



(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93300294.1**

(51) Int. Cl.⁵ : **E04B 1/348, E04F 13/12, E04F 19/06**

(22) Date of filing : **18.01.93**

(30) Priority : **17.01.92 GB 9200961**

(43) Date of publication of application :
21.07.93 Bulletin 93/29

(84) Designated Contracting States :
AT BE CH DE DK ES FR GB GR IE IT LI LU MC NL PT SE

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(54) **Modular construction units for buildings.**

(57) The invention relates to modular construction units for buildings and to panel members (1) for their construction. Modular construction units are known, factory built and delivered finished internally, but which cannot readily cope with stresses imposed on the unit during transportation or with any differential expansion between an outer skin and an inner cladding or lining caused by temperature changes. Equally troublesome is ensuring that the modular construction is watertight. The invention seeks to remedy these difficulties by providing a modular construction unit comprising an outer metallic skin (or shell), having internal cladding (4) on at least one wall of the skin (or shell), the skin (or shell) being provided with a plurality of cladding support members (2) extending inwardly from the skin (or shell), first engaging means (3) on the support members (2) for slidable engagement with a respective second engaging means (5) on the cladding (4) material to allow relative movement of the cladding (4) with respect to the skin (or shell), or vice versa.

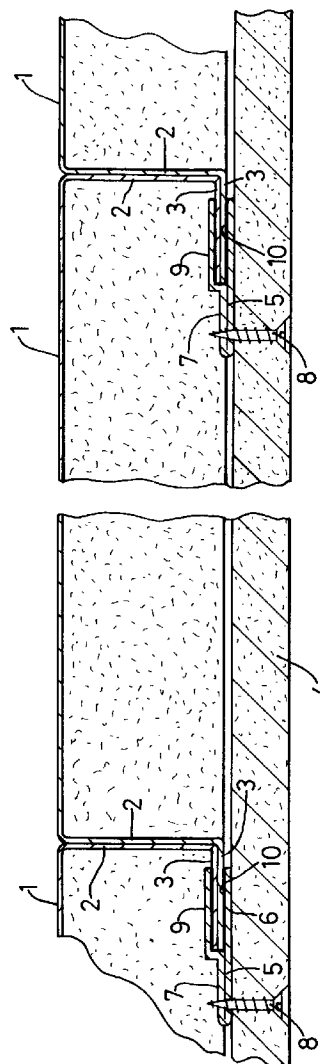


Fig.2

This invention relates to modular construction units for buildings, particularly but not exclusively accommodation units for, such as hotels, student accommodation and the like.

Modular construction is a well known building method whereby individual rooms can be manufactured and finished internally, i.e. decorated and carpeted, at the factory and then transported for assembly with other such units on site. The units are made in the form of a shell having side walls, ceiling and floor. The walls and ceiling are provided with an internal cladding of suitable fireproof material. Whilst this type of construction is very strong and fireproof the unit may be subject to changes in temperature not only on site but temperature change between factory and site such that the steel panels expand or contract at a different rate to the cladding material resulting in damage to the cladding and internal decoration. Similar damage may occur merely due to the rigors of transportation and handling the unit where there is some movement of the steel panels with respect to the cladding. Such an effect can also be created by earth tremors and localised disturbance on site.

According to the present invention a modular construction unit for a building comprises an outer metallic skin (or shell), having internal cladding on at least one wall of the skin (or shell), the skin (or shell) being provided with a plurality of cladding support members extending inwardly from the skin (or shell), first engaging means on the support members for slidable engagement with a respective second engaging means on the cladding material to allow relative movement of the cladding with respect to the skin (or shell), or vice versa.

Preferably the shell is made up of a plurality of butting metal panels or elongate panel lengths fixed together at their respective abutments, at least one panel having at least one support member extending inwardly. The first engaging means is preferably a tongue adapted to slidably engage a groove provided by the second engaging means on the cladding.

The shell is preferably spaced from the cladding and the panels are preferably formed from sheet metal, with a planar central portion and two inwardly turned abutment flanges. Preferably, the flanges extend perpendicular to the respective panels. The panels may be secured together by welding or local deformation. The free end of at least one flange of each panel may be provided with a portion perpendicular to the flange to provide the tongue.

Preferably, a tongue is provided on each flange for engagement with respective grooves on the cladding. The tongue may be formed simply by bending of the flange or by spot welding or stitch welding a portion to the flange.

The groove is preferably formed by means of a metal element secured to the cladding by suitable means, i.e., screws, bolts, rivets and the like, said ele-

ment may be in the form of a flat plate or strip kinked outwardly to form the groove between the cladding and the element whereby to receive the tongue. Alternatively, the metal element is fork-like to one side to form the groove to receive the tongue.

Preferably, abutting flanges are bent together to form the tongue. A suitable elastomeric material, such as rubber may be provided on at least one side, but preferably both sides, of the tongue to provide a firm fit in the groove and provide increased resistance to sound transfer.

A further metal element may be provided on the cladding between the first metal element and the cladding to protect the cladding from the tongue.

According to a second aspect of the invention a panel for a modular construction unit in accordance with the first aspect of the invention comprises an elongate panel length formed from sheet metal, with a planar central portion and two inwardly turned abutment flanges, the free end of at least one flange is provided with a portion perpendicular to the flange to provide a tongue and at least one section of material is removed at the intersection of the flange and the tongue in order to create a gap thereby to increase resistance to sound transfer through the material.

Preferably, a tongue is provided on each flange for engagement with respective grooves on the cladding.

The tongue may be formed by simply bending the flange or by spot welding or stitch welding a portion to the flange. Preferably, a plurality of gaps are provided along the intersection.

According to a third aspect of the invention a building comprises a plurality of modular construction units in accordance with either the first and second aspects of the invention.

An essential advantage of the invention is that a modular construction unit, at least over its walls, can be formed predominantly from a requisite number of identical panel members with a minimum number of additional corner connecting units and spacer members, with the benefit of that on manufacturing costs, enabling relatively low cost production of modular units to serve as rooms that can be internally fitted to suit any required purpose.

One embodiment of the invention will now be described by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is an elevation of a panel member in accordance with the invention;

Figure 2 is a sectional plan view showing panel members of the invention connected to internal cladding members;

Figure 3 is a sectional plan view showing panel members of the invention connected to corner units;

Figure 4 is a sectional side elevation showing the location of panel members of the invention on a

floor member; and

Figure 5 is a sectional side elevation showing the mounting of roof members on the panel members according to the invention.

As is shown primarily by Figures 1 and 2, a panel member 1 is formed from flat sheet material, inwardly turned at each edge to form abutment flanges 2, the inner ends of which are further turned to provide tongues 3 lying perpendicular to the respective flanges 2.

Thus, with adjacent panels 1 in abutting side by side relationship (Figure 2) the respective flanges 2 are in contact, preferably with an interposed elastomeric material, and the tongues 3 overlying each other to form a means of connection to internal cladding members 4.

Secured to the cladding members 4 are connecting members 5 (glide bars) formed by bending flat sheet material to provide a face member 6 to lie against the cladding, a flat folded section 7 to serve as a connecting flange to be engaged such as by a securing screw 8, and kinked outwardly at 9 to create a groove 10 to receive the tongues 3 of the panel members, preferably with elastomeric material within the groove and surrounding the tongues.

At the top and bottom of the panel members inwardly folded sections 11, 12 are provided to provide top and bottom faces to the panel members.

As is indicated in the drawings, the inner space of the panel members can be filled with a suitable heat/sound insulating material such as rockwool.

To assemble a complete wall of a modular unit, it is simply a case of laying a requisite number of panel members on a support surface with the respective flanges abutting each other and the respective tongues overlying each other, placing the cladding members on the panel members, with connecting members (glide bars) secured in the required positions, and sliding the cladding members to introduce the tongues into the respective grooves.

A complete wall can then be fitted and suitably located on a prepared floor as will be described below. With the cladding members formed from such as plasterboard, it is equally possible to apply decoration to its surface prior to being lifted for placement on the prepared floor.

As is shown by Figure 3 adjacent walls formed from a number of panel members 1 are connected by corner posts 12,13 each formed as a pressing from flat sheet material, in similar manner to the panel members 1. Thus the corner unit 12 is bent to its side to form flanges 14,15, with the flange 14 further turned to form a perpendicular tongue 16 for sliding engagement in the groove of a connecting member 5 secured to a, eg, plasterboard cladding member 4. The flange 15 has its out edge turned to form a perpendicular tongue 17 which tongue is further intumed to form a lip 18 to engage behind an angled connect-

ing member 19 one leg of which is located within the groove of a further connecting member 5 secured to the plasterboard cladding member 4. The corner post 13 is constructed identically to the panel members 1, but of appropriately narrower width to provide tongues 20 and 21, the tongue 20 fitting in the groove of a connecting member 5 at the edge of a respective cladding member 4, and the tongue 21 along with the tongue of the immediately adjacent panel member 1 being directly secured to the cladding member such as by a screw. The abutting faces of the respective flange on the post 13 and the tongue 17 on the post 12 may have an interposed layer of a sealant/adhesive but preferably is overlayed by a connecting plate 22 bolted to the flange 15 of the post 12 and the face of the post 13 with an interposed layer of a sealant/adhesive, to ensure a watertight connection.

The location of the walls on a floor is illustrated in Figure 4. Here, floor members 23 formed identically to the panel members 1 but of larger size are laid in abutting side by side relationship with the face of the members 23 uppermost and to the outer edge of the floor members there is secured an angled location member 24 on to which the respective panel members 1 and corner post 12,13 are placed, and there secured such as by rivets 25 (or by welding). The inner leg 26 of the location member 24 has an intumed flange 27 to form a bearing surface for the cladding members 4 of the wall members and corner posts and to form a location below which the ends of flooring members 28 locate, the flooring members sitting on a appropriate sound insulating/heat insulating layer 29 placed on the floor members 23.

As is shown by Figure 5, a roof to the modular unit is formed by roof members 30, each formed identically to the panel members 1 and of the size larger than the panel members 1 but smaller than the floor members 23. The roof members have an underslung ceiling formed by cladding members of an appropriate material attached to the ceiling members by connecting members identical to those that attach the cladding members to the wall members, and the space within each ceiling member is again filled with an appropriate sound proofing/heat insulating material. On the exposed upper faces of the roofing members, a first cap plate 31 is provided of triangular configuration and located one at each corner of the modular unit, each cap plate being secured in place such as by welding. Further larger cap plates 32 are provided again of triangular shape to extend across the cap plates 31, and each secured to a respective cap plate by welding. The cap plates 32 provide an overhanging portion 33 below which engages the edge of outerfacing members of sound/heat insulating material and/or metal sheeting to seal the roof of the modular unit. The cap plates 31 extend beyond the edge of the roof members, to overlie the tops of the corner posts 12,13 for connection to the end most flanges of the

corner posts such as by welding.

For added rigidity and as is indicated in Figure 4 triangular base plates 34 can be provided at the corners of the floor and secured to the overlying floor members by welding the tongue sections of the floor members to the base plates.

The result of the invention is the ability to provide modular units in highly cost effective manner, with an outer watertight metal skin, with no disruption to the internal cladding as a consequence of expansion of contraction of the outer metal skin. Its strength is such that modular units can be placed one on top of another, to enable the creation of buildings with multiple rooms. It will be evident that each modular unit can be internally fitted in any desired manner to suit any required purpose.

Claims

1. A modular construction unit for a building characterised by an outer metallic skin or shell (1,12,13) having internal cladding (4) on at least one wall of the skin or shell, the skin or shell being provided with a plurality of cladding support members (2,3) extending inwardly from the skin or shell, first engaging means (3) on the support members (2) for slidable engagement with a respective second engaging means (5) on the cladding material (4) to allow relative movement of the cladding material with respect to the skin or shell, or vice versa.
2. A modular construction unit as in Claim 1 characterised in that the skin or shell is made up of a plurality of butting metal panels or elongate panel lengths (1) fixed together at their respective abutments at least one panel (1) having at least one support member (2) extending inwardly.
3. A modular construction unit as in Claim 2 characterised in that the first engagement means (3) is a tongue adapted to slidably engage a groove provided by the second engaging means (5) on the cladding (4).
4. A modular construction unit as in any of Claims 1 to 3 characterised in that the panels (1) or formed as a pressing from sheet metal with a planar central portion and two inwardly turned abutment flanges (2) there being a tongue (3) formed on or secured to each flange and lying perpendicular to the each flange.
5. A modular construction unit as in any of Claims 1 to 4 characterised in that the second engaging means (5) is formed from flat plate or strip material kinked outwardly to form the groove.

6. A modular construction unit as in any of Claims 1 to 4 characterised in that the second engaging means (5) is formed from flat plate or strip material bent to provide a face to contact the cladding material and to provide a fork-like sector to form the groove.
7. A modular construction unit as in any one of Claims 1 to 6 characterised in that an elastomeric material is provided between the first and second engaging means (3,5).
8. A panel for a modular construction unit, characterised by an elongate panel length (1) formed from sheet metal with a planar central portion and two inwardly turned abutment flanges (2), the free end of at least one flange (2) being provided with a portion perpendicular to the flange to provide a tongue (3).
9. A panel as in Claim 8 characterised in that at least one section of material is removed from the intersection of the flange (2) and the tongue (3) to create a gap thereby to increase resistance to sound transfer through the material.
10. A panel as in Claim 8 or Claim 9 characterised in that a tongue (3) is provided on each flange (2) by simple bending of a flange or by being separately formed and suitably secured to the flange (2).
11. A building characterised by a plurality of modular construction units in accordance with Claim 1 the walls of each of which are constructed from panel members in accordance with Claim 8.
12. A modular construction unit as in Claim 1 characterised in that the roof of the unit and the floor of the unit or each formed by panel members with essentially similar characteristics to those of the panel members (1), the roof at least having internal cladding (4) to form a ceiling secured to the roof members in essentially similar manner to the cladding (4) of the panel members (1), and a floating floor being laid on the floor members.

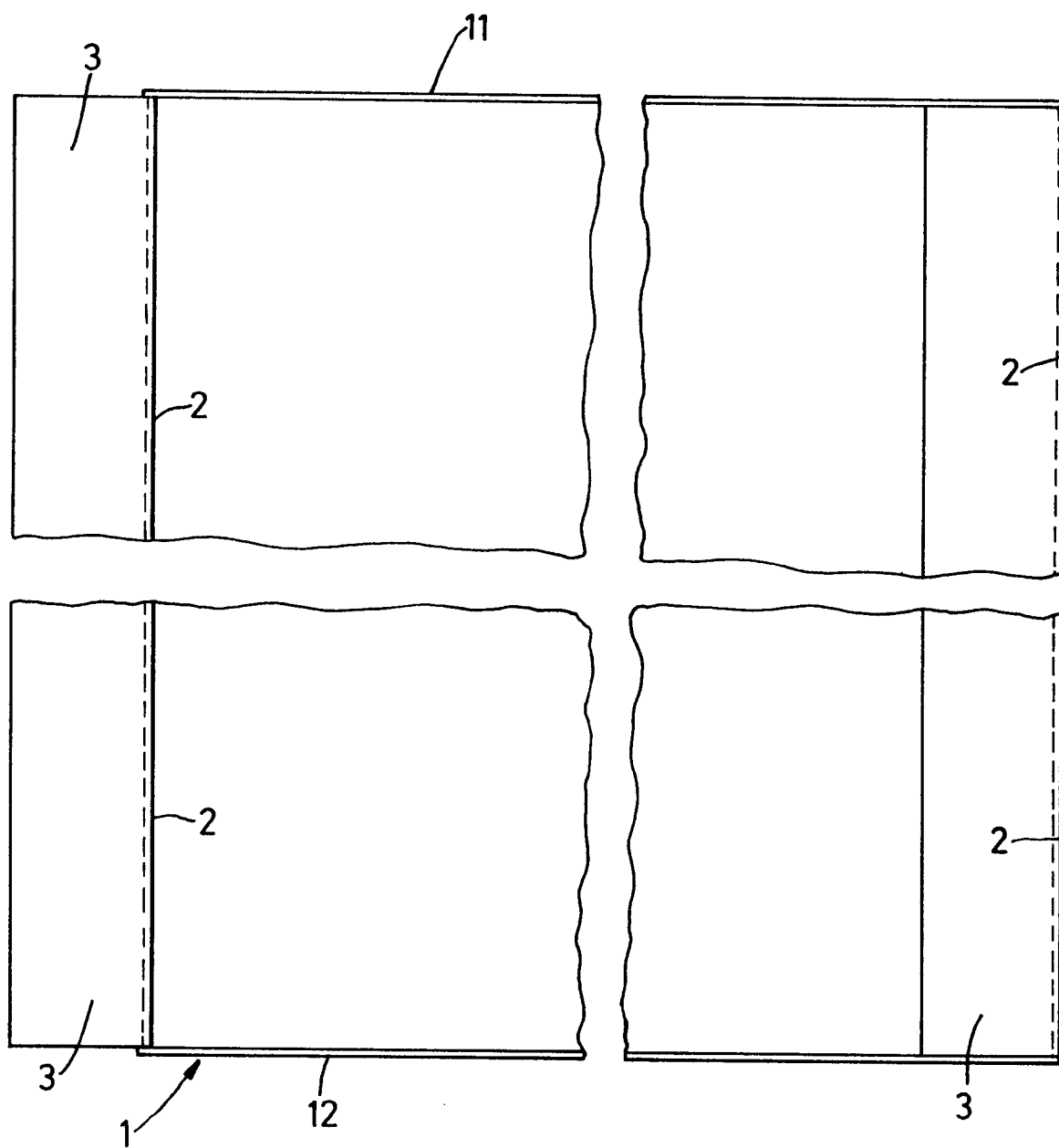


Fig.1

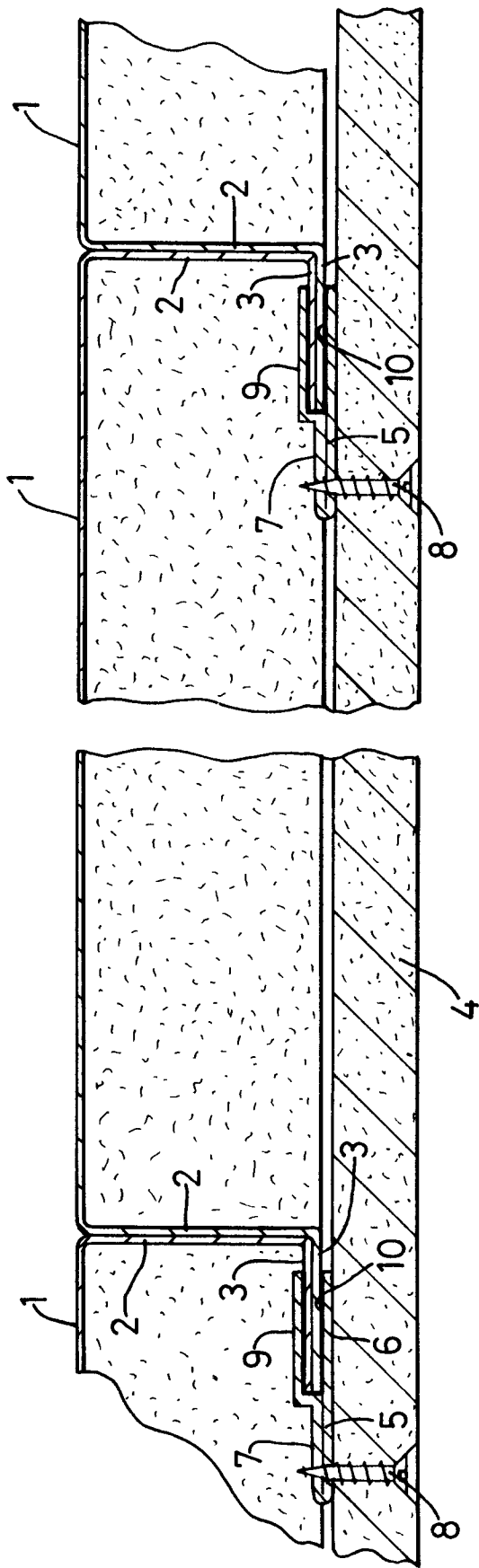


Fig.2

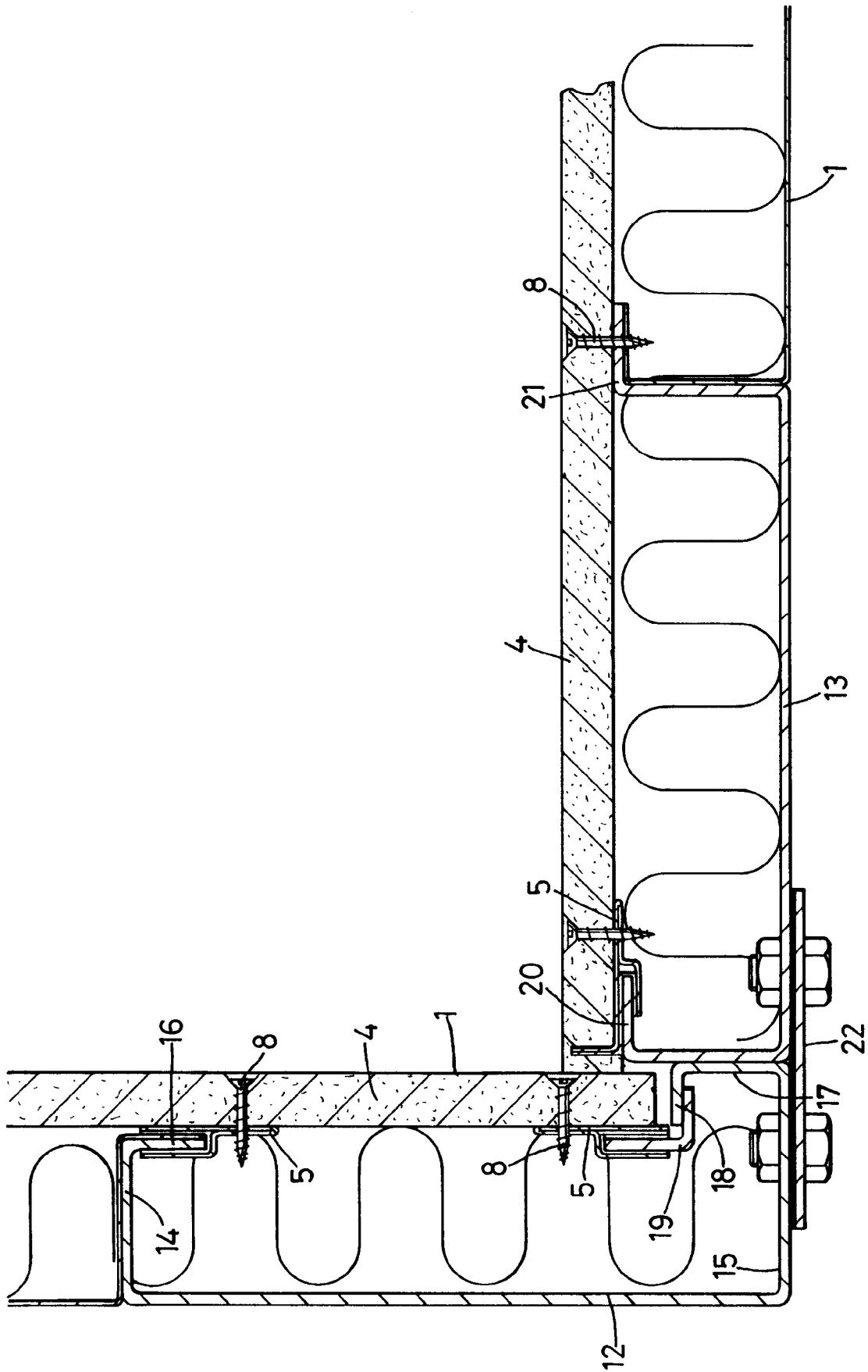


Fig.3

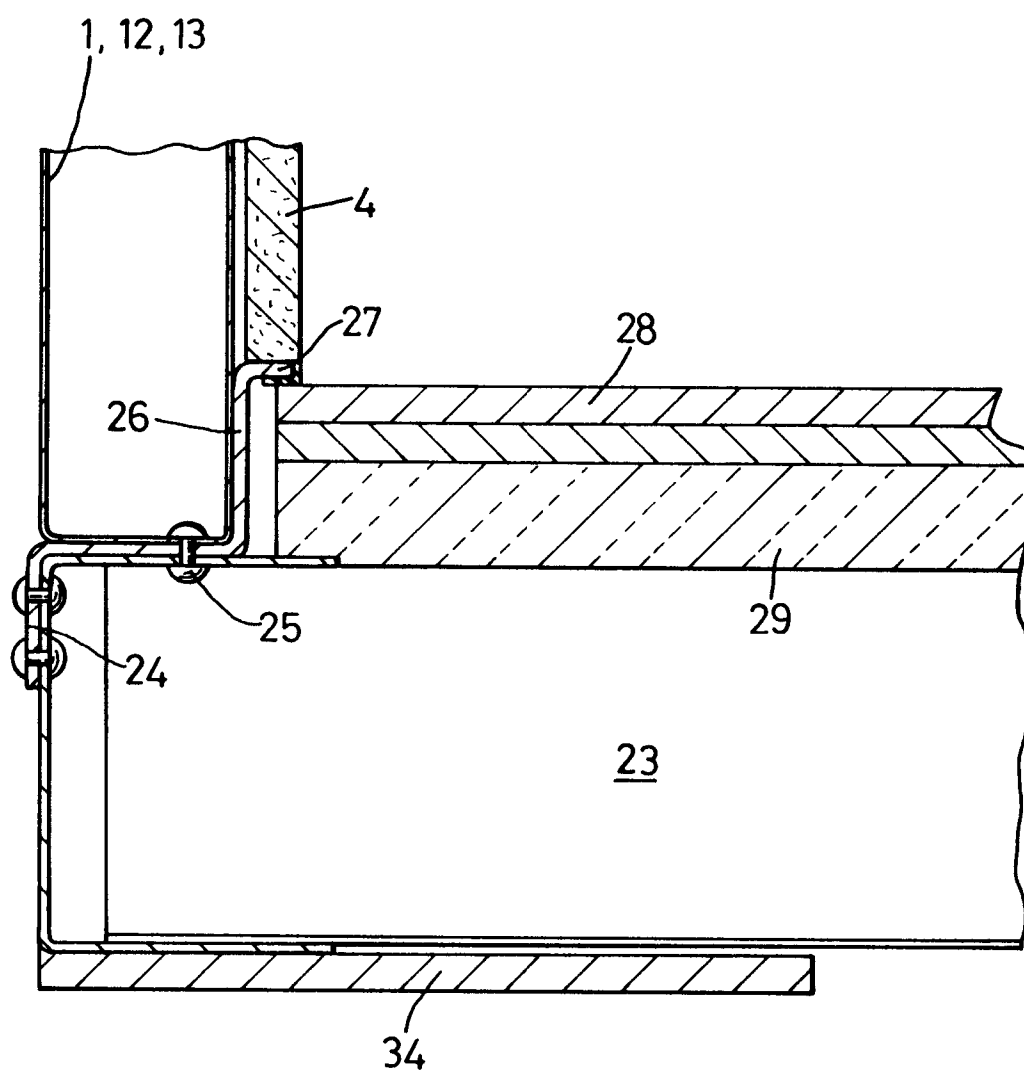


Fig.4

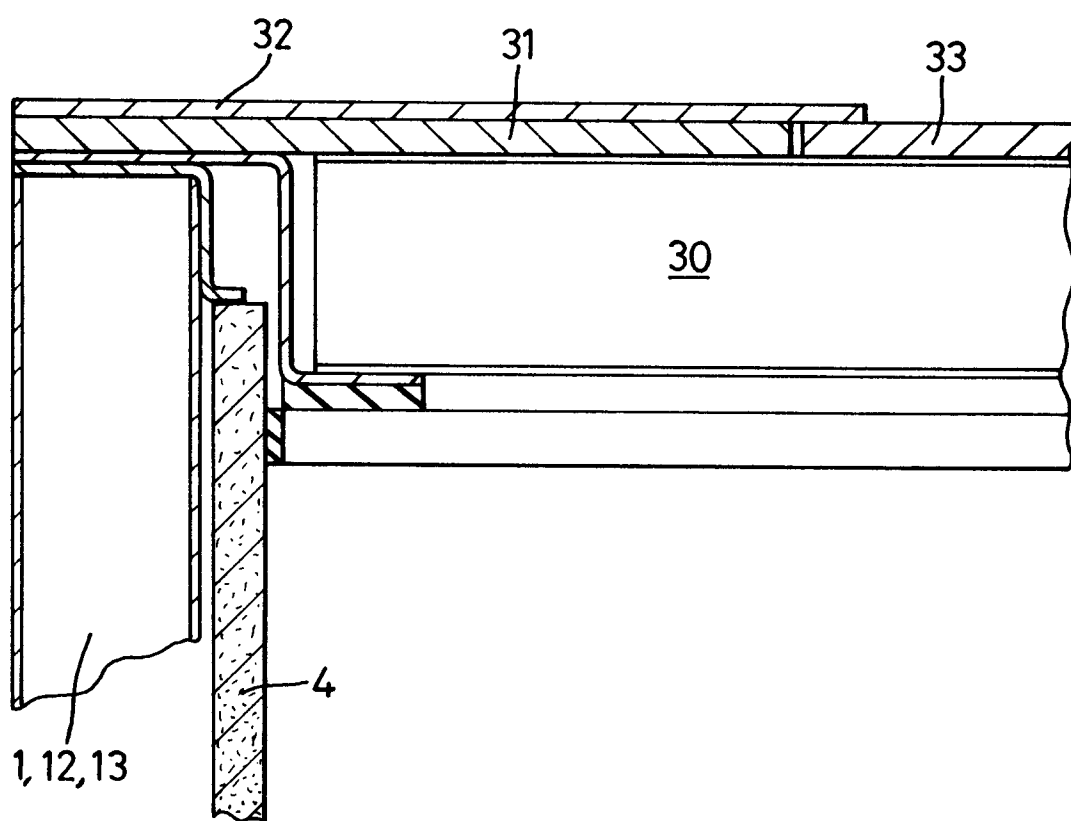


Fig.5



European Patent
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EUROPEAN SEARCH REPORT

Application Number

EP 93 30 0294

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	GB-A-L21866 (STOREY) & GB-A-21866 A.D. 1911 * page 3, line 26 - page 4, line 33; figures 1,2 *	8-10	E04B1/348 E04F13/12 E04F19/06
Y	EP-A-0 058 354 (PORTAKABIN LTD) * page 1, line 1 - line 12 *	1-4,7,11 12	
A	* page 5, line 12 - line 22 * * page 6, line 27 - page 7, line 18 * * page 8, line 1 - line 16; figures 1-4 *		
Y	EP-A-0 121 120 (ELTREVA AG) * page 10, line 1 - page 11, line 19; figures 1,2,4,6 *	1-4,7,11 8	
A	DE-A-2 458 833 (BILLIAN) * page 6, line 14 - page 7, line 6; figures 1,3 *	5,6	
A	DE-A-3 208 302 (HÄFELFINGER)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E04B E04F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05 APRIL 1993	Examiner PORWOLL H.P.
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			

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