(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 546 847 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92311330.2**

(22) Date of filing : **11.12.92**

(51) Int. Cl.[5] : **E04B 1/16,** E04B 1/348, E04B 2/86

(30) Priority : **13.12.91 GB 9126526**

(43) Date of publication of application : **16.06.93 Bulletin 93/24**

(84) Designated Contracting States : **DE GB**

(71) Applicant : **TRINITY MODULAR TECHNOLOGY LIMITED**
Suite 113, Premier House, 10 Greycoat Place
London SW1P 1SB (GB)

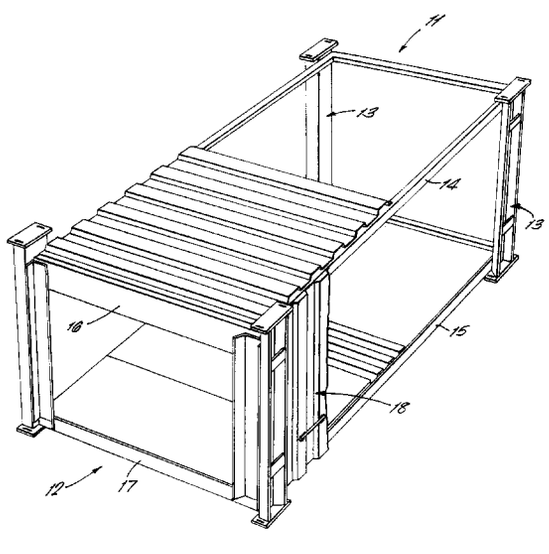
(72) Inventor : **Prewer, John**
71 School Lane
Bapchild Nr.Sittingbourne Kent (gb)

(74) Representative : **Bayliss, Geoffrey Cyril et al**
BOULT, WADE & TENNANT 27 Furnival Street
London EC4A 1PQ (GB)

(54) Improvements in or relating to accommodation modules.

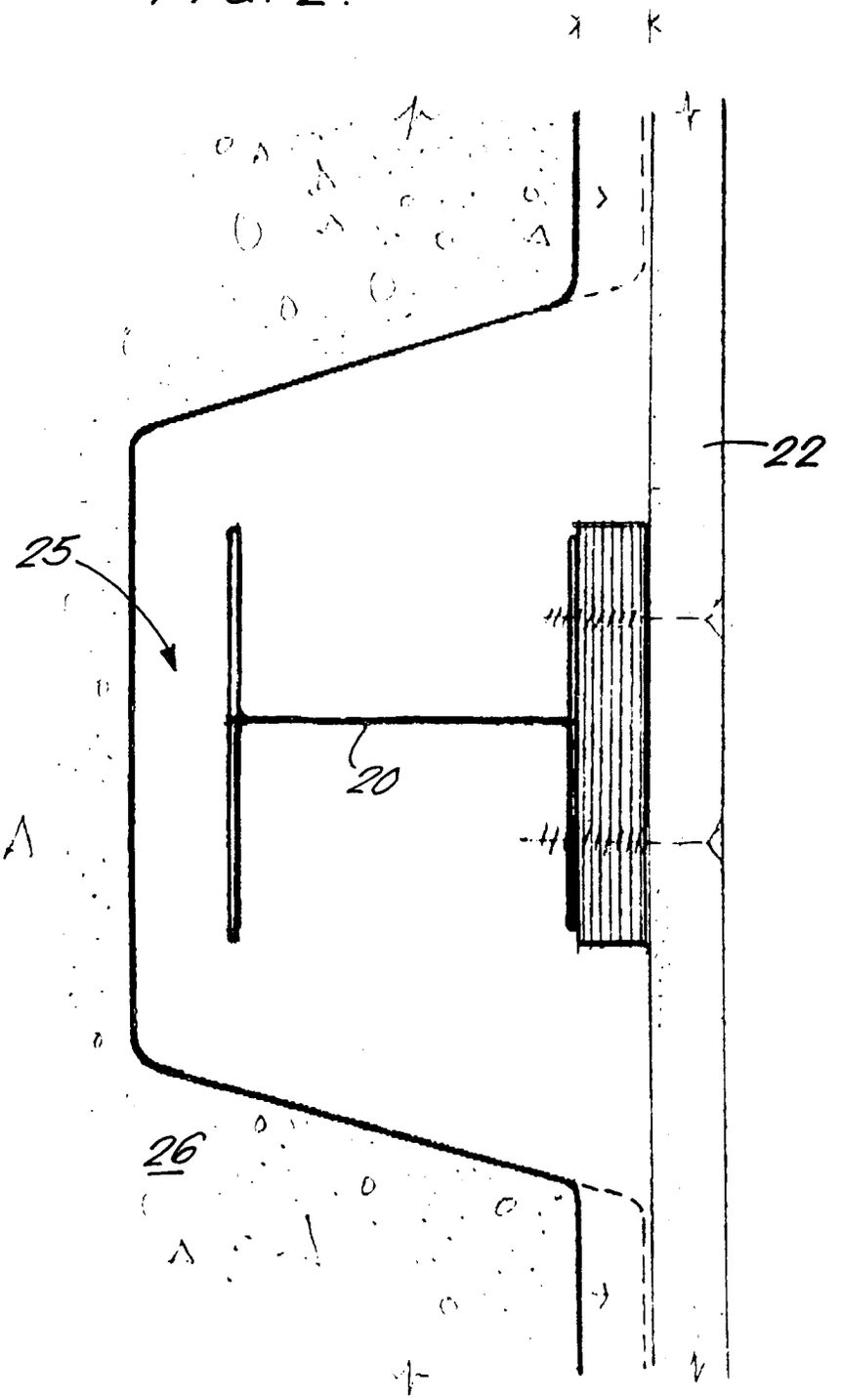
(57) The disclosure relates to an accommodation module comprising a frame (13,14,15,16,17) supporting sheet metal panels (18,40,41). The side panels (18) are secured to upper and lower longitudinal members (14,15,) of the frame and are formed with vertically extending corrugations spaced apart along the walls to stiffen the walls. A plurality of vertically extending stud members (20) extend on the inner sides of the side panels between the upper and lower longitudinal members of the frame and are disposed in troughs in the corrugations of the side panels with all round clearance from the side panels. The studs provide mounting means to support lining panels (22) for the interior of the module spaced from the side panels whereby the side panels can deflect to a limited extent without engaging the stud members or lining panels.

FIG. 1.



EP 0 546 847 A1

FIG. 2.



This invention relates to accommodation modules for forming, with a multiplicity of such units, a single or multi-storey building, each storey of which may comprise one or more parallel rows of modules arranged side by side with a corridor between adjacent rows.

UK Patent No. 2015615 discloses the construction of multi-storey buildings made up of accommodation modules of the form indicated above in which concrete is cast between adjacent modules after they have been mounted on a foundation or on a previously erected row of modules. The concrete creates a cohesive structure between the modules and also provides a degree of fire resistance and sound proofing between the adjacent modules. The side walls of the modules described are formed from sheet metal panels having vertically extending out turned flanges. The flanges are of L-shaped cross section and the abutting flanges of adjacent sheets are bolted together to form a T-shaped cross section element at the join between adjacent panels. The T-shaped element stiffens the panel and also forms a "key" with the concrete cast between adjacent side walls of a pair of modules to form a composite structure between the side walls and cast concrete infill. Although the panels are stiffened by the T-shaped element, the force on the panels when wet concrete is poured in them is considerable if the full amount to fill the gap between the adjacent side walls is poured in one go. The panels may be bowed by the force and because of the risk of this occurring, the interior lining panels for the accommodation module were not put in place until after the modules have been erected on site and the concrete fill set. Thus part of the gains of erecting a building from prefabricated modules was lost in that the interiors of the modules were not fully fitted out.

UK Patent Application No. 9026581.0, discloses an improvement to the arrangement of UK Patent No. 2015615 a number of devices which would link the panels to restrict bowing when the concrete infill is cast between the panels. Nevertheless a limited amount of movement can occur in the panels when the concrete is poured between the side walls of the module and if the modules have been fully fitted out inside, damage may occur to the side wall lining panels.

This invention provides an accommodation module comprising a frame supporting sheet metal panels providing floor, ceiling and side walls, the frame comprising upright corner posts having means for attachment to further horizontally or vertically adjacent modules and upper and lower longitudinal and transverse members interconnecting the corner posts, the side walls being secured to the upper and lower longitudinal members and being formed with vertically extending corrugations spaced apart along the walls to stiffen the walls and a plurality of vertically extending stud members being provided on the inner sides of the side walls and extending between the upper and lower longitudinal members of the frame, the stud members being disposed in troughs in the corrugations of the side walls to provide clearance from the side walls and means being provided on the stud members to support lining panels for the interior of the accommodation module spaced from the side walls whereby the side walls can deflect to a limited extend without engaging the stud members or lining panels.

In one embodiment of the invention the stud members may be in the form of "Unistrut" channel section members extending between and connected to the upper and lower longitudinal members of the module on either side thereof.

More specifically the means to mount the lining panels on the "Unistrut" channels may comprise a number of plates mounted on each channel at spaced locations along the channel, the plates being shaped to support the lining panels spaced with a clearance from the inner sides of corrugated side panels of the module to allow the latter to deflect to a certain extent without bearing on the lining panels.

In a further embodiment of the invention each stud member may be of I-shaped cross section extending between and secured to the upper and lower longitudinal members of the frame, cross-pieces of the I-section members being adapted to receive and support the interior lining panels.

In the latter arrangement the cross-pieces of the I-sections may lie in a plane containing the innermost faces of the corrugated side panels of the module and packing means are provided on the cross-pieces to support the lining panels spaced from the innermost faces of the side walls to allow the latter a limited deflection without bearing on the lining panels.

In any of the above arrangements horizontally extending bars may be mounted at spaced locations on the outer sides of the corrugated side walls between adjacent peaks in the corrugations of the side walls to receive clips linking the bars on side walls of adjacent modules to restrict separation of the panels when concrete is beyween the modules. Preferably each clip has shaped ends to spring over the bars.

The following is a description of some specific embodiments of the invention, reference being made to the accompanying drawings in which:

Figure 1 is a perspective view of an accommodation module in accordance with the invention;

Figure 2 is a cross-sectional view through a part of a side wall of the module showing concrete infill between the module and adjacent module;

Figure 3 is a similar view to Figure 2 showing an alternative construction;

Figure 4 is a diagrammatic view of a vertical section through a pair of adjacent modules;

Figure 5 is a similar view to Figure 4 showing the arrangement in greater detail; and

Figure 6 is a perspective view of part of the connection between the side walls on an adjacent pair of modules.

Referring firstly to Figure 1 of the drawings there is shown a lightweight accommodation module a number of which can be assembled together to form an accommodation block. The module may be erected on a preformed foundation and may be in the form of a multi-storey building, each storey comprising parallel rows of modules with a communications corridor between the adjacent rows. After the erection of the or each storey, concrete is cast between the side walls of adjacent modules to form a cohesive structure between the module. Reference should be made to UK Patent No. 2015615 and UK Patent Application No. 9026581.0 for a general description of the arrangements.

The module illustrated is a generally lightweight box shaped metal structure having one external end indicated at 11 to receive a window unit and balcony and one internal end 12 adapted to open onto a central corridor between rows of modules. The module comprises a frame made up of lightweight steel sections including upright corner posts indicated at 13 which are interconnected by longitudinally extending upper and lower angle section members 14, 15 and by transversely extending upper and lower angle section members 16 and 17.

The accomodation unit has side panels indicated generally at 18 which have vertical corrugations for stiffness and are secured by bolts, rivets or spot welds to the vertical flanges of the upper and lower pairs of longitudinal members 14 and 15. Similar corrugated floor and ceiling panels 40 and 41 extend between and are secured to the upper frame members 14 and lower frame members 15 and assist in holding the frame members and, thereby, the side panels against lateral movement.

I-section stud members 20 extend vertically between the upper and lower members 14, 15 on the inner side of each side wall within the channels provided by the corrugated wall and are secured at their upper and lower ends to the upper and lower members 14, 15 by "Henrob" the self piercing rivets as indicated in Figure 3. The I-section members are dimensioned and disposed to have a clearance from the walls of the channels in the side panels in which they are mounted as indicated in Figure 2 to allow the side walls to deflect to a limited extent without engaging the stud members.

Dry lining panels 22 are mounted on the I-section studs with wooden (or other suitable material) packing pieces between the lining panels and cross pieces of the studs to space the lining panels from the inner faces of the side walls to provide a clearance indicated at 25. Thus when concrete as indicated at 26 is cast between the side walls of adjacent modules, the side walls can deflect to a certain extent because of the pressure of the concrete on the side walls without engaging either the stud member or the lining panel.

The interior of the accommodation module can therefore be fully fitted out with lining panels and furniture and furnishing units off site and the risk of damage to the interior of the accommodation unit when concrete is cast between the opposing side walls of the unit is minimised.

Figure 4 of the drawings shows an alternative construction in which the I-section stud is replaced by a "Unistrut" channel 27 on which dished plates 28 are secured by bolts 29 which engage in washers 30 held captive in the strut at spaced locations to support the dry lining panels off the side walls of the accommodation unit.

Referring now to Figures 5 to 7, an arrangement for restricting the "bowing" of the side wall panels when an infill of concrete is inserted between them is shown comprising bridging bars 31 which extend between and are secured by welding 32 to the inner face of the side walls across the channels in the walls. When a pair of modules is assembled together, pairs of bridging bars on opposing side walls are located opposite each other. Steel clips 35 having shaped ends 36 are provided to snap over the pairs of bridging bars to hold the side wall panels against bowing when concrete is filled in the gap between modules.

Claims

1. An accommodation module comprising a frame supporting sheet metal panels providing floor, ceiling and side walls, the frame comprising upright corner posts having means for attachment to further horizontally or vertically adjacent modules and upper and lower longitudinal and transverse members interconnecting the corner posts, the side walls being secured to the upper and lower longitudinal members and being formed with vertically extending corrugations spaced apart along the walls to stiffen the walls and a plurality of vertically extending stud members being provided on the inner sides of the side walls and extending between the upper and lower longitudinal members of the frame, the stud members being disposed in troughs in the corrugations of the side walls to provide clearance from the side walls and means being provided on the stud members to support lining panels for the interior of the accommodation module spaced from the side walls whereby the side walls can deflect to a limited extend without engaging the stud members or lining panels.

2. An accommodation module as claimed in Claim 1, wherein stud members are in the form of "Unistrut" channel section members extending be-

tween and connected to the upper and lower longitudinal members of the module on either side thereof.

3. An accommodation module as claimed in Claim 2, wherein the means to mount the lining panels on the "Unistrut" channels comprise a number of plates mounted on each channel at spaced locations along the channel, the plates being shaped to support the lining panels spaced with a clearance from the inner sides of corrugated side panels of the module to allow the latter to deflect to a certain extent without bearing on the lining panels.

4. An accommodation module as claimed in Claim 1, wherein, each stud member is a I-shaped cross section extending between and secured to the upper and lower longitudinal members of the frame, cross-pieces of I-section members being adapted to receive and support the interior lining panels.

5. An accommodation module as claimed in Claim 4, wherein the cross-pieces of the I-sections lie in a plane containing the innermost faces of the corrugated side panels of the module and packing means are provided on the cross-pieces to support the lining panels spaced from the innermost faces of the side walls to allow the latter a limited deflection without bearing on the lining panels.

6. An accommodation module as claimed in any of the preceding claims, wherein horizontally extending bars are mounted at spaced locations on the outer sides of the corrugated side walls between adjacent peaks in the corrugations of the side walls to receive clips linking the bars on side walls of adjacent modules to restrict separation of the panels when concrete is between the modules.

7. An accommodation module as claimed in Claim 6, wherein each clip has shaped ends to spring over the bars.

FIG. 1.

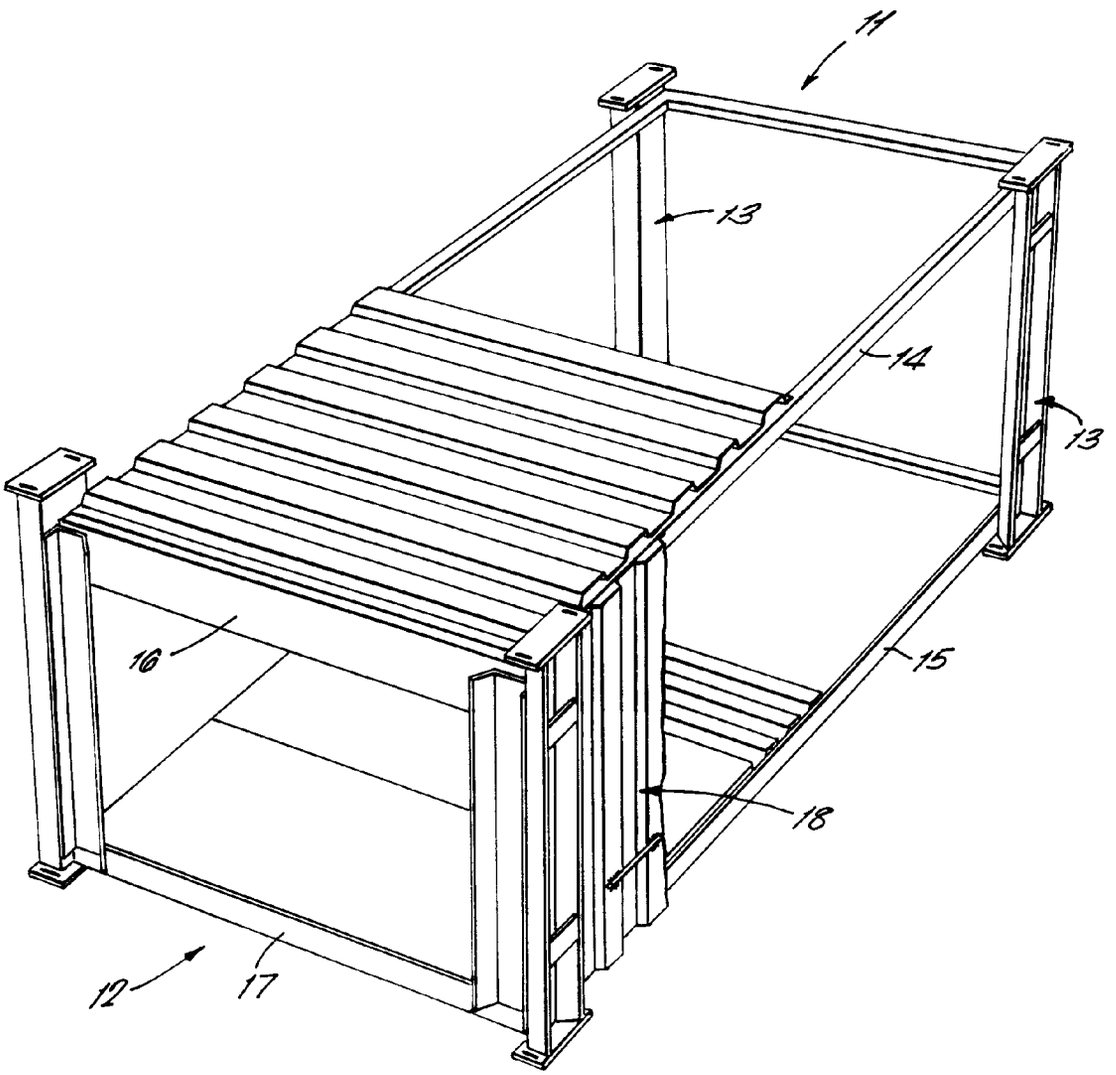


FIG. 2.

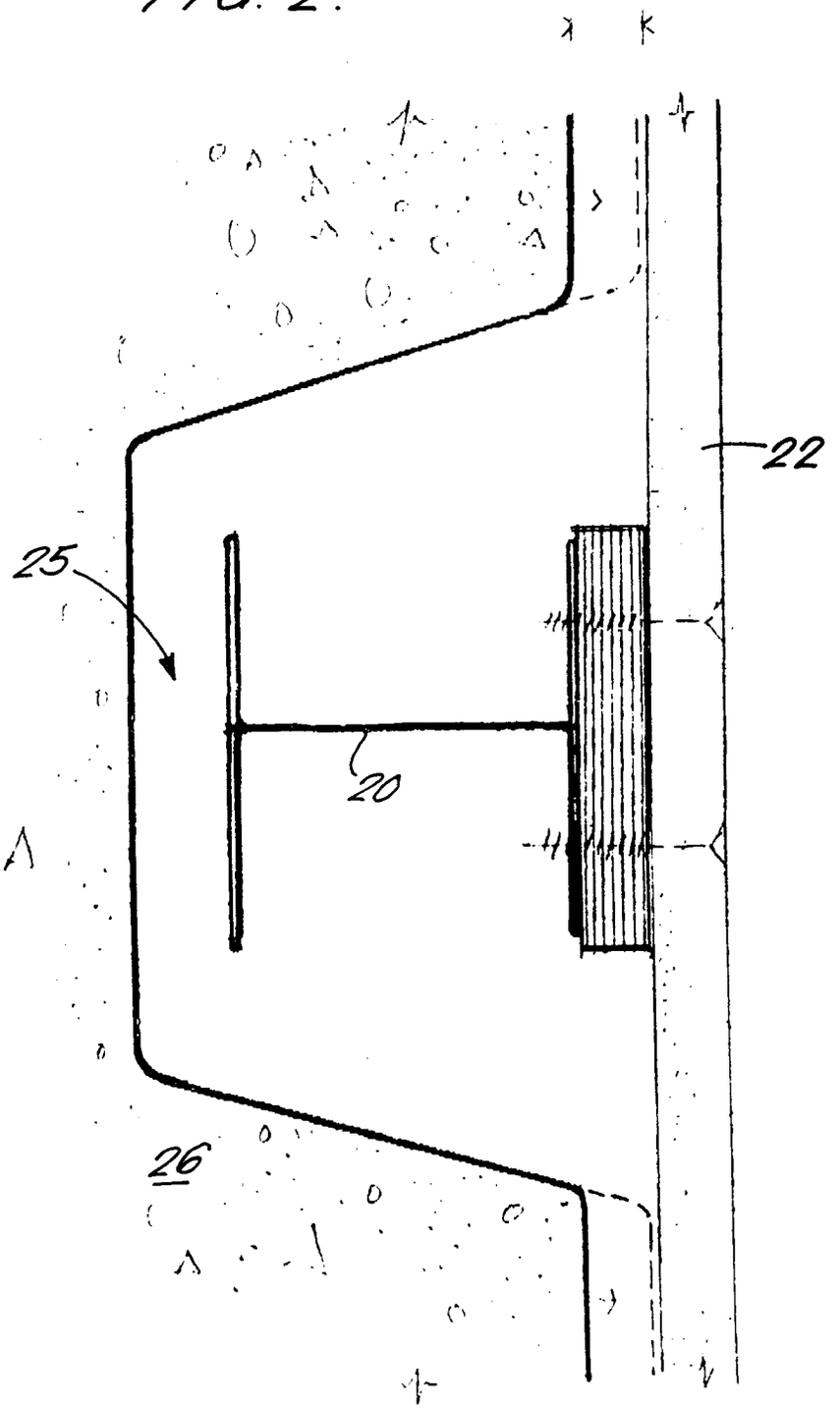


FIG. 3.

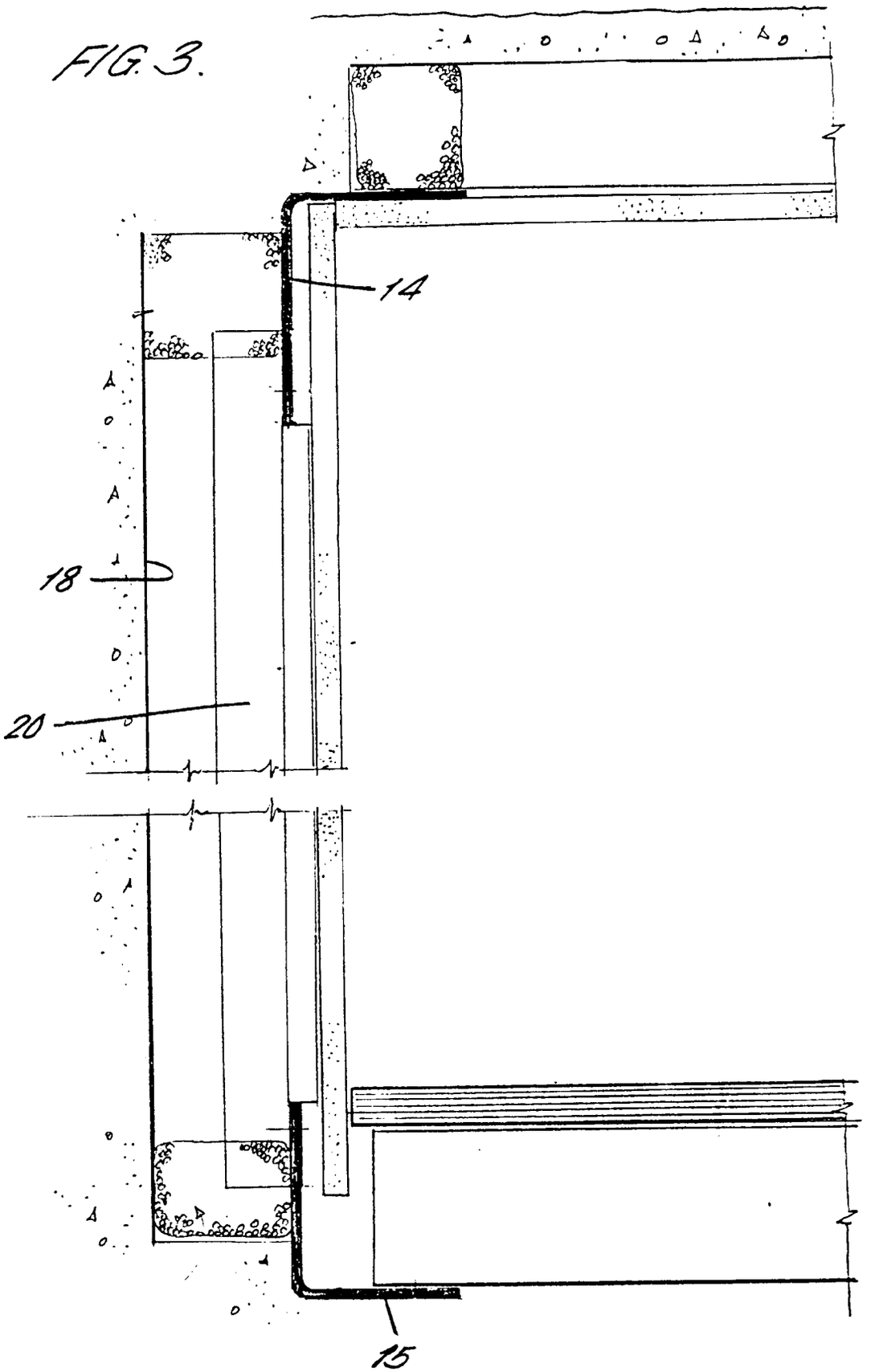


FIG. 4.

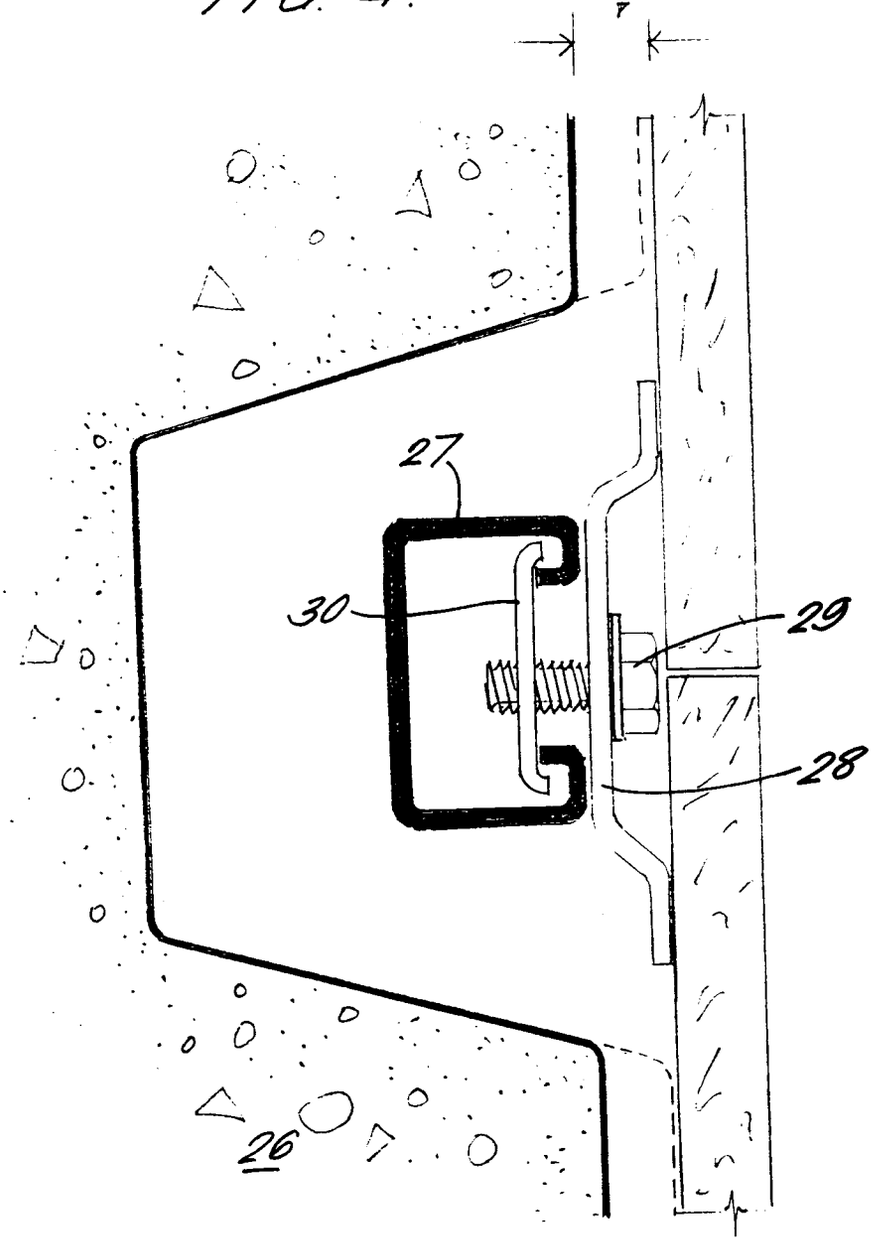


FIG. 5

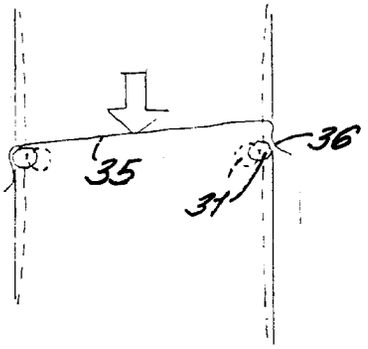


FIG. 6.

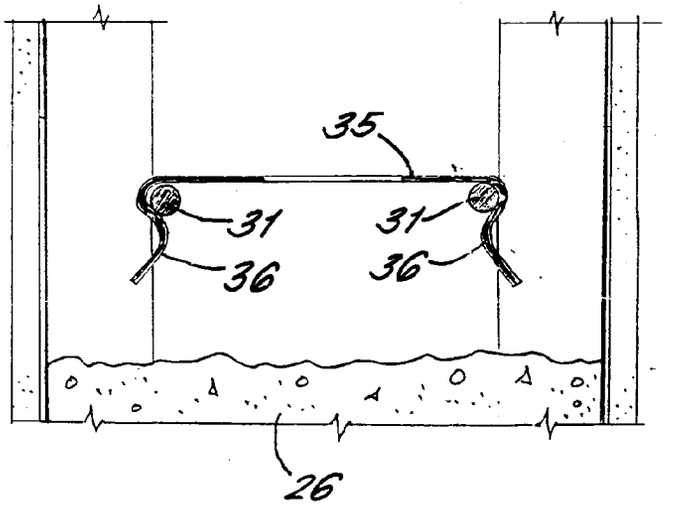
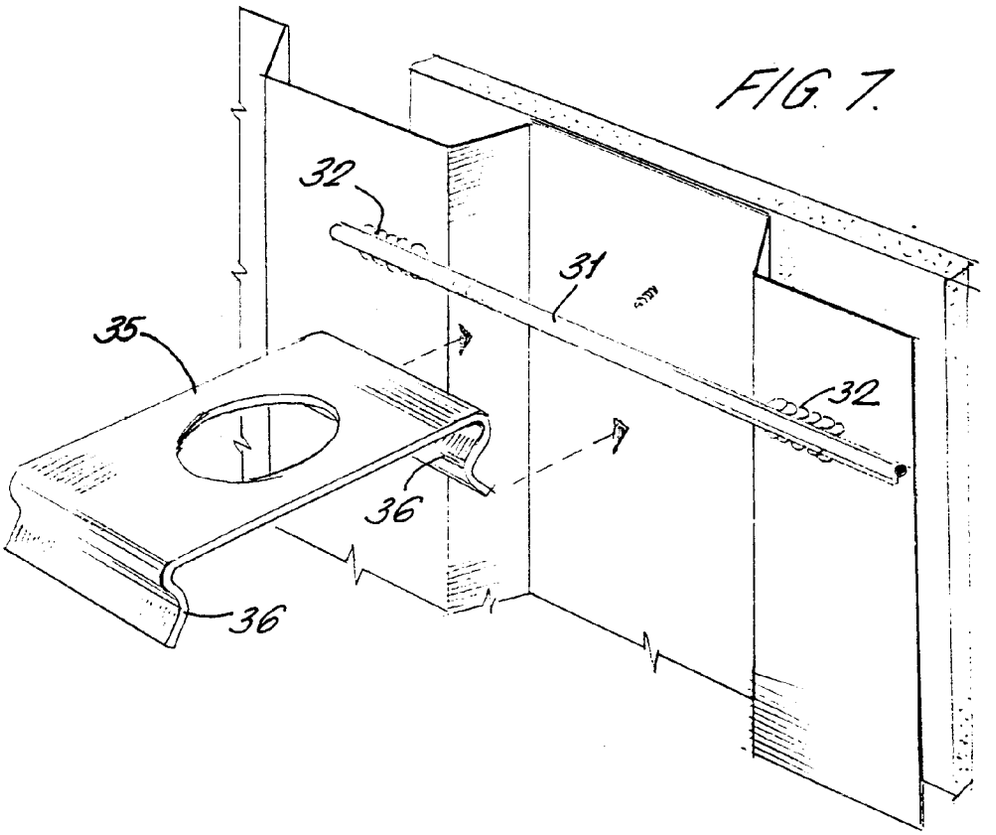


FIG. 7.



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 31 1330

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)
A,D	GB-A-2 015 615 (SANDERS AND FORSTER)		E04B1/16 E04B1/348 E04B2/86
A	US-A-4 357 783 (UNIVERSAL COMPONENT SYSTEMS, INC.)		
A	GB-A-796 730 (MULTI-CONFLATS LIMITED)		
A	GB-A-1 303 703 (PITRA DESIGNS LIMITED)		

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	25 FEBRUARY 1993	HUBEAU M.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

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

EPO FORM 1503 03.82 (P0401)