

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number:

0 016 486**A1**

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: 80200172.7

(51) Int. Cl.³: **E 04 B 7/02**

(22) Date of filing: 28.02.80

(30) Priority: 01.03.79 NL 7901624

(43) Date of publication of application:
01.10.80 Bulletin 80/20(84) Designated Contracting States:
AT BE CH DE FR GB IT LU NL SE(71) Applicant: **STAMICARBON B.V.**
Postbus 10
NL-6160 MC Geleen(NL)(72) Inventor: **van den Berg, Marinus Hubertus Nicolaas**
Ankersweg 2
NL-6121 AS Born(NL)(74) Representative: **Philippens, Martin Hubert Johan**
Jacques et al,
OCTROOIBUREAU DSM Postbus 9
NL-6160 MA Geleen(NL)(54) **Combined roof ceiling and dwelling provided with such a roof ceiling.**

(57) Combined, sloping roof-ceiling, is built up of adjacent roof-ceiling segments are coupled to each other, which segments, consist of an oblong section as ceiling element, (1,2,3) of a substantially L- or U-shaped profile, and two oblong roof sections (5,6,7) of practically the same width as the ceiling element, also of a substantially L- or U-shaped profile, which near the two ends are attached to the flange or to both flanges (3) of the ceiling element and which roof elements are rigidly coupled to each other when mounted.

The flange or the flanges (3) of the ceiling elements are preferably turned upward and the abutting flanges (6,7) of the U-shaped roof elements (5,6,7), are covered by a clamping profile (13) passed over these flanges (6,7).

The edges (8) of several roof elements (5,6,7) which abut against each other at the ridge of the roof when mounted are covered by a ridge profile (9).

The ceiling (1,2,3), and roof elements (5,6,7), may be made of glass-fibre-reinforced cement in which also has been taken up a resin dispersion of a polymer which contains acid radicals and has an average particle size between 0.05 and 0.5 microns, the setting mass having a water-cement ratio between 0.2 and 0.5, while the resin-cement ratio is between 0.2 and 0.4.

EP 0 016 486 A1



-1- TITLE MODIFIED
see front page

COMBINED ROOF-CEILING

The invention relates to a combined sloping roof-ceiling, built up of pre-fabricated elements.

From the Netherlands patent application No. 7314092 there is known a roof-ceiling system which is also built up of pre-fabricated elements.

5 The drawback of this system is that the dimensions of that ceiling and therefore also of the roof are entirely determined by the dimensions of the substructure, while, moreover, mounting of the ceiling, which is placed between the side-walls of the dwelling, requires correct spacing of the side-walls. Although the whole is built up of pre-
10 fabricated elements, mounting is laborious owing to the large dimensions, takes much time, and, in addition, requires trained craftsmen.

The purpose of the invention is to provide a roof-ceiling combination built up of prefabricated roof-ceiling segments placed side by side and coupled to each other, which can be mounted indepen-
15 dently of the dimensions of the substructure in a very short time, and which form a very stable whole. The dimensions of the elements are less large, which makes transport and mounting easier and, moreover, permits of unlimited expansion of the dwelling in two directions. Mounting is very simple, moreover, and no additional roofing like tiles or slates
20 etc. is needed.

According to the invention, this is achieved due to the combined roof-ceiling being built up of roof-ceiling segments coupled to each other side by side, which segments consist of an oblong section, as ceiling element, of a substantially L- or U-shaped profile, and two
25 oblong roof elements of practically the same width as the ceiling element, also of a substantially L- or U-shaped profile as roof elements, which near the two ends are attached to the flange or to both flanges of the ceiling element and which roof elements are rigidly coupled to each other at the ridge when mounted. By the term oblong is meant that,
30 for instance, the ratio of the length to the width is 4 : 1 to 8 : 1. By the flange of the L-shaped element is understood the short leg of the L-shape.

Preferably, flange or flanges of the ceiling elements are

turned upward.

Covering of the flanges of the roof elements, which are placed against each other, is preferably done by means of a cover profile, placed over the edges to prevent penetration of rain water.

- 5 For the same purpose, the adjacent edges of the roof elements of several elements, when mounted, are preferably covered at the ridge by a ridge profile. In the system according to the invention, the overhang of the roof elements, and thereby also the roof pitch, can be easily varied.

- The ceiling and roof elements may have been made of
10 a variety of materials, such as steel, aluminium, plastic, or glassfibre-reinforced plastic and in particular fibre-reinforced cement, in which preferably has also been taken up a resin dispersion of a polymer which contains acid radicals and has an average particle size between 0.05 and 5 microns, the setting mass having a water-cement ratio between
15 0.2 and 0.5, while the resin-cement weight ratio, is between 0.02 and 0.4.

- The width of the roof and ceiling elements may vary between wide limits, e.g. from 15 to 240 cm, the height of the upright edges being 5 to 60 cm. Preferably, the width is 30-120 cm and the height
20 of the flanges 10-40 cm.

Preferably, the bodies of the roof elements have a step-shaped profile, for reasons of strength as well as aesthetics.

- At the ridge side, the roof elements may advantageously be provided with a raised edge, which is in particular higher than the upright
25 flange or flanges.

- The length of the ceiling elements may vary from 2 to 12 m, in particular from 3-8 m. In attaching the roof elements to the ends of the ceiling elements, it is possible to leave a clearance between the bodies of the two elements. Ventilation air can flow in through this
30 clearance, leaving the roof again at the ridge. To that effect, the ridge profile is mounted with a clearance over the slightly spaced end edges of the roof elements. In this way, continuous ventilation between roof and ceiling is obtained. The combined roof-ceiling according to the invention is mounted very simply, is very stable and is independent
35 of the substructure. Positioning of the interior walls of the substructure is completely free; as regards the positioning of the outer walls, there is a high degree of freedom. The ceiling is rigid and can be

-3-

walked on, so that the room above the ceiling can be made fit to live in. The roof-ceiling is cheap and, moreover, wood-substituting. This is of particular importance for countries where wood as a construction material is scarce.

5 With reference to a drawing, the invention will be further elucidated.

 In this drawing:

Fig. 1 is a U-shaped ceiling element in perspective;

Fig. 2 is a U-shaped roof element, the body having a step-shaped

10 profile;

Fig. 3 is a combined roof-ceiling segment;

Fig. 4 shows two adjacent, coupled roof-ceiling segments.

 Fig. 1 shows a diagrammatic representation of a U-shaped ceiling element of fibre-reinforced cement to which has been added a
15 resin dispersion consisting of a dispersion of a polymer which contains acid radicals and has an average particle size between 0.05 and 5 microns, the water-setting mass having a water-cement ratio between 0.2 and 0.5, while the resin-cement weight ratio is between 0.02 and 0.4.

 The processability of the mortars used is excellent, in spite
20 of the lower water-cement factor and the presence of the acid radicals.

 In particular, preference is given to polymer resins prepared from monomers containing vinyl radicals. The polymer resins should contain acid radicals such as phosphoric acid or sulphoric acid radicals. These carboxylic radicals may come from built-in mono-unsaturated acids,
25 such as acrylic acid, methacrylic acid, fumaric acid, itaconic acid, crotonic acid or semi-esters of maleic acid, fumaric acid or itaconic acid; they may also have been grafted onto the polymer. Further, they may have been formed through modification, in particular through oxidation or saponification, of certain polymers. Preference, however, is
30 given to carboxylic acids from monomers with one free valency, containing one or more carboxylic radicals and polymerized into the polymeric resin. For optimum results, these monomers are preferably present in a quantity of 2.5 to 30 % by wt. relative to the polymer.

 Very good results are obtained if the quantity of unsaturated monomer
35 containing carboxylic acids amounts to 5 to 25 % by wt., in particular from 10 to 20 % by wt.

For the rest, the polymers consist of vinyl monomers, styrene, α -methyl styrene, vinyl chloride, cyclohexyl methacrylate, acrylonitrile, vinyl acetate, vinyl versatate, methyl methacrylate, ethyl, butyl and hexylacrylate, dibutyl fumarate, or dibutyl maleate, methyl vinyl ether, ethylene and propylene.

To reach optimum properties, it is desirable to choose the water-cement factor between 0.2 and 0.4.

A ceiling element of a U-shaped cross-section consists of the body 1 and the flanges 2 and 3, the ends of which have been provided with holes 4, through which pivoting pins can be stuck.

Fig. 2 represents a roof element of a U-shaped cross-section with a step-shaped profile. In this figure, 5 indicates the body and 6 and 7 the flanges. At the ridge side of the roof, the element has a raised edge 8.

Fig. 3 shows a combined roof-ceiling segment. Ceiling elements of a U-shaped cross-section are attached to the substructure (not shown). The roof segments 5, 6, 7 are pivoted to the ceiling elements by means of pins 10 which pass through the holes 4 and 12 of the ceiling elements and the roof elements, respectively. Subsequently, the roof segments are swung up till the upright edges 8 meet. These edges 8 are coupled to each other by means of pins 11. A ridge profile 9 is placed over the upright edges 8 to prevent penetration of rain water. By changing the position of the holes 12 in the roof elements, their overhang is changed and thereby the roof pitch.

Fig. 4 shows two coupled roof-ceiling segments, one behind the other.

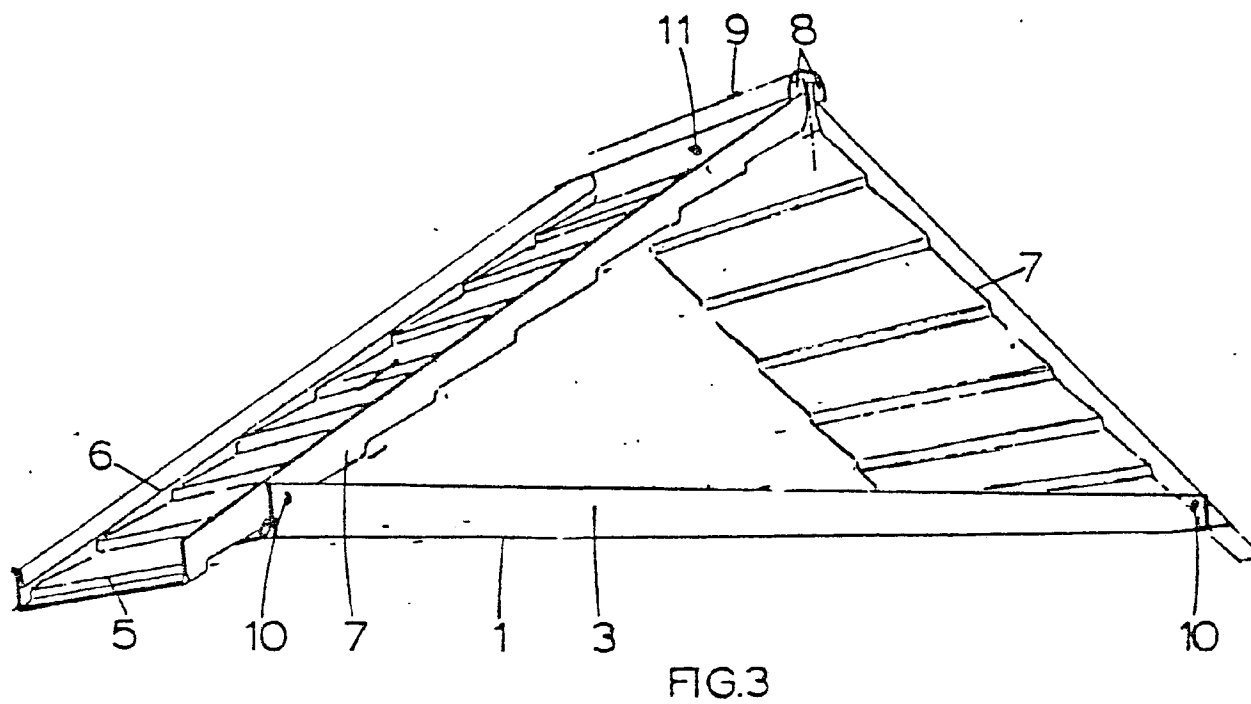
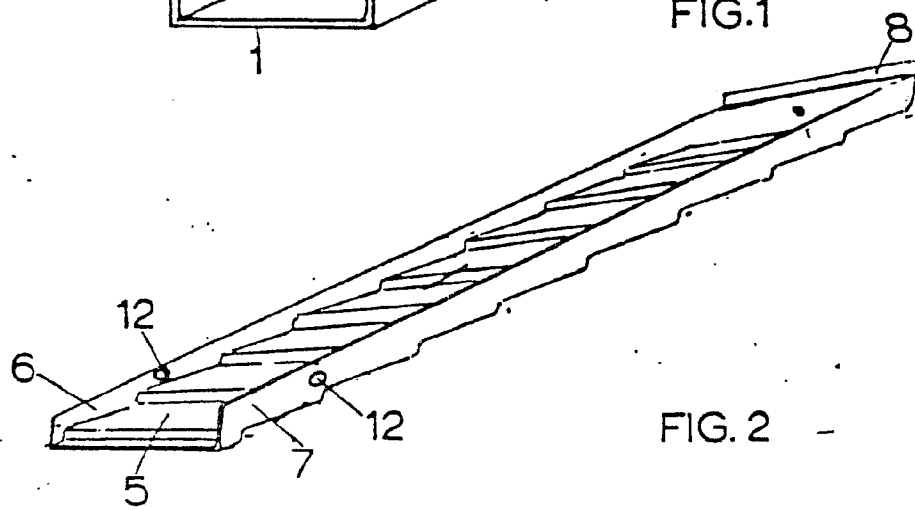
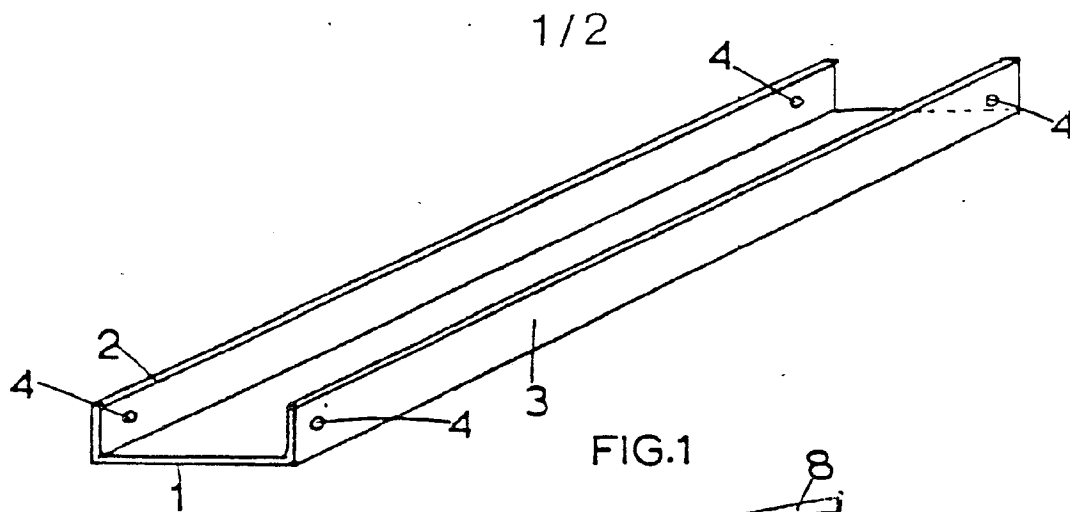
Over the abutting flanges 6, 7 of the roof elements of U-shaped cross-section, a cover profile 13 has been placed for the same purpose as the ridge profile 9.

As shown by the figures 3 and 4, there is a clearance 14 between the body 1 of the ceiling element and the body 5 of the roof element, when mounted. Through this clearance, air can flow in between roof and ceiling, which air leaves the roof again at the ridge. Continuous ventilation under the roof is thus provided.

C L A I M S

1. Combined, sloping roof-ceiling, characterized in that it is built up of adjacent roof-ceiling segments coupled to each other, which segments, consist of an oblong section as ceiling element, of a substantially L- or U-shaped profile, and two oblong roof sections
5 of practically the same width as the ceiling element, also of a substantially L- or U-shaped profile, which near the two ends are attached to the flange or to both flanges of the ceiling element and which roof elements are rigidly coupled to each other when mounted.
- 10 2. Combined roof-ceiling according to claim 1, characterized in that the flange or the flanges of the ceiling elements are turned upward.
3. Combined roof-ceiling according to claims 1 and 2, characterized in that the abutting flanges of the U-shaped roof elements are
15 covered by a clamping profile passed over these flanges.
4. Combined roof-ceiling according to claims 1 and 2, characterized in that the edges of several roof elements which abut against each other at the ridge of the roof when mounted are covered by a ridge profile.
- 20 5. Combined roof-ceiling according to the claims 1-4, characterized in that the U-shaped ceiling and roof elements are made of fibre-reinforced cement.
6. Combined roof-ceiling according to the claims 1-5, characterized in that the ceiling and roof elements are made of glass-fibre-
25 reinforced cement in which also has been taken up a resin dispersion of a polymer which contains acid radicals and has an average particle size between 0.05 and 0.5 microns, the setting mass having a water-cement ratio between 0.2 and 0.5, while the resin-cement ratio is between 0.02 and 0.4.
- 30 7. Combined roof-ceiling according to the claims 1-6, characterized in that the width of the roof and ceiling elements varies from 15-240 cm, and the height of the flanges from 5 to 60 cm.
8. Combined roof-ceiling according to the claims 1-7, characterized in that the bodies of the U-shaped roof elements have a stepshaped
35 profile.

9. Combined roof-ceiling according to the claims 1-8, characterized in that the roof elements have a raised end edge at the ridge side.
10. Combined roof-ceiling according to the claims 1-9, characterized in that ventilation air can freely flow in and out between the ceiling and the roof when mounted.
11. Roof-ceiling segment, characterized in that it is built up of an oblong section as ceiling element of a substantially L- or U-shaped profile, with a length which exceeds the relevant dimension of the dwelling, and two sections of practically the same width as the ceiling element, of a substantially L- or U-shaped profile, as roof elements, which near the two ends are attached to the flange or to both flanges of this ceiling section and which roof elements are rigidly coupled to each other at the ridge when mounted and so form a sloping roof segment.
12. Dwelling provided with a roof-ceiling according to the claims 1-11.
13. Combined roof-ceiling as described and represented in the drawing.



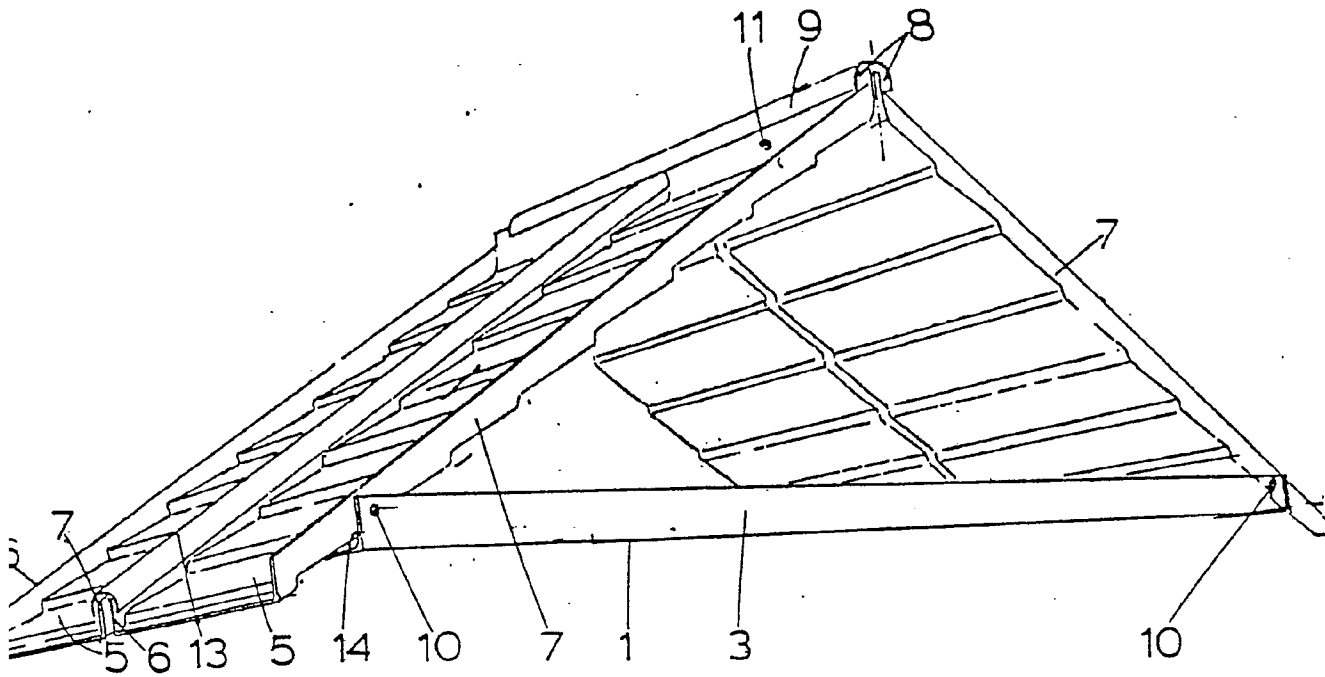


FIG.4

0016486

Application number

EP 80 20 0172

European Patent
Office

EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. 7)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
X	FR - A - 2 381 872 (POYET) * Page 2, lines 12-40; page 3, lines 1-11; figures 1-3 *	1,11	E 04 B 7/02
	--		
	GB - A - 723 675 (DOW MAC) * Page 2, lines 5-37; 85-107; figures 1-4 *	1,4	
	--		
	FR - A - 2 381 876 (ROUGIER) * Page 8, lines 16-31; page 12, lines 3-39; page 13, lines 1-9; figures 6,9,10,11 *	1,3	TECHNICAL FIELDS SEARCHED (Int. Cl. 7)
	--		E 04 B
	FR - A - 870 332 (SAPEC) * Whole document *	8	
	--		
	FR - A - 1 182 260 (ALOGUES) * Whole document *	9	

			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			& member of the same patent family, corresponding document
 The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	05-06-1980	SCHOLS	