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**EUROPEAN PATENT APPLICATION**

21 Application number: 80850092.0

51 Int. Cl.<sup>3</sup>: **E 04 C 2/38**  
**E 04 C 2/26, E 04 B 2/72**

22 Date of filing: 16.06.80

30 Priority: 19.06.79 FI 791945

43 Date of publication of application:  
07.01.81 Bulletin 81/1

84 Designated Contracting States:  
DE FR IT NL SE

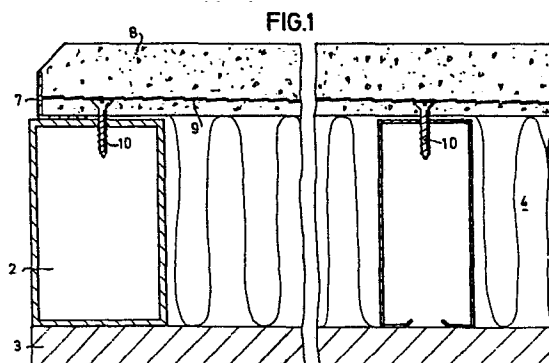
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54 A light-weight wall element and method for manufacturing such element.

57 A light-weight wall element having a concrete slab constituting the external layer (8) of the element. This slab is made by using the frame (2) and an L-shaped profile (7) attached thereto as a mould and casting concrete therein. The slab is reinforced with a ribbed steel lathing (9) which in turn is affixed directly to the frame (2) by means of screws (10).



A light-weight wall element and method for manufacturing such element

The present invention relates to a light-weight wall element produced quickly and cheaply, and being particularly suitable for house building in warm countries such as in the Middle East.

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Different types of building elements are today used in house building. As an exterior wall element a sandwich element is often used, which comprises layers of different types of materials. Between the external and internal layers  
10 in such wall element there is placed thermal insulation, e.g. insulation of rock wool or polyurethane foam. Building elements can be produced either at building sites or in building element factories.

15 In order to standardize the building methods, for the purpose of minimizing the building costs, speeding up the building work and reducing the work at the building site, it has been proposed to use prefabricated building elements.

20 The external surface or face of this type of element is nowadays often made of porous, gypsum-based materials, timber or reinforced concrete. Thermal insulation and weather insulation of gypsum-based materials is often very poor, and wood cannot resist termites in warm countries.

25 Elements being made of concrete and reinforced with steel are usually massive, thick and heavy, and transportation and erection costs for such elements are high.

If concrete elements are produced in a warm country, where  
30 the building work is to be executed, the requirements of elements made by using a normal method include the establishing of an element factory with large factory facilities and expensive moulds for the production of the elements.

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Transportation and removal of these elements would require heavy duty equipment and thus the investment costs would be high. Moreover, these arrangements are limiting from a production planning point of view; building will  
5 probably be very monotonous.

The traditional element production is relatively slow. Erecting such heavy and massive units requires the use of heavy duty equipment, and moreover their weight places heavy  
10 demands on groundload carrying capacity and foundations. When coloured elements are to be used, such elements will be very expensive when made by using traditional methods because of the large amount of colour powder needed for a thick external layer.

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The invention as claimed is intended to eliminate the above disadvantages.

The main object of the present invention is thus to provide  
- 20 a light-weight, prefabricated wall element particularly suitable for use in warm countries. A further object of the present invention is to provide a light-weight wall element which can be manufactured quickly and at a low cost. Still another object of the invention is to provide a method for  
25 manufacturing such elements.

The specific features of the invention are defined in the claims. The advantages of the invention can be obtained by means of an embodiment of the invention which is  
30 further illustrated in the accompanying drawings showing an example of one application.

Figure 1 is a cross-sectional view of a part of the element or unit of the present invention. Figure 2 is a  
35 further cross-sectional view of the element of the invention, and particularly shows the edge detail, i.e. the

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L-shaped fixing profile. Figure 3 is also a cross-sectional view of the invention, and especially shows one embodiment of the mechanical fixing of the reinforcement of the external layer.

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Figure 1 shows a sandwich type construction of a wall element in accordance with the invention. Between an external concrete layer 8 and an inner board 3 there is positioned a thermal insulation 4.

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Figures 2 and 3 show primarily the construction of the external layer. At the frame 2 a ribbed lathing 9 has been fixed using a joint comprising mechanical fixing means 10. The lathing 9 is provided with ribs 12. Figure 2 shows an L-shaped steel profile 7 surrounding the element.

The element of the present invention can be made for example using the following method:

- 20 First the frame 2 is assembled, whereupon the inner board 3 and thermal insulation 4 are mounted in their respective positions. The lathing 9, which is a metal net, and the L-shaped profile 7 extending around the element are then affixed to the frame 2. Reinforcing lathing 9 and edge  
25 profile 7 are mechanically affixed to the frame 2. Thereupon the concrete layer 8 is spread.

The frame 2 of the element can be made of any suitable material, for example timber or steel. It is required that  
30 the frame 2 be rigid. In the shown embodiment of the present invention the frame 2 constitutes a load carrying construction and the concrete layer 8 stiffens the frame and can withstand wind loads.

35 In the shown embodiment of the present invention the (perforated) ribbed lathing 9 (for example British red-rib) is used as a covering of the frame 2. The lathing 9

is made of galvanized steel sheet and acts as a double-functional reinforcement; the ribs 12 act as tension bars and thus as a bracing construction, and the ribbed lathing 9 acts as a key for the concrete and reinforcement to  
5 avoid wreckage. The concrete slab is thus reinforced in one direction.

The L-shaped corner profile 7, which is fixed around the frame 2, acts as an edge trim and so, together with the  
10 frame 2, as a mould, thereby obviating the traditional, expensive mould which is necessary when producing elements using traditional techniques.

Ribbed lathing 9 and L-shaped profile 7 are fixed directly  
15 to the frame 2 by fixing means capable of transferring forces. The fixing can be made preferably mechanically, for example using hot dipped galvanized screws 10. Alternatively the fixing can be made for example using the tack welding method, in a line. When the reinforcement is care-  
20 fully fixed to the frame, the concrete external layer will stiffen the frame. This stiffening can be used when calculating the total stability of the building frame, in other words, these concrete elements constitute shear walls holding house together.

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The concrete casting is made in the ordinary way onto the frame 2: the concrete is spread, vibrated with beam tamping and the surface is textured (e.g. by brushing). Use of lightweight lathing or net 9 makes possible that the layer 8 need  
30 not be heavy; the concrete layer 8 is considerably thinner than normal, and moreover - because the concrete is fixed to the frame 2 with the reinforcement - the stiffening capacity of the concrete is utilized.

35 The wall element of the present invention can be moved to storage immediately after casting, whereas an element made using traditional methods has to dry in its mould for

about twenty-four hours. The suction casting method can be used when producing elements of the present invention, i.e. the excess amount of water will be sucked away. The suction casting method cannot be used when producing additional sandwich elements.

The external layer of the element of this invention is thin, about 25 mm (when using the traditional techniques to produce elements the external layer is about 70 mm). The total thickness of the element (2.4 x 2.6 m) of the present invention, described in the foregoing example, is only about 110 mm, of which the thermal insulating wool is about 70 mm, which satisfies the Middle Eastern standards. The bulk density of the element is thus 500 kg per cubic metre, which is only about 16 per cent of the bulk density of the traditional sandwich element, and the element is thus very light and economical to move and transport. The element of the present invention is, however, firm and durable, and its thermal insulating capacity is good. The element has been calculated for 100 kg/m<sup>2</sup> wind load.

The production of the element of the present invention does not require great hall areas, neither expensive moulds nor heavy equipment for moving elements on the production area or at the building site. The casting site does not require great investments, and the making of the element does not require highly skilled workers. The element can be produced in small workshops quickly, and at low material and labour costs. The fact that the element can be moved to storage immediately after casting, enables a large production capacity. Light equipment like forklifts is sufficient to move the elements of the present invention. The lightness of the element therefore saves on handling equipment and shortens erection time, and makes possible the use of lighter foundations.

Moreover, the element of the present invention can be made

coloured in a cheaper way than traditional elements. The element of the invention needs significantly less concrete, and therefore it needs less colour powder, too, which generally has been added about 6 per cent of the weight  
5 of concrete; in other words, three times more colour powder is needed to colour the traditional sandwich element than to colour the element of the present invention.

The wall element, and method of producing same, can be  
10 modified within the scope of the claimed invention, and in accordance with prevailing working conditions. For example, although the elements of the present invention are provided mainly for the demands of warm countries, they can be suitably modified for use under cooler conditions, too.  
15 For example, the thickness of the rock wool layer could be increased, or the layer can be replaced by polyurethane foam for the sake of increasing the thermal insulating capacity. The main advantage of the present invention is that there is a concrete slab constituting the external layer  
20 of the element, and this slab is made by using the frame as a mould, and furthermore it is reinforced with the ribbed steel lathing which is affixed directly to the frame, preferably mechanically.

## Claims:

1. Light-weight wall element or unit comprising an external layer of concrete (8), characterized by a frame (2), an inner board (3), a thermal insulation (4), and an exterior slab of concrete being attached to a ribbed steel lathing  
5 (9) and fixed directly to the frame (2) by fixing means (10) capable of transferring forces, preferably mechanically.
2. A wall element according to claim 1, characterized in  
10 that the frame (2) is surrounded by an L-shaped profile (7) acting as a mould for the external concrete layer (8).
3. Method for producing a wall element according to claim 1 or 2, characterized in that to a frame (2) of the element,  
15 which is made by known methods and equipped with an inner board (3), a thermal insulation (4) and an L-shaped profile (7), a ribbed lathing (9) is being affixed by fixing means (10), e.g. screws, capable of transferring forces, preferably mechanically, and after affixing the lathing (9), concrete  
20 is being cast so as to form an external layer of the wall element.
4. A method according to claim 3, characterized in that the element, if appropriate after suction, is moved after a  
25 while to storage, where it is allowed to become definitely dry.



FIG.1

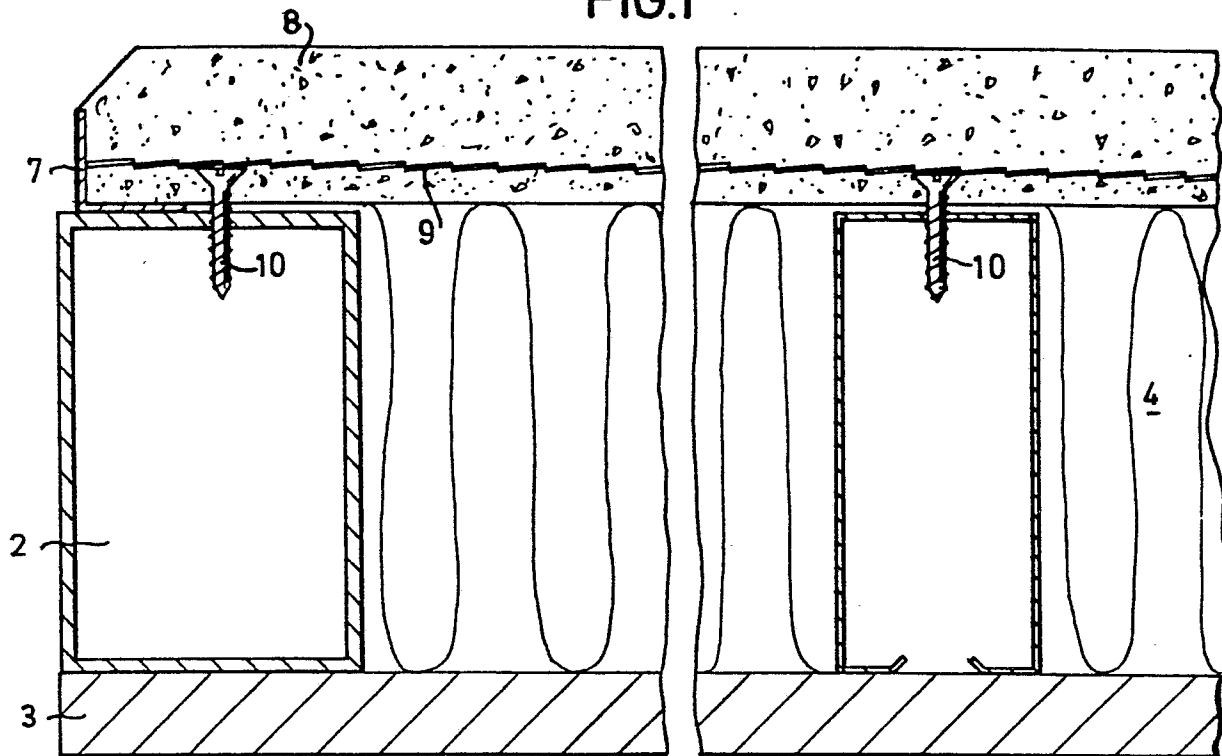


FIG.2

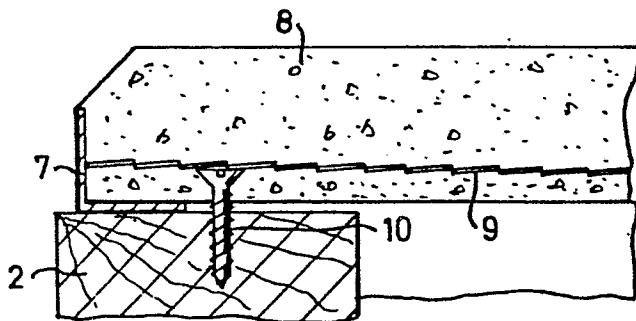
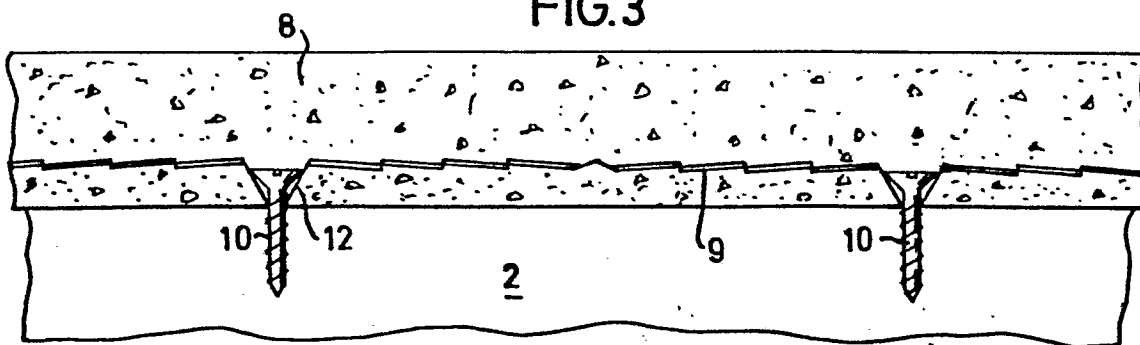


FIG.3





European Patent  
Office

# EUROPEAN SEARCH REPORT

0022107

Application number

EP 80 85 0092.0

| DOCUMENTS CONSIDERED TO BE RELEVANT                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       | CLASSIFICATION OF THE APPLICATION (Int. Cl.3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category                                                            | Citation of document with indication, where appropriate, of relevant passages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Relevant to claim                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                     | <p><u>DE - B2 - 1 940 198</u> (VEREINIGTE<br/>ÖSTERREICHISCHE EISEN- UND STAHL-<br/>WERKE)</p> <p>* claim; column 2, lines 56 to 68,<br/>columns 3 and 4; fig. 1, 2 *</p> <p>---</p> <p><u>DE - C - 802 405</u> (A. HETTICH)</p> <p>* claims 1, 3, 7, 8; fig. *</p> <p>---</p> <p><u>DE - A1 - 2 556 589</u> (ENTREPRISE CARONI)</p> <p>* claim 1; fig. 1, 3 *</p> <p>---</p> <p><u>GB - A - 786 530</u> (THERMACOUST LTD.)</p> <p>* page 1, lines 58 to 68; fig. 1, 2 *</p> <p>---</p> <p><u>US - A - 3 625 808</u> (C.A. MARTIN)</p> <p>* fig. 2 *</p> <p>---</p> <p><u>FR - A - 1 525 210</u> (G. VIDREQUIN<br/>et al.)</p> <p>* fig. 1 to 8 *</p> <p>---</p> <p><u>US - A - 3 587 198</u> (W.C. HENSEL)</p> <p>* fig. 3 *</p> <p>---</p> <p><u>DE - U - 7 342 066</u> (W. KLEIN)</p> <p>* fig. 1, 2 *</p> <p>-----</p> | <p>1,2</p> <p>1</p> <p>1</p> <p>1</p> | <p>E 04 C 2/38</p> <p>E 04 C 2/26</p> <p>E 04 B 2/72</p> <p>TECHNICAL FIELDS<br/>SEARCHED (Int.Cl.3)</p> <p>E 04 B 2/00</p> <p>E 04 C 2/00</p> <p>CATEGORY OF<br/>CITED DOCUMENTS</p> <p>X: particularly relevant</p> <p>A: technological background</p> <p>O: non-written disclosure</p> <p>P: intermediate document</p> <p>T: theory or principle underlying<br/>the invention</p> <p>E: conflicting application</p> <p>D: document cited in the<br/>application</p> <p>L: citation for other reasons</p> <p>&amp;: member of the same patent<br/>family,<br/>corresponding document</p> |
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| <p>X The present search report has been drawn up for all claims</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Place of search                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Date of completion of the search      | Examiner                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Berlin                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 12-09-1980                            | v. WITTKEN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |