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(54) Facade cladding system and facade cladding panel.

(57) Facade cladding system with panels (4-6) and a fastening system (3) supporting the panels (4-6) in installed condition. The panels (4-6) comprise blocks (13-15) attached to backsides of those panels (4-6). The fastening system (3) engages the panels (4-6) in the area of the blocks (13-15). Each of the corners of each of these panels (4-6) comprises one of the blocks (13-15). The invention also relates to a facade cladding panel for use as a part of such system. The blocks reinforce the corners of the panels and pass on locally concentratedly introduced forces in an evenly distributed manner.

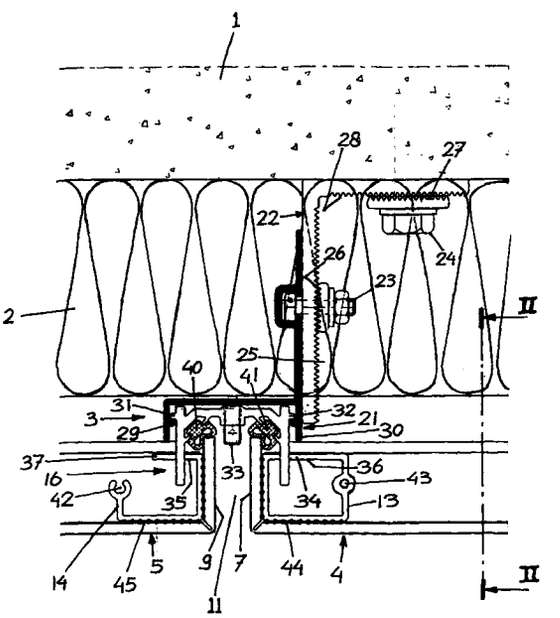


FIG. 1

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Description

The invention relates to a facade cladding system according to the preamble of claim 1 and to a facade cladding panel according to the preamble of claim 13.

Such facade cladding system and such facade cladding panel are known from European patent application 0 201 630. In this known system, if the system is in assembled condition, the panels are attached to a fastening structure located behind those panels in that they each rest, along a top edge thereof, on a support and in that an upwardly raised flange of each panel engages a slot in a block and is fixed relative to that block by screws. The bottom edge, bent over upwards so as to be U-shaped, of a following panel located thereabove engages a further slot in the same block as the flange of the former panel, which flange is bent over so as to be Z-shaped. The blocks attached along the edges of the panel bodies are constructed as angle sections and form, together with supports which engage those blocks, intermediate fixations between the attachments along top and bottom edges of the panels.

Vertical forces and horizontal forces are taken up by separate supports. This renders the construction and assembly of this facade cladding system complicated.

In the constructions according to German patent application 195 36 442 and international patent application WO 93/12307, too, the edges of the panels rest on supports projecting from the fastening system to the outer face of the cladding.

The object of the invention is to provide a facade cladding in which the panels can be of a light construction but nevertheless offer an adequate resistance to deformation prior to, during and after assembling.

In accordance with the present invention, this object is realized by constructing a facade cladding system of the initially indicated type according to the characterizing part of claim 1. The invention may also be embodied in a facade cladding panel of the initially indicated type, which is especially arranged for being used as part of such facade cladding system, in that it is constructed according to the characterizing part of claim 13.

Because each of the corners of each of these panels is provided with one of the blocks, the corners of the panels, which are subjected to the highest load by locally introduced forces, are reinforced and offer more resistance to deformation. Further, locally concentratedly introduced forces, for instance resulting from forces exerted during assembling, the weight of the panel, wind-exerted forces, thermal expansion and shrinkage, as well as objects impinging on and resting against the facade, are evenly distributed over larger parts of the respective panels. Hence, also with a relatively light construction from relatively simple constructional materials, panels having sufficient resistance to deformation in the area of the suspension of those panels can be obtained.

Particularly advantageous embodiments of the invention are laid down in the dependent claims.

These and further structural aspects of the invention and objects and effects thereof are specified in the following description of a presently most preferred exemplary embodiment of the invention and some variants. For this, reference is made to the accompanying drawings, in which:

Fig. 1 is a horizontal view in section taken on the line I-I in Fig. 2 of a facade cladding according to the invention;
Fig. 2 is a view in vertical section taken on the line II-II in Fig. 1;
Fig. 3 is a pulled-apart perspective view of some components of the facade cladding according to Figs. 1 and 2; and
Fig. 4 is a cutaway perspective view of parts of the construction according to Figs. 1-3.

In the drawings, an exemplary embodiment of a facade cladding system according to the invention is shown in assembled condition, while the support structure 1 and insulation 2 shown in Figs. 1 and 2, located behind the facade cladding system and not forming part of the system, are omitted in Figs. 3 and 4.

The facade cladding system shown is built up from a fastening system 3 and panels 4, 5, 6 suspended from that fastening system 3, the panel 4 being of a slightly different design from the panels 5 and 6 in order to show different variants.

The panels 4, 5, 6 have end edges 7, 8, 9, 10 and corners where in each case two of the end edges 7, 8 of the same panel 4 meet. In mounted condition, the panels, including the panels designated by reference numerals 4, 5, 6, form a facade surface having joints 11, 12 between the panels 4, 5, 6 and comprise blocks 13, 14, 15 fixedly attached to backsides of those panels 4, 5, 6, along the end edges thereof, in the form of aluminum sections which in the embodiment according to panel 4 have closed cross sections, and which in the embodiment according to panels 5 and 6 have open cross sections.

In installed condition, the fastening system 3 is located behind the facade surface defined by the panels 4, 5, 6 for attaching the panels 4, 5, 6 against a supporting construction. This involves the fastening system 3 engaging the blocks 13, 14, 15 of the panels 4, 5, 6 for retaining those panels 4, 5, 6 in the intended positions.

Each of the corners of each of the panels 4, 5, 6 comprises one of the blocks 13, 14, 15. Hence, the fastening system 3 engaging the blocks can readily be coupled to supports 16, 17 located behind the panels 4, 5, 6. The couplings whereby the panels 4, 5, 6 are hooked onto the supports 16, 17 are thus located behind those panels and are in essence independent of the shape and construction of the edges of the panel. Within the framework of a single suspension system and a single

fastening system, this last permits a substantial freedom as regards the size and design of the edges 8, 9, 10 of the panels, which, in turn, opens a wide variety of architectonic possibilities. Further, coupling the supports 16, 17 to blocks 13, 14, 15 attached to the backsides of the panel bodies readily prevents fastening members from being located in front of outstanding flanges of the panels, clearly within view.

The blocks 13, 14, 15 provided at the location of each of the corners constitute reinforcements of the corners of the panels 4, 5, 6. As a result, locally introduced forces which are exerted by the fastening system 3 on the panels 4, 5, 6 and which may for instance be caused by forces exerted during assembling, the weight of the panels, wind pressure, thermal expansion or shrinkage, as well as by objects impinging on and resting against the facade, are resisted without undue or permanent deformation and are evenly distributed over larger parts of the panels 4, 5, 6, so that also in the case of a light construction from simple construction materials, sufficient resistance to undue or permanent deformations in the area of the suspension of the panels is obtained. It is observed that the fastening system 3 may also directly engage the panel body rather than the blocks 13, 14, 15. Since the forces are then introduced in areas where the panel is reinforced by blocks, the greatest stresses are also then taken up by reinforced parts of the panel, which, in turn, enables a light basic construction of the panel body.

It is also possible to construct the panels and the supports so that the supports for instance engage the blocks at the location of the corners and that intermediate fixations are in each case formed at a distance between two of the corners of a panel by a support which directly engages an edge of the panel body. Such construction is in particular advantageous for attaching very large panels, whose corners are accordingly heavily loaded and which are retained between the corners only to prevent excessive or permanent deflection.

The panels shown have raised flanges 7-10 extending along the end edges. Because the blocks 13-15 are each positioned so as to connect to two of those flanges 7-10, which flanges extend along two of the end edges whose ends are formed by the relevant corner, the blocks 13-15 are restrained from tilting about two mutually perpendicular axes due to the stiffening action of those raised flanges. Moreover, a particularly effective reinforcement of the corner area of the panel is thus obtained without requiring interconnecting the flanges at the location of the corner.

The flanges are obtained in a simple manner by bending over continuations of plate material of the panel.

Of each of the panels, the two upper blocks (in the drawings, only the upper block 15 is shown) each have a flange 18 having a free edge 19 which in the condition shown, mounted in front of a vertical wall 1, is located at the bottom side of the flange 18. By means of such flanges 18 with a free edge at the bottom side, the panels are hooked onto the supports 16 of the fastening system 3 in a very simple manner. Hence, complicated constructions for retaining the top edges of the panels 4, 5, 6 are not necessary. The flange 20, pointing upwards and away from the panel, shields the space behind the panels 4, 5, 6 from the ingress of rain, leaves and the like, and plays no further part in keeping the panel of which it forms a part in position.

The blocks 13, 14, 15 are designed as elongated profiled sections which, in the condition shown, installed along a vertical wall 1, are vertically oriented. This vertical orientation of the profiled section is advantageous for limiting forces exerted perpendicularly to the plane in which the panels extend, because in this manner, the profiled sections form a long arm for taking up moments caused by forces exerted on the panels.

In the panels 4, 5, 6 proposed, a particularly effective reinforcement of the corners is obtained in that the blocks 13, 14, 15 are mounted so as to connect to the raised flanges 7-10 and are each directly attached to two of the raised flanges 7-10.

The horizontally oriented edge portions or flanges are in each case fixed, by means of self-tapping screws, in a position perpendicular to the main face of the panel 4, 5, 6 against an end face of one of the blocks 13, 14, 15. The self-tapping screws engage channels 42, 43 of the profile-shaped blocks 13, 14.

The reinforcement of the panels by the blocks 13, 14, 15 and the force-distributing action of those blocks 13, 14, 15 are further particularly effective in that the blocks are attached through gluing and the glued joints 44, 45 connect both the backsides and the bent-over sides of the panel body, manufactured from metal plate, to the blocks 13, 14, 15. In fact, the adhesion to the backside of the panel body can also be established in another manner, for instance by means of soldering or welding. In the case of sandwich-shaped panel bodies (for instance two layers of aluminum with one layer of PE thereinbetween), such connecting techniques can be performed without heat-induced buckling of the panel on the side which, during mounting, is to be turned outwards.

During the manufacture of the panels 4-6, the blocks 13, 14, 15 are glued to the backsides of those panels and retained by the screws which engage the channels 42, 43 of the profile-shaped blocks 13, 14, causing the blocks 13, 14 to reliably remain in position, also if the adhesive has not yet cured.

The fastening system 3 is provided with fastening sections 21 which, in the installed condition shown, extend vertically and are attached to the wall 1 lying behind it by means of adjustable wall brackets 22 and bolt joints 23, 24 and enmeshing knurls 25, 26, 27, 28. The supports 16, 17 are adjustable along those sections 21 and, in the installed condition shown, engage the blocks 13, 14, 15. Because the blocks 13, 14, 15 rest on height-adjustable supports 16, 17, no particular

requirements have to be set with regard to the accuracy of the vertical positioning of the fastening sections 21, and it is also not necessary to drill holes at the proper height in the work (during the construction) for hanging the panels at the proper height. Further, the fastening sections 21 and the supports 16, 17 can be used in combination with panels of different heights.

For guiding the supports 16, 17, the fastening sections 21 are provided with opposite grooves 29, 30 cooperating with projecting ribs 31, 32 of the supports 16, 17. These ribs 31, 32 are in a sliding fit, with play, in the grooves 29, 30. For securing the supports 16, 17 in the desired positions, those supports comprise fixation members in the form of short threaded ends 33 having a socket head and a sharp tip (not visible) which, when the threaded end 33 is being tightened, engages the relevant fastening section 21 and, moreover, clamps the ribs 31, 32 of the supports 16, 17 against a side of the grooves 29, 30. These threaded ends 33 are reachable by means of a socket wrench or a hexagon-head screwdriver via joints 11 between the panels 4, 5, 6 in mounted condition for fixing and releasing the supports 16, 17. In this manner, the panels 4, 5, 6 are detachable through displacement of the supports 16, 17 in which they are hooked. For this, displacement of the panels in a direction parallel to the facade surface is not necessary, which means that the panels can be mounted and removed regardless of the presence of panels beside, above or below those panels, and regardless of the relation between the width of the joints and the distance over which the panels are hooked in.

As shown most clearly in Fig. 2, the supports 16, 17 of the fastening system 3 in each case engage facing edges 19, 34, 35 of the blocks 13, 14 of each of the panels 4, 5, 6. During mounting, each of those panels 4, 5, 6 is fixed relative to the fastening system 3 by increasing the distance between supports 16, 17 of that fastening system 3 which engage those panels. This manner of fixing by sliding apart fastening members which hook into facing parts of the panels offers the advantage that when the panels 4, 5, 6 are mounted and the fastening members are fixed in their extreme spaced apart positions and hooked into the panels, it is practically impossible for unauthorized persons to detach the panels without special tools for detaching the fixation members.

Further, this manner of attachment readily enables using the panels against oblique and horizontal surfaces with the outer side facing upwards or downwards. This means the that facade cladding system is also very suitable for cladding bottom sides of coverings, gates, balconies, projecting facades and the like.

The blocks 13, 14, 15 are provided with ribs 18, 36, 37 extending parallel to and at a distance behind the panels 4, 5, 6, and the supports of the fastening system 3 are each provided with a slot 38, 39 in which portions of those ribs 18, 36, 37 are received. Since these ribs 18, 36, 37 extending parallel to the facade surface hook into recesses in the fastening system, a wide tolerance on the lateral position of recesses can be permitted and the panels can be set to obtain straight and uniform vertical joints 11.

The block 13 shown differs from the blocks 14, 15 in that it is constructed as a tubular section. Constructing the block as a tubular construction provides an additional increase of the torsion rigidity of the panels in the area of the corners. Further, with the tubular block 13 it is impossible that a panel moves sidewards so far that the end of the rib 36 of the block 13, which rib extends parallel behind the panel body, slides from the support 16, 17, causing the panel to fall from the support 16, 17. This last is advantageous in particular during the installation of panels when they are first hung approximately in the proper places and then slid sidewards until the eventual precise position is reached.

The proposed facade cladding can thus be erected and accurately set to form a cladding having a smooth and even appearance, without requiring drilling in the work or other operations on parts thereof and without requiring narrow tolerances on the positioning of the fastening system against the construction 1 lying behind it.

The supports 16, 17 which in mounted condition engage the blocks 13, 14, 15, comprise resilient filling pieces 40, 41 which, in the installed condition shown, are clamped between the supports 16, 17 and the panels 4, 5, 6. These resilient filling pieces 40, 41 press out any play between the panels 4, 5, 6 and the supports 16, 17 and thus prevent the panels from rattling, while some freedom for movement is nevertheless allowed for limiting the occurrence of stresses in the panels. Moreover, by these filling pieces 40, 41, the panels 4, 5, 6, which are slightly movable back and forth on the supports 16, 17 in horizontal direction parallel to the facade surface, are held positioned in horizontal direction without actually impeding thermal expansion and shrinkage.

Because the filling pieces 40, 41 are anchored in grooves in the supports 16, 17, the supports 16, 17 can be supplied with the filling pieces 40, 41 pre-assembled, and the filling pieces, too, need not be separately mounted in the work. This last not only simplifies building up, but also simplifies logistics by limiting the number of loose parts and avoids rattling problems caused by the abusive omission of the filling pieces.

Claims

1. A facade cladding system comprising:

   panels (4-6), each having a panel body with end edges (7-10) and corners which in each case form ends of two of the end edges (7-10) and blocks (13-15) fixedly attached to the panel body (4-6) along said end edges (7-10), said panels (4-6) in installed condition forming a facade surface with joints (11, 12) between the

panels (4-6), and

a fastening system (3) with supports (16, 17) projecting towards the facade surface for retaining in installed condition said panels (4-6) relative to a supporting construction (1) of a building,

wherein, in installed condition, said supports (16, 17) in the area of each of the corners of each of said panels (4-6) engage each of said panels (4-6),

characterized in that each of the corners of each of said panels (4-6) is provided with one of said blocks (13-15).

2. A facade cladding system according to claim 1, wherein the panels are provided with raised flanges (7-10) extending along the end edges, and wherein said blocks (13-15) are each positioned so as to connect to two of said flanges (7-10), said flanges extending along two of the end edges whose ends are formed by the relevant corner.

3. A facade cladding system according to claim 2, wherein said blocks (13-15) are each directly attached to two of said raised flanges (7-10).

4. A facade cladding system according to any one of the preceding claims, wherein said supports (16, 17) in installed condition engage said blocks (13-15) for retaining said panels (4-6).

5. A facade cladding system according to any one of the preceding claims, wherein at least two blocks (13-15) of each of said panels (4-6) each have a flange (18) with a free edge (19) which, in a condition in which it is installed against a vertical facade, is located at the bottom side of said flange (18).

6. A facade cladding system according to any one of the preceding claims, wherein the blocks (13-15) are designed as elongated profiled sections whose longitudinal direction, in a condition in which they are installed against a vertical facade, is in each case vertically oriented.

7. A facade cladding system according to any one of the preceding claims, wherein the fastening system (3), in a condition in which it is installed against a vertical facade, comprises vertically extending fastening sections (21) and supports (16, 17) adjustable along said sections (21).

8. A facade cladding system according to claim 7, further comprising fixation members (33) for fixing the supports (16, 17) in positions along the fastening sections (21), said fixation members (33) being reachable, via joints (11, 12) between said panels (4-6) in installed condition, for fixing and detaching said supports (16, 17).

9. A facade cladding system according to any one of the preceding claims, wherein the supports (16, 17) which support a particular panel (4-6) in each case engage facing edges (19, 34) of each of said panels (4-6), such that during mounting, each of said panels (4-6) is fixed relative to said fastening system (3) by increasing the distance between the supports (16, 17).

10. A facade cladding system according to any one of the preceding claims, wherein said blocks (13-15) comprise ribs (18, 36, 37) extending parallel to and at a distance from backsides of said panels (4-6) and wherein the supports are provided with slots (38, 39) into which, in installed condition, portions of said ribs (18, 36, 37) extending parallel to and at a distance behind said panels (4-6) are hooked.

11. A facade cladding system according to any one of the preceding claims, wherein the supports (16, 17) comprise resilient filling pieces (40, 41) which in installed condition are clamped between said supports (16, 17) and said panels (4-6).

12. A facade cladding system according to any one of the preceding claims, wherein the filling pieces (40, 41) are at least partially retained in grooves in said supports (16, 17).

13. A facade cladding panel having a panel body with end edges (7-10) and corners which in each case form ends of two of the end edges (7-10) and comprising blocks (13-15) which are fixedly mounted and located on the backside of said panel and along said end edges (7-10) of said panels (4-6),

characterized in that each of the corners of said panel comprises one of said blocks (13-15).

14. A facade cladding panel according to claim 13, wherein said panel body has a backside and said blocks are attached to said backside.

15. A facade cladding panel according to claim 13 or 14, wherein the blocks (13-15) have facing free edges (19, 34) for cooperation with supports (16, 17) of a fastening system (3).

16. A facade cladding panel according to any one of claims 13-15, further comprising raised flanges (7-10) extending along the end edges, wherein said blocks (13-15) are each positioned so as to connect to two of said flanges (7-10), said flanges extending along two of the end edges whose ends are formed by the relevant corner.

17. A facade cladding panel according to claim 16,

wherein said blocks (13-15) are each directly attached to two of said raised flanges (7-10).

18. A facade cladding panel according to claim 16 or 17, wherein said flanges form bent-over continuations of plate material of the panel.

19. A facade cladding panel according to any one of claims 13-18, wherein the blocks (13-15) are designed as elongated profiled sections.

20. A facade cladding panel according to claim 19, wherein the blocks (13) are each designed as a tubular section.

21. A facade cladding panel according to any one of claims 11-17, further comprising bonding joints (44, 45) obtained by transition from a fluid into a solid state, such as a glued, soldered or welded joint whereby said blocks (13-15) adhere to said panel body.

22. A facade cladding panel according to claim 21, further comprising at least one block spaced from edges of said panel body.

23. A facade cladding panel according to any one of claims 13-22, wherein at least a number of said blocks (13-15) are profile-shaped and fixed by means of a mechanical fastening means, said fastening means engaging the relevant block (13-15) in longitudinal direction.

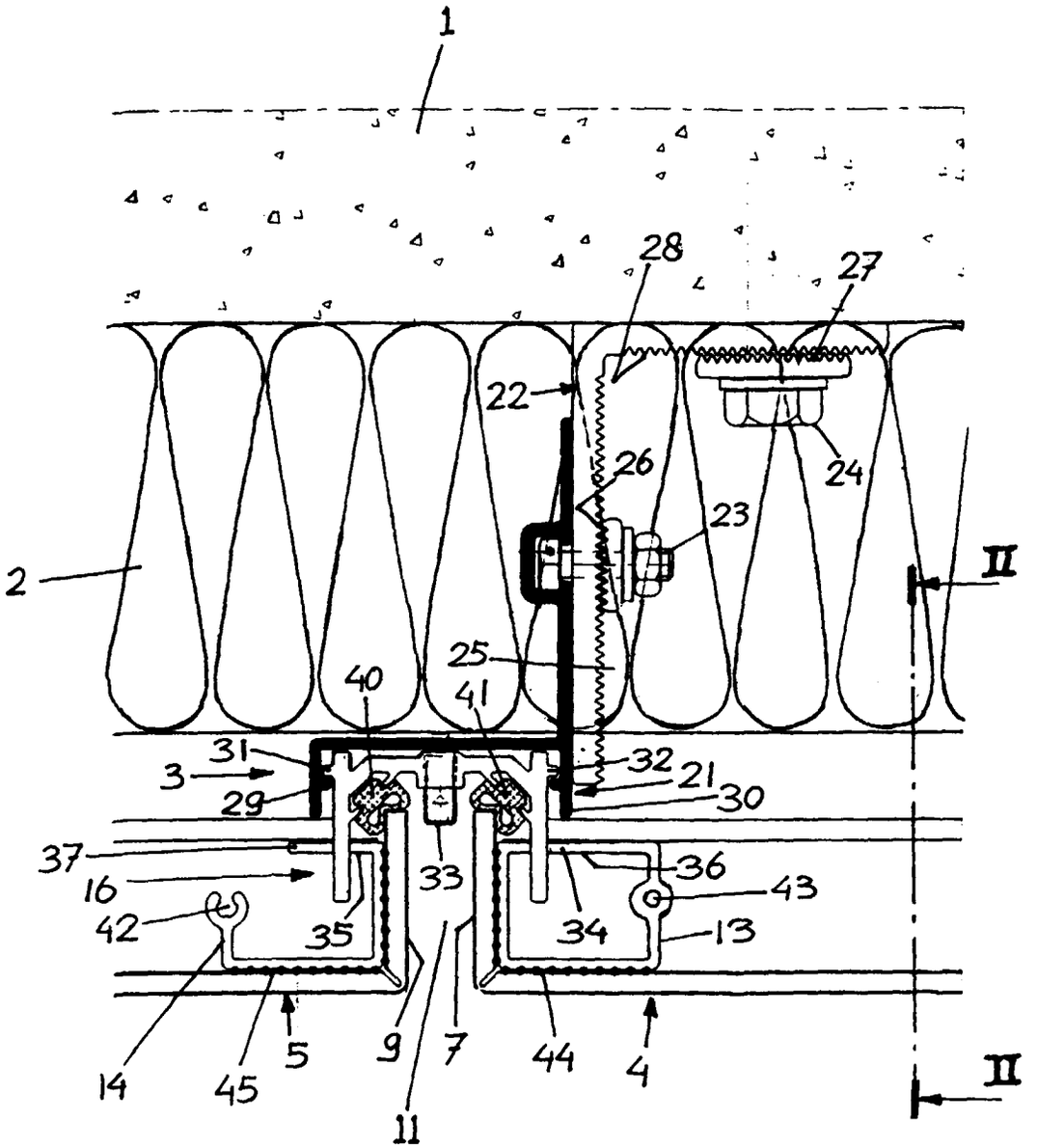

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FIG. 1

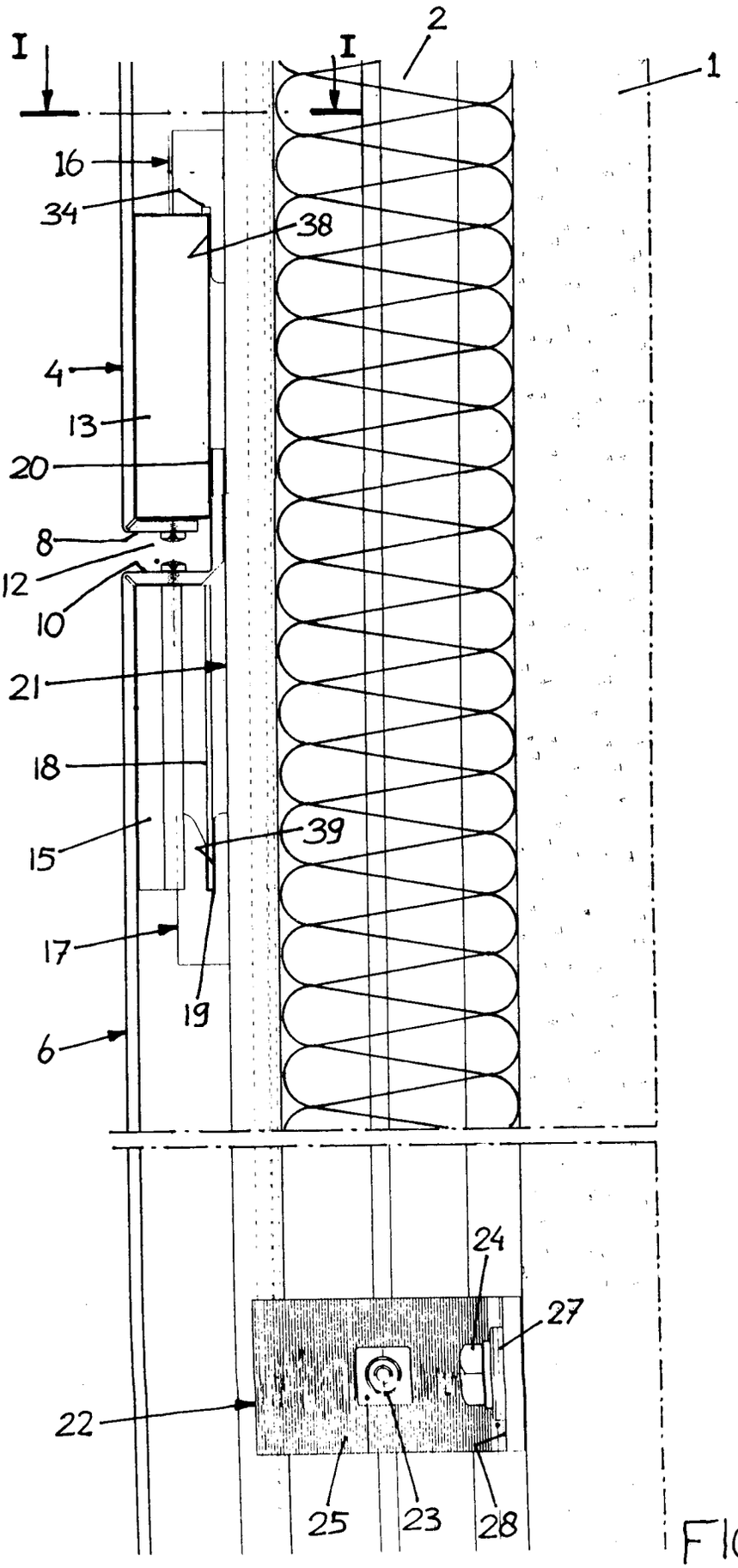


FIG. 2

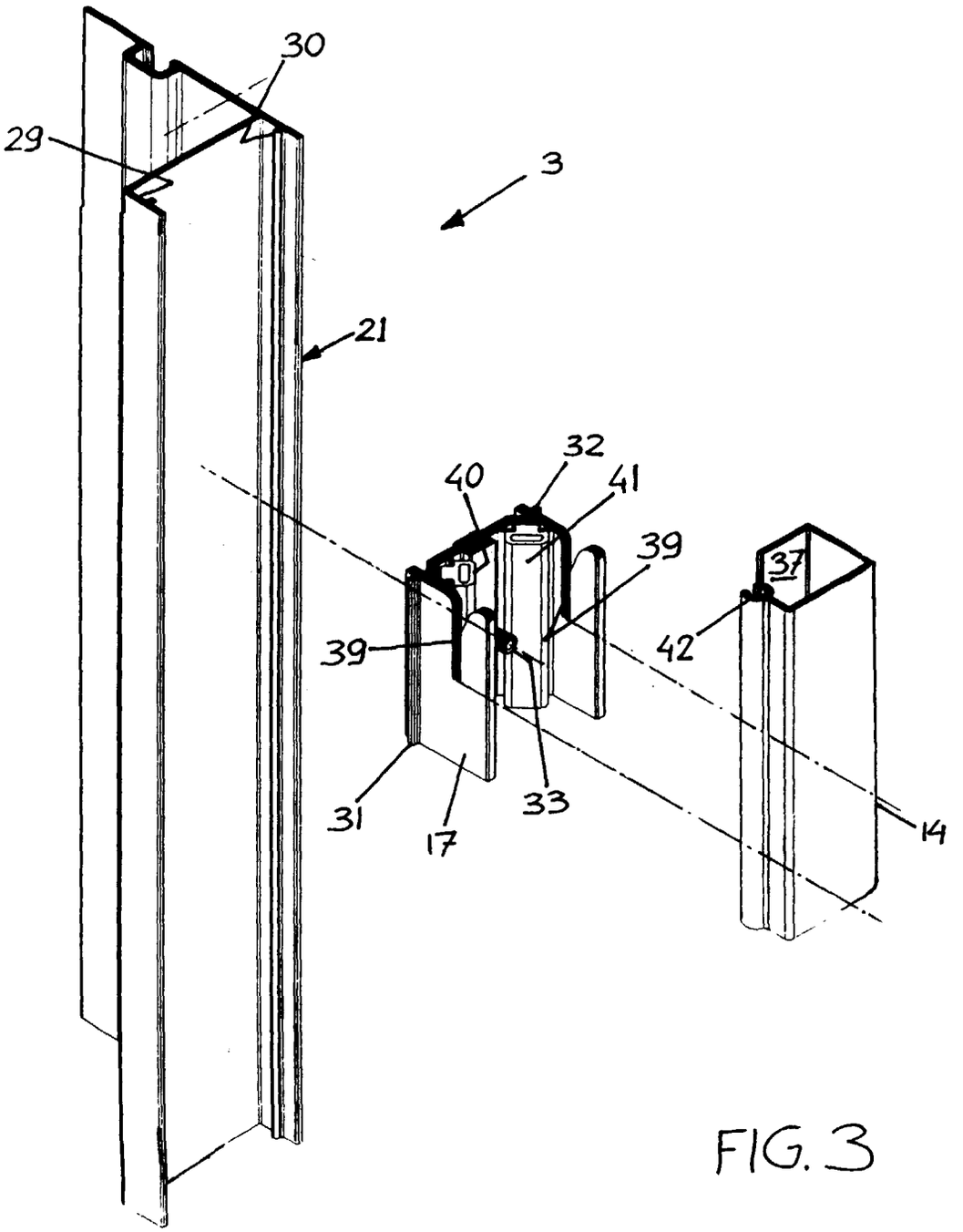


FIG. 3

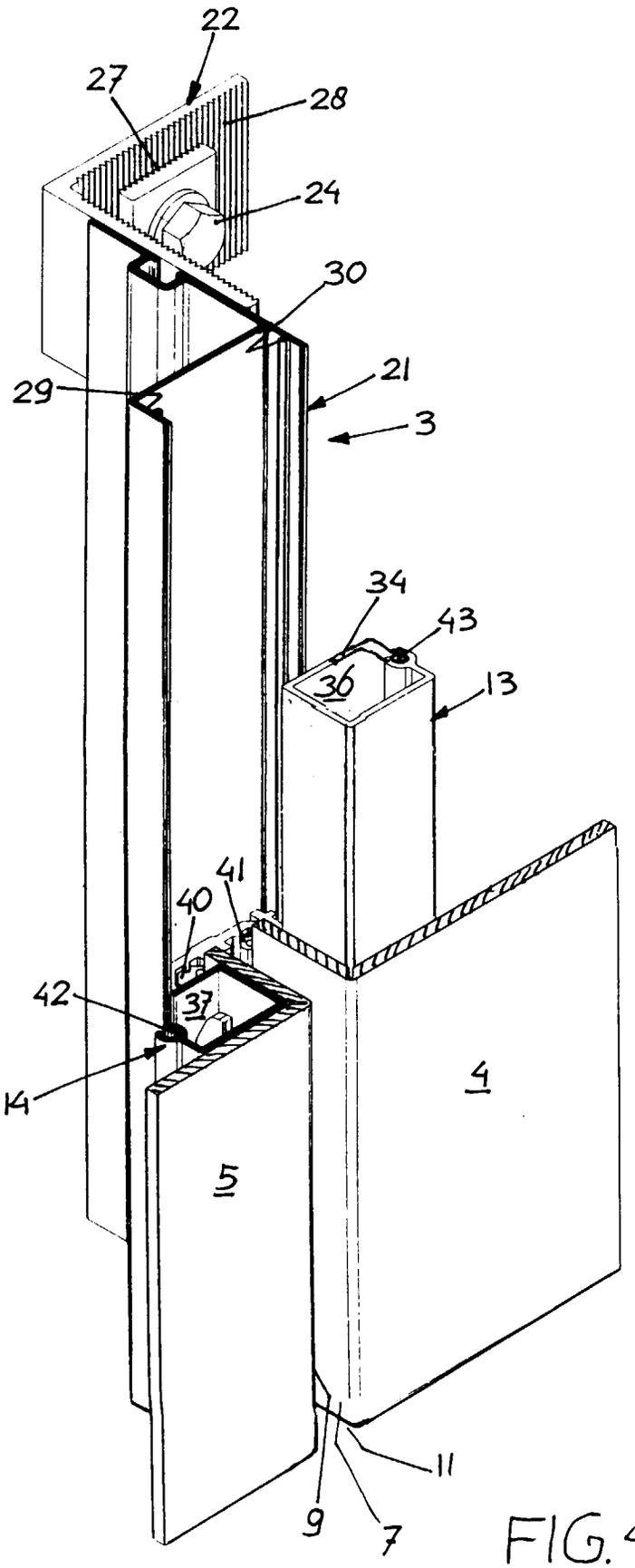


FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 98 20 1820

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)
Y	DE 92 11 639 U (LOOS) 12 November 1992 * page 4, line 3 - page 8, line 25; figures 1-8 *	1,6-8, 10,13, 14,16, 19-23	E04F13/08
Y	DE 94 03 018 U (BITRA AG METTMENSTETTEN) 14 April 1994 * page 5, line 7 - page 10, line 31; figures 1-4 *	1,6-8, 10,13, 14,16, 19-23	
D,A	EP 0 201 630 A (STRAUB THEODOR) 20 November 1986 * page 13, line 18 - page 18, line 2; figures 1-9 *	1,7-9, 11,12	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E04F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	8 September 1998	Ayiter, J

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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