system according to the invention;

Figure 5 is a horizontal section through the fixing slots and flaps of a further cladding panel fixing system according to the invention.

Although panel shapes may vary and the fixings can be in different positions, in order to facilitate understanding of the principles involved, a typical, simple installation - with rectangular panels with one fixing flap on each of the two vertical sides - is described.

## A. FIXING AND LOCATING

Figure 1 shows two wall cladding panels 1 as per the present invention: one fitted, the other being fitted. On each side (only one side is drawn) each panel has a flexible fixing flap 2. The flap is an integral part of the panel's external skin which is folded in to provide the side of a cassette panel. The flap acts as a hook which corresponds to a slot 4 in the support rail 3.

The slots in the rails are provided at centres equal to the distance d (see Figure 1) required between the horizontal joints between the panels. If the external height of each panel is h and the desired joint width is j, then $d = h + j$.

Figure 2 shows - as a possible alternative to that shown on Figure 1 - a panel with the fixing flap being an attachment 5 to the panel.

Figure 3 is a horizontal section at the level of the fixing slots through the support rail shown in Figure 2. Two adjacent panels 1 with fixing flaps 5 are shown fitted into the slots. A gasket 6 is shown inserted into the gap (= "joint") between the panels.

More than one flap on each side of each panel is obviously possible and might be prudent on very tall panels. However, there are good reasons for widening the one flap instead to obtain the necessary strength - see THERMAL MOVEMENT below.

The slots in the rails are cut out precisely during manufacture. On site, the levels of all the panels can thus be determined by merely levelling up the bottom of all the rails. As the lateral positions of the panels are set by the distances between the cladding rails, these need to be set out accurately. (One might plumb one rail and set out the others with templates along the top and bottom of the rails.)

When the support rails have been installed, each panel is both positioned and fixed by merely pushing it onto two adjacent support rails; the two fixing flaps springing into the corresponding slots - there are no nuts to tighten and no adjustments to be made. (But note SECURING below).

There is a possible exception to the normal practice of fitting the support rails first: If the building is to be provided with corner panels which wrap round the corner (instead of, say, linking the panels on two adjoining elevations with a flashing) , it might be necessary to fit one of the fixing rails after the corner panels have been fitted on the other side of the corner. This is facilitated as the placing of the securing channel and/or the sealing gasket (see SECURING below) in the joint on one side allows the corner panels to hang (cantilevered from one fixing rail) until the second support rail is inserted under the panels and fixed on the adjoining elevation.

## THERMAL MOVEMENT

Most materials expand when heated and contract when cooled. This is frequently a problem with other cladding systems as the panels on a hot day can bow out and even force fixings to break.

Under the present invention, each panel (with only one flap on each side) is free to expand or contract in either direction away from the fixing flaps. This obviates any need for tolerances to be built in to accommodate vertical thermal movements. Horizontal thermal movement is taken up by the flexibility of the panel returns (and the fixing flaps) and of the securing channel (see B below) and/or the sealing gasket.

## B. SECURING

Figure 4 is a horizontal section (like Figure 3) , but a securing channel 7 has replaced the rear of the gasket and the fixing flaps are part of the returns of the outer skin (i.e. as on Figure 1).

(The panels shown here are of the "sandwich" type - see SOME OTHER EMBODIMENTS below.)

When the panels and their fixing flaps are sufficiently rigid and if the manufacture and the fitting is of sufficient accuracy, the panels will not need further securing after they have been inserted into the slots. However, this may not always be relied upon. The fixing flaps should therefore be prevented from coming out of their slots by an appropriate insert into the joints. This could be a sealing gasket (6 on Figure 3), but where one would not wish to rely on this (e.g. when there is a danger of the gasket being torn out), the special, springy, securing channel 7 should be inserted into the joint. This is shaped so that it clips into position, and it is prevented from moving out by the fixing flaps.

Before installed panels can be removed, the securing channel must be released. This might involve prizing the flaps apart by inserting a forked tool between the securing channel and the fixing flaps.

The securing channel is shaped so that it provides an additional barrier against water penetration - see C. below.

## C. DRAINAGE OF VERTICAL JOINTS

The support rail is a channel with inverted flanges. Its shape allows it to drain away any water penetrating the outer defences (the sealing gasket and/or the securing channel). This gives double or, with the securing channel (see SECURING above), even treble defence against water penetration:

i the (outer) sealing gasket
ii the securing channel (if employed)
iii the draining effect of the support rail

It is obviously possible to use a simpler, "top hat" or U shaped channel as support rail, but this might facilitate water penetration at every fixing slot - unless these are water proof (e.g. by each slot being lined or the rail having appropriate indentations instead of slots).

However, installations with both sealing gasket and securing channel (acting as a drainage channel) are so unlikely to allow water penetration to the fixing slot that the simpler rails will probably suffice. Nevertheless, aesthetical considerations or a need for insulation at the joint (inside the rail), might nevertheless make the use of the rail with inverted flanges preferable. (See Figure 4 and SOME OTHER EMBODIMENTS below.)

## SOME OTHER EMBODIMENTS

Figure 4 shows an insulated installation. Insulation 8 is "sandwiched" between an outer (sheet metal) skin 9 and an inner skin 10, thus providing a complete wall. Freedom from "cold bridging" is normally required, and this is provided by insula-

tion 11 inserted into the (very suitably shaped) support rail. If securing channels and gaskets are fitted, there is little danger of water penetrating to the insulation, but drainage could still be maintained inside the rail (if the insulation is non-absorbant and/or set back).

Figure 5 is a vertical section showing an installation with panels fixed to horizontal rails. This means that the panels are fixed on the top 12 and bottom 13 (instead of the "typical" side fixing). Only the top return of the support channel has slots 14 (for the flaps 15 at the bottom of the panels). The bottom of the rail has an uninterrupted flange 16 to receive a continuous flange or return 17 on top of the panels (i.e. no flaps). The securing channel 18 stops against a return on the fixing flap 15 and provides a stop and a "hook" for the sealing gasket 19. This installation is designed to rely on the sealing gasket and the securing channel for water proofing (to avoid any problems with draining horizontal rails). The uppermost panels are fitted first.

Fixing flaps on all four sides would facilitate the fitting of larger panels (but this would require support rails both vertically and horizontally).

Windows and doors may be fitted into the support rails like the panels by attaching fixing flaps to each side of their frames in positions corresponding to slots in the support rails. (Extra large fixing flaps may be required, and doors and large windows would probably always need securing channels.)

## Claims

1. A cladding panel fixing system comprising a push-fit cladding panel having flexible fixing flaps with hook effect on two or more sides and a support rail with slots corresponding to the fixing flaps, so that the panel can be fixed by merely pushing it onto the rail.

2. A cladding panel fixing system as claimed in claim 1 wherein, inserts are provided for inserting into the gaps between those panel sides which have fixing flaps, in order to force the flaps apart so that they cannot come out of the slots in the support rails.

3. A cladding panel fixing system as claimed in claim 2 wherein the inserts in the joints are flexible gaskets in rubber or similar material and act both for water-proofing and for securing the panels.

4. A cladding panel fixing system as claimed in claim 3 wherein the gaskets have hook-effect returns.

5. A cladding panel fixing system as claimed in claim 2 wherein the inserts in the joints are made from sheet material and are folded so that not only are the fixing flaps kept apart, but also hook-effect folds are incorporated to restrict the withdrawal of the inserts as they clip in behind a groove in, or a fold in, or the end of fixing flaps.

6. A cladding panel fixing system as claimed in claim 5 wherein there is also a flexible gasket, which provides a seal against water ingress as well as contributing to keeping the fixing flaps apart; the gasket having a hook-effect protrusion which corresponds to a return or groove in the sheet material insert and which thus resists removal of the gasket.

7. A cladding panel fixing system as claimed in claim 5 or claim 6 wherein the sheet metal insert is replaced with a similarly shaped extruded insert.

8. A cladding panel fixing system as claimed in claim 1 or claim 2, wherein the support rails have inverted flanges so that the rails can act as drainage channels.

9. A cladding panel fixing system as claimed in claim 1 apart from the fixing flap or flaps on one side of the panel being replaced by a fixed hook effect flange along all or part of the panel side; the corresponding flange in the support rail not requiring slots.

10. A cladding panel fixing system in which two opposite parallel edges of a cladding panel are secured to corresponding parallel support rails, at least one of said edges being formed with a flexible fixing flap adapted to have a hook securing effect in a corresponding slot formed in the respective support rail, whereby said at least one edge is securable simply by a push-fit action, the flap/slot engagement inhibiting movement of the panel in a direction along the support rails.

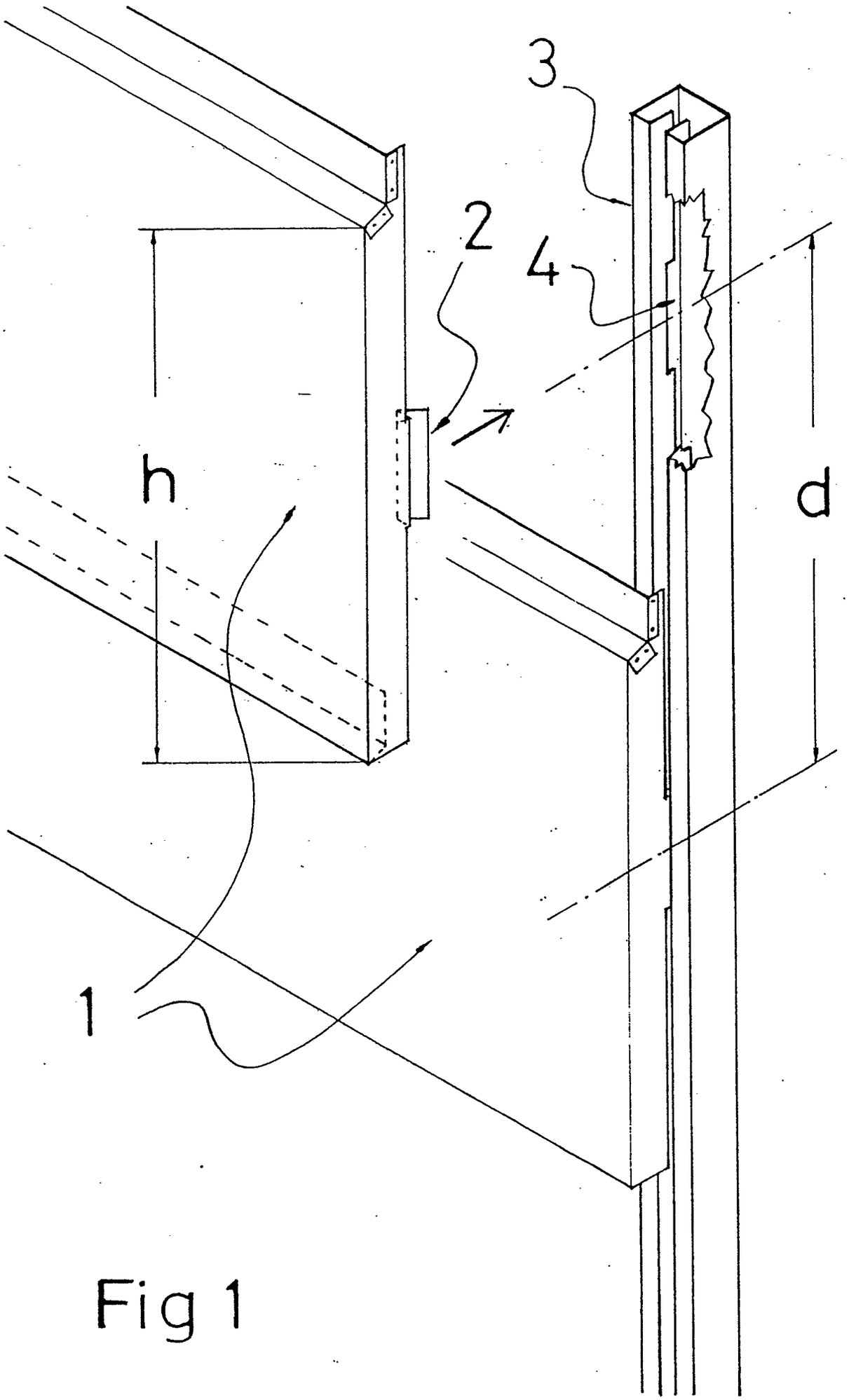



Fig 1

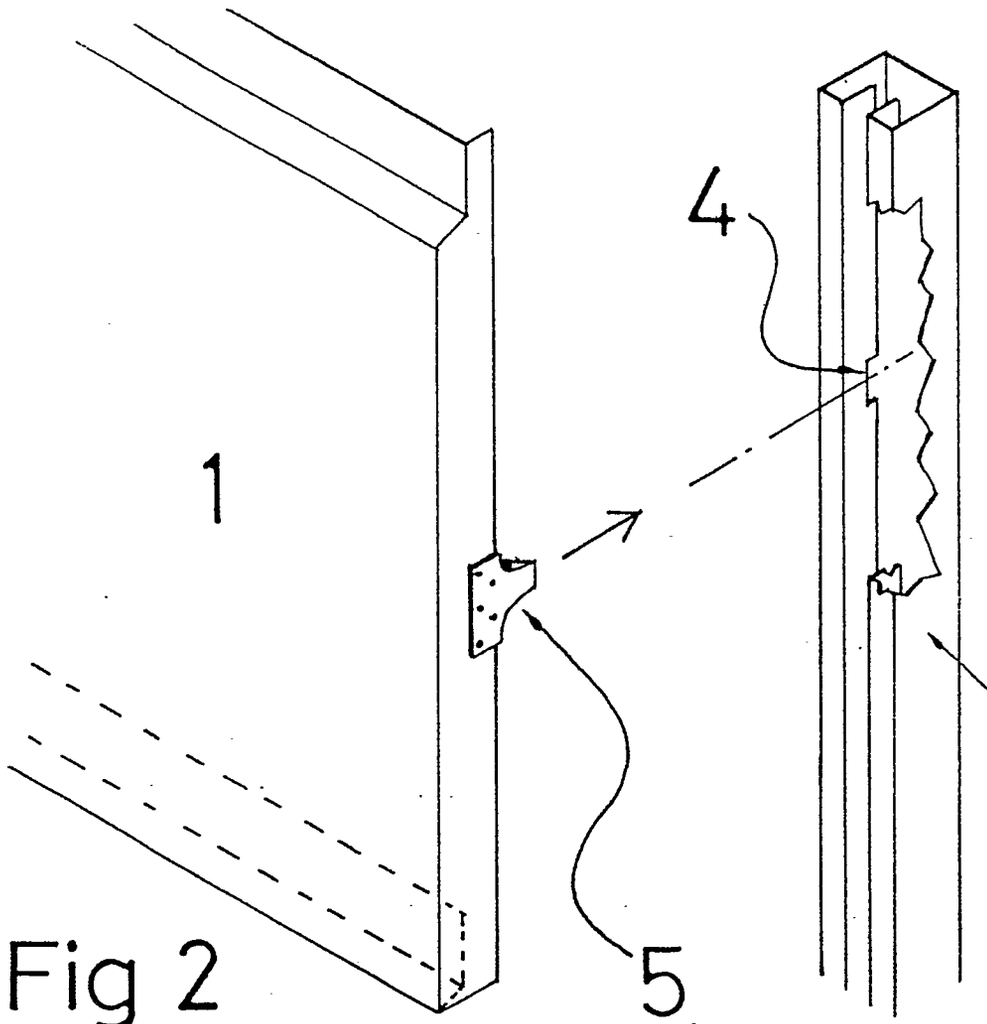



Fig 2

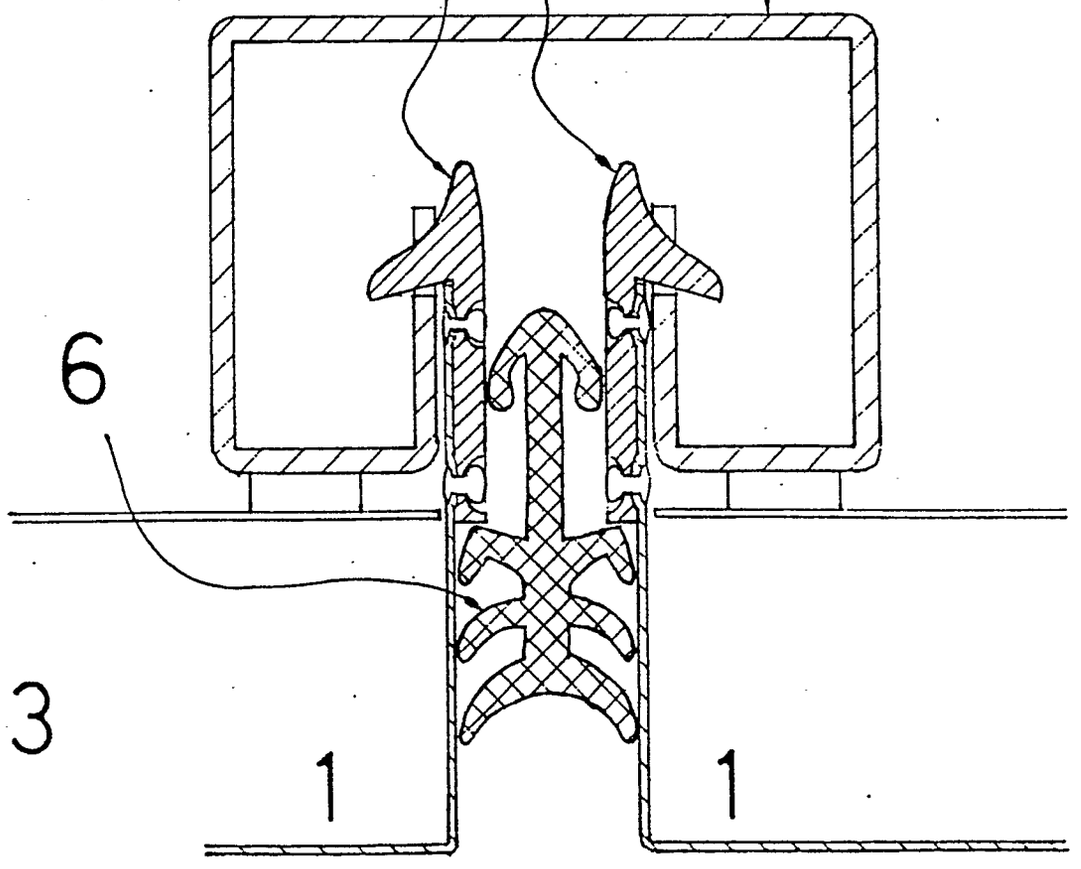



Fig 3

Fig 4

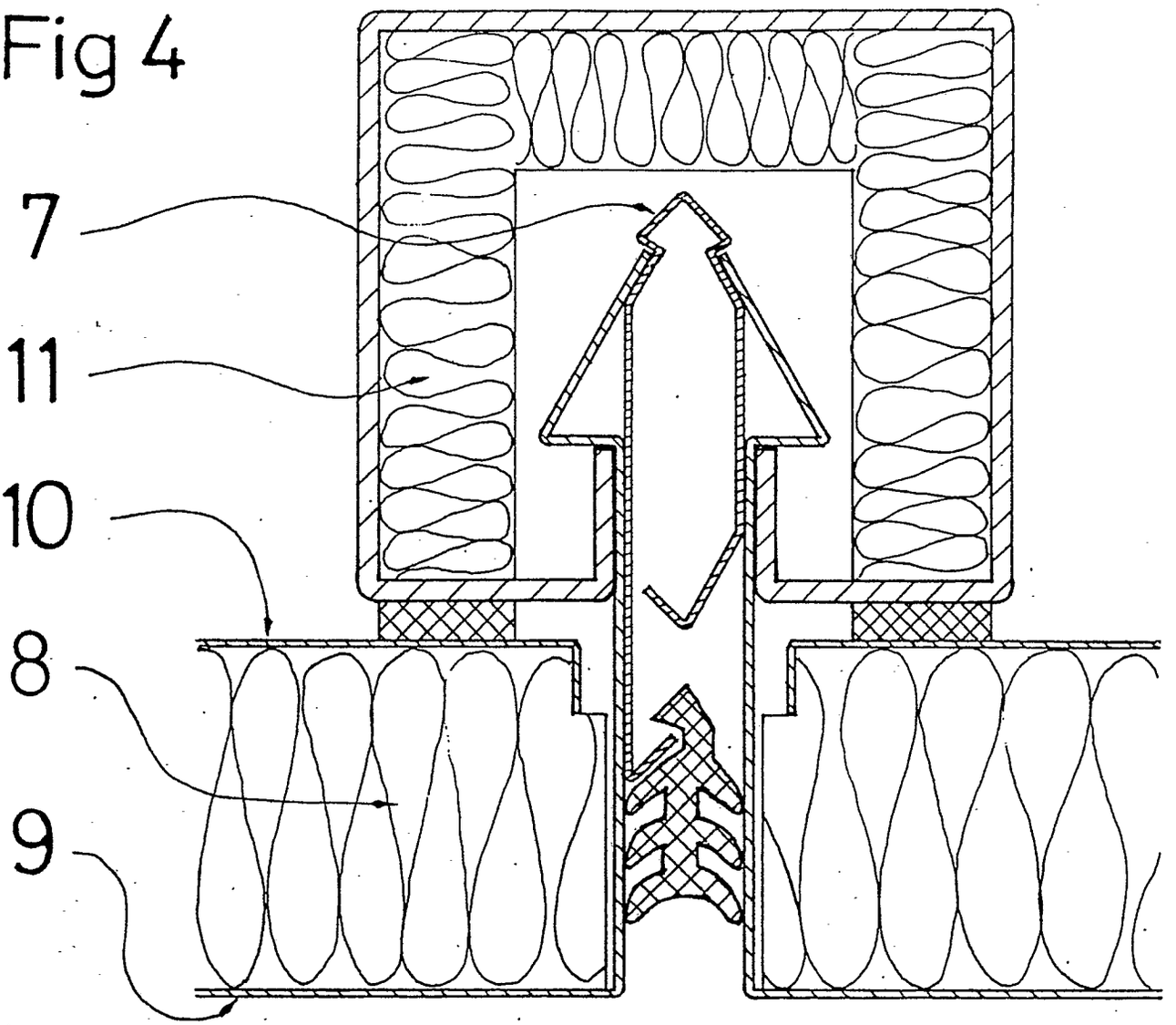
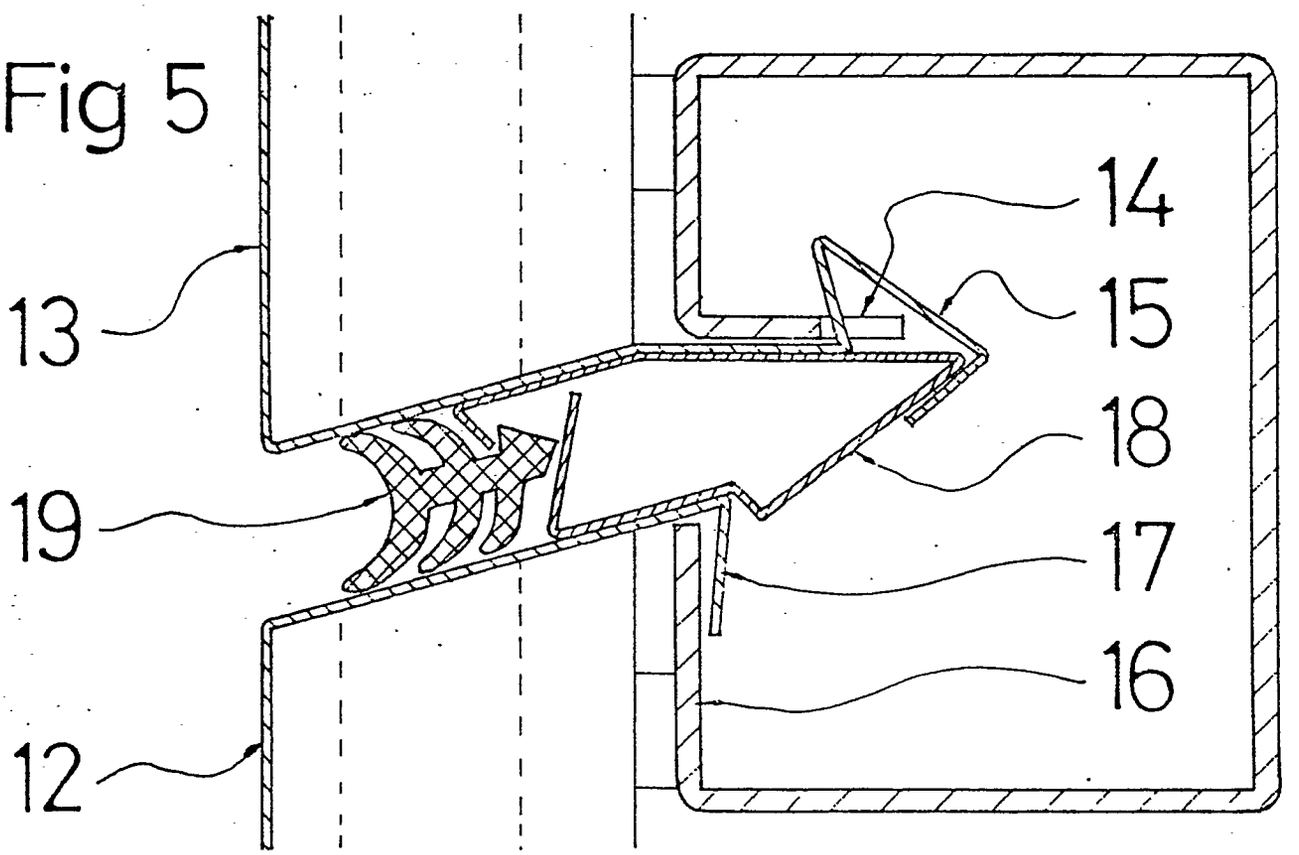



Fig 5



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# EUROPEAN SEARCH REPORT

Application Number

EP 90 30 3735

## 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.5 ) |
|---|---|---|---|
| X<br>Y | FR-A-2205078 (FRANCON ET AL.)<br>* page 1, lines 1 - 9 *<br>* page 1, line 36 - page 2, line 33; figures 1-4 *<br>--- | 1, 10<br>2, 9 | E04F13/08<br>E04B2/74 |
| Y<br>A | GB-A-2135355 (TEAL CLADDINGS LIMITED)<br>* page 1, line 92 - page 2, line 10; figures 1-3 *<br>--- | 2<br>1, 3 | |
| Y<br>A | CH-A-441699 (JOSEF MEYER EISENBAU AG)<br>* column 1, line 17 - column 4, line 5; figures 1-3 *<br>--- | 9<br>1, 10 | |
| A | DE-A-1816934 (AHLERS-HEIZKESSEL GMBH)<br>* page 4, line 18 - page 7, line 25; figures 1-4 *<br>--- | 1, 2, 3, 4 | |
| A | US-A-3667183 (HEIRICH)<br>* column 1, line 63 - column 3, line 21; figures 1-8 *<br>--- | 1, 2, 5 | |
| A | GB-A-328617 (KILBURN)<br>* page 1, line 76 - page 2, line 79; figures 1-9 *<br>--- | 1, 9, 10 | |
| A | FR-A-1274880 (FONTALBA)<br>* page 1, right-hand column, line 13 - page 2, left-hand column, line 17; figures 1-5 *<br>----- | 1, 9, 10 | |

TECHNICAL FIELDS SEARCHED (Int. Cl.5 )

E04F
E04B

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 11 JULY 1990 | AYITER J. |

CATEGORY OF CITED DOCUMENTS

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