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

(11) Publication number: **0 149 433**
A2

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **84830313.7**

(51) Int. Cl.⁴: **E 04 B 5/38**

(22) Date of filing: **20.11.84**

(30) Priority: **24.11.83 IT 4938783**

(43) Date of publication of application:
24.07.85 Bulletin 85/30

(84) Designated Contracting States:
AT BE CH DE FR GB LI LU NL SE

(71) Applicant: **Cipriano, Micciché**
Via Roma No. 2
I-92025 Casteltermini (Agrigento)(IT)

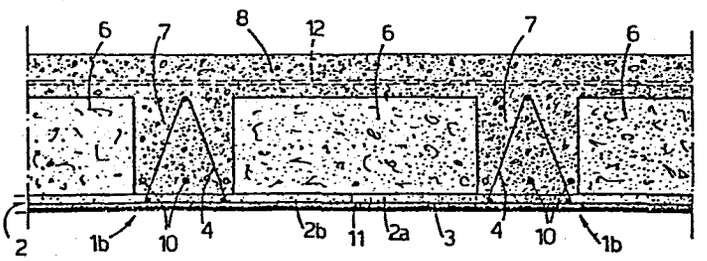
(72) Inventor: **Cipriano, Micciché**
Via Roma No. 2
I-92025 Casteltermini (Agrigento)(IT)

(74) Representative: **Fiammenghi Domenighetti, Delfina et al,**
Via Quattro Fontane 31
I-00184 Rome(IT)

(54) Prefabricated reinforced plate-shape elements made of thermo-acoustic insulating plastic material, in particular polyurethan resin, comprising a reinforcement for at least one beam of the floor and forming parts of a one-use mold for said floor.

(57) Prefabricated reinforced plate-shaped elements (1, 1a, 1b...), wherein said plate is realized out of thermic and acoustic insulating plastic material, and comprises a lower layer incorporating an inert granulated material for making easier the application of the plaster. Said elements contain a metal reinforcement (4, 5) upwardly projecting for the connection with the base metal reinforcement of the respective plate and arranged for the construction of at least one of the reinforced concrete beams of the floor, comprising filling blocks (6) which in combination with said elements (1, 1a, 1b..) form the one-use mold that remain incorporated in the floor.

FIG. 6



EP 0 149 433 A2

0149433

PREFABRICATED REINFORCED PLATE-SHAPE ELEMENTS MADE OF THERMO-ACOUSTIC INSULATING PLASTIC MATERIAL, IN PARTICULAR POLYURETHAN RESIN, COMPRISING A REINFORCEMENT FOR AT LEAST ONE BEAM OF THE FLOOR AND FORMING PARTS OF A ONE-USE MOLD FOR SAID FLOOR

The present invention concerns modular prefabricated elements for defining the floor surface of an industrial or civil building, wherein the room will be covered by a floor or by a roof that will be built using said structure elements, as one-use mold or form, whereby by means of said elements a thermo-acoustic insulation is obtained.

In the conventional construction systems the floors are built with various systems, which nearly all request the use of complicated and expensive forms, which in turn must be supported by an encumbersome scaffolding. Furthermore, for obtaining a ceiling surface ready for receiving the plaster, in some kinds of floors labourious operations and oftenly the application of metal nets to hold the plaster, or other complicated and expensive means are necessary. In the conventional floors, which all have a considerable unit weight, also the inconvenience of a considerable trampling feet noise and resonance due to the aircraft flight shall be considered.

Various systems have already been suggested for

insulating the floor wall, like the one of incorporating blocks of a mix made of expanded clay, pumice, vermiculite or other materials being acoustically and thermically insulating and light, in the floor, but the problem has only partially been solved.

It has also been suggested to apply plates of said materials above and under the floor, but said solution is complicated and expensive.

Above mentioned solutions lead to some advantages which nevertheless are connected to various disadvantages, particularly a higher weight and unit cost of the floor. In particular, in the above mentioned solution providing the application of plates of the conventional kind under the floor, it is impossible to directly apply the plaster without previously applying a wire netting or a perforated metal lathing, safely fixed to the floor, and that considerably increases the plaster consumption and therefore the working costs.

The present invention provides the realization of prefabricated structural modular elements which, at the same time, accomplish the following tasks:

a) a considerably reduction of the weight and the unitary cost of the floor;

b) the realization of a complete thermic and acoustic screen of the floor;

c) the provision of a ceiling surface for the direct application of the plaster or any other suitable coating means;

d) the acting like means for the forming of a one-use mold for the casting of the reinforced concrete structure of the floor;

e) the provision of an at least partially prefabricated reinforcement for the carrying beams of the floor, so as to obtain a perfect interconnection between said structural elements.

For this purpose the present invention suggests the realization of prefabricated plate-shaped structural elements, carrying reinforcements for the plate, buried in said elements, as well as reinforcements only partially buried and shaped and proportioned for acting as or for cooperating with the reinforcement of the carrying beams of the floor. Said plate-shaped elements of modular kind will be mounted, side by side, until the whole room is covered, resting on the peripheral beams or on the walls of the carrying structure of the building. Said elements will also form the one-use mold for the construction of the carrying structure made of reinforced concrete of the floor and may be supported in one or more intermediate points by simple props, if necessary.

The plate-shaped walls according to the present invention incorporate, in the lower part thereof, a granulated layer that remains partially buried in the particular mixture used to construct the plate of each prefabricated element and which in the lower surface thereof defines the ceiling of the room, said surface having thus such surface features as to allow a perfect adherence of the plaster.

According to the present invention, the floor will be realized mounting on the prefabricated elements filling blocks of light material, e.g. polystyrene or the like, which together with said plate-shaped elements form the one-use mold and define the side surfaces of the carrying beams which will be obtained, together with the upper slab, according to the conventional system in reinforced concrete conglomerate. Said mold or casting form will allow, with the aid of simple props, if necessary to support the workers and the materials during the casting of the floor in which the same will remain incorporated.

These and other features of the prefabricated structural elements according to the present invention, and of a floor, thereby obtained, will be better understood from the following description of some embodiments thereof, with reference to the accompanying drawings, in which:

Figure 1, is a partial cross section of a prefabricated element according to the present invention, in an enlarged scale;

Figures 2, 3 and 4 show the complete cross sections of three variants of prefabricated elements according to the present invention;

Figure 5 shows a cross section of the assembly of two prefabricated structural elements and of the blocks forming together the one-use mold for the casting of the

beams and of the slab of the floor; and

Figure 6 shows the same section, when the floor has been completed.

Relating to the drawings, each modular structural element is generically indicated with 1 and comprises a plate generally marked 2, having predetermined modular lenght and width. The lenght of each element corresponds to the width of the room to be covered, increased by a value sufficient in order that element 1 may rest on the transversal peripheral beams or on the masonry walls or of any other type delimiting the room, onto which a thermic and acousting insulating floor must be constructed.

The structural elements are prefabricated by means of suitable molds.

The plate 2 comprises a lower layer 2a and an upper layer 2b; said plate-shaped element 2a, 2b incorporates longitudinal and/or transversal reinforcement irons 3 for the plate 2; said reinforcement means may be obtained by means of an electric welded metal netting, or said reinforcement may have a latticed structure made of longitudinal metal rods 5a, 5b fixed to stirrup rods 4; said reinforcement is buried in the body of plate 2 only for the lower part thereof comprising rods 5a of the reinforcement means 5a, 5b, 4, being welded to reinforcement irons 3, and upwardly projecting from the body of the plate, exactly in those areas in which a

carrying reinforced concrete beam must be realized in the floor to be constructed, generically marked 7 in Figure 6 and made of a cement conglomerate.

The lower layer 2a of plate 2 is obtained using a granulated mixture of a light inert. For example, a mixture of water, expanded clay mixed up with cement, in the portions of 250 kg of cement per mc of the obtained product, or also simply expanded clay. The mixture will harden and then the same will be crushed so as to obtain granules in the dimensions of 1 mm to 3 mm. Instead of expanded clay, tile granules, cement mixture and non cement mixture granules and the like may be used.

On the bottom of the mold for the construction of said structural elements a layer of said granulated mixture is placed, e.g., for a thickness of about 8 mm. Above this layer metal reinforcement 3 is placed, preferably consisting on a granting onto which a metal latticed assembly 5a, 5b and 4 is welded, fixing the same to reinforcement 3, for each carrying beam belonging to the structural element 1. With the conventional technique a polyurethan foam is poured in the mold, said foam penetrating in the pits created between the granules forming layer 2a and that then fills up all the upper layer 2b for the thickness provided for the plate, which thickness may be, e.g., of about 25 mm. In the polyurethan the lower part of the or of each latticed reinforcement comprising longitudinal rods 5a and the lower part of stirrup rods 4 adjacent thereto, as well as reinforcement 3 of plate 2 are buried.

It is provided that plate-shaped structural elements 1, which are the object of the present invention, are fabricated in predetermined modular dimensions according to the most common widths of the rooms to be covered. Said elements may be realized in many variants, and precisely: according to the variant of Figure 2 as element 1a of a width substantially equal to that of a beam; according to the variant of Figure 3, where an element is shown in the form of a flanged joist 1b, the width thereof varying between 0,20 m and 0,80 m; according to the variant of Figure 4 wherein the width of element 1n is equal to a multiple of the one of flanged joist 1b of Figure 3. Usually, for reasons of easier handling, the constructive element 1c is preferably realized in a width twice the one of a flanged joist 1b, i.e. equal to the distance between two centres of the floor; said plate-shaped element will therefore comprise two latticed reinforcements 5a, 5b, 4 for the realization of two supporting beams 7 of the floor.

The floor will be built as follows. A number of prefabricated elements 1a, 1b, 1c..., are set up in contact side by side, as are needed for covering the room, whereby the ends thereof are resting on the transversal walls or on the transversal peripheral beams. If the room is very large, the prefabricated elements may be supported by simple intermediate props or stands. Each plate 2 may be provided, in correspondence to the longitudinal edges of elements 1 (1a, 1b, 1c...) with an outline 11 for a better coupling between prefabricated

elements 1 in contact.

The ceiling surface therefore will be defined by the combination of all lower surfaces of elements 1 whereby said surface, due to the granulated material incorporated in lower layer 2a of plates 2, is perfectly suitable for the application of the plaster or other coating means.

The irons of the latticed reinforcements 4, 5a, 5b will partially project from the upper part of element 1 in that area where the respective reinforced supporting beams 7 will be obtained. Above the plate-shaped part 2a, 2b filling and lightening blocks and blocks for the separation of the joists, marked 6, will be rested, said blocks consisting in expanded polyurethan reinforced with mineralized wood fibres, glass fibres or may consists in other expanded or extruded resins. Blocks 6 in combination with the body of plates 2 form the one-use casting mold which will remain incorporated in the floor and in which blocks 6 together with plates 2 define the mold for the casting of each beam to be built, while blocks 6 delimit, with the upper face thereof, slab 8.

Above the assembly of Figure 5, thus prepared, other reinforcement irons may be mounted for the beams and irons 12 for the reinforcement of slab 8; now the cement mixture will be casted with the conventional technique.

Once the cement mixture is hardened and seasoned, the obtained floor has the form shown in Figure 6, wherein the prefabricated elements 1, being the object of the present invention, are strongly incorporated in the floor due to metal latticed reinforcements 5a, 5b and 4,

incorporated in the beams 71 as well to those incorporated in plates 2 and at the same time form a continuous barrier wall for the heat and the sound. The floor thus is very light and thermically and acoustically insulating, of low cost as there are only small costs relating to the use, mounting and removing of the casting mold. Furthermore, said floor is ready for the application of the ceiling plaster or of any other suitable coating.

It is evident that the prefabricated elements according to the present invention may be used not only for obtaining plane horizontal floors, but also sloping floors as well as for realizing pents of a pent roof in buildings for civil houses, in agricultural, commercial or industrial buildings.

CLAIMS

1. Prefabricated , plate-shaped structural reinforced elements (1) for the construction of a thermically and acoustically insulating plane or inclined floor, characterized in that said elements each comprises: a plate-shaped lower element (2), in which plate (2) consists in a plastic theremically and acoustically insulating material, in particular expanded polyurethan or similar, and is provided with reinforcing means (3); reinforcing means (4, 5a, 5b) for the construction of at least one carrying beam (7) of the floor having a latticed structure and being partially buried with the lower part thereof in said plate (2), said lower part of the said reinforcing means (4, 5a, 5b) connected with the reinforcing means (3) of the plate, whereby said plate (2) of said elements (1) comprises a lower layer (2a) where a granulated material adapted to create a lower rough ceiling surface is embedded in the plastic material and an upper layer (2b) each prefabricated element (1) showing modular dimensions such as to cover a transversal strip of the room and to rest on the transversal peripheral beams or on the transversal walls of the room, said elements (1) together with prismatic blocks (6), made of light and porous material, forming a one-use casting mold for the contruction of a reinforced concrete floor (7, 8) comprising transversal reinforced carrying beams (7) and a slab (8).

2. Structural elements according to claim 1 wherein the lower layer (2a) of each plate (2) contains a granulated material obtained through the crushing of a mixture of cement, water and granulated inert, like natural or artificial sand, tile granules or the like or simply expanded clay.

3. Structural elements according to claim 1 wherein the reinforcement provided for the respective beam is formed by longitudinal rods (5a, 5b) and by a stirrup rod (4) or another equivalent latticed structure for the cooperation with other reinforcing means (10), successively mounted, for setting up the respective beam (7) after the casting of the floor, and for linking constructive elements (1) to the body of the floor (7, 8).

4. Structural elements according to claim 1 wherein structural elements (1a) are provided of a width substantially equal to that of a supporting beam (7).

5. Structural elements according to claim 1 wherein flanged joists (1b) are provided of a width equal to the distance between the centres of two following joists.

6. Structural elements according to claim 5 wherein elements (1c, 1d...) are provided of a width multiple to that of a flanged joist (1b).

7. Structural elements according to claim 1 wherein longitudinal edges (11) of plates (2) are shaped as male and female joints for seal connecting the elements (1) to each other.

8. A one-use casting mold for the realization of a plane or inclined beam (7) and slab (8) floor made of

reinforced concrete wherein structural elements (1) according to claim 1 are mounted side by side with the longitudinal edges (11) thereof being in contact and the projecting, reinforcing parts (4, 5a, 5b) placed in the position of the beams (7) to be constructed, while between said reinforcing parts (4, 5a, 5b) blocks (6) made of light material like expanded polyurethan are mounted, proportioned so as to define with the upper surface of plates (2) of elements (1) the sides of forms for the casting of beams (7), and with the upper surface thereof the lower surface of reinforced slab (8) of the floor, whereby said mold, once the floor is constructed, remains incorporated in said floor and forms a ceiling surface substantially continuous, heat and sound insulating and ready for the immediated application of the plaster.

0149433

FIG. 1

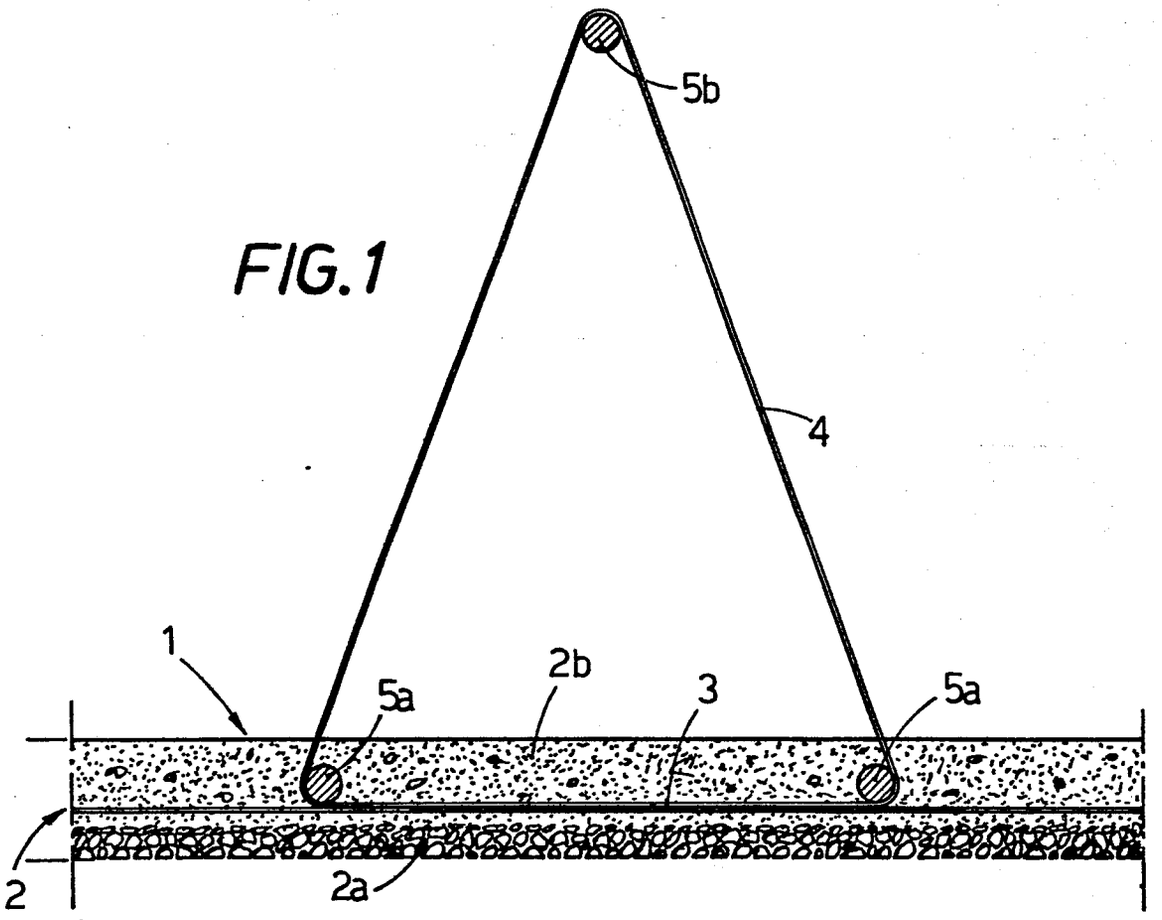


FIG. 2

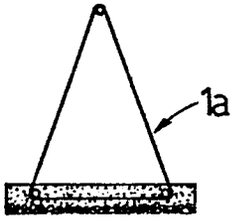


FIG. 3

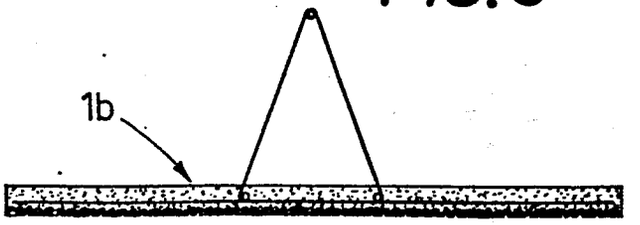
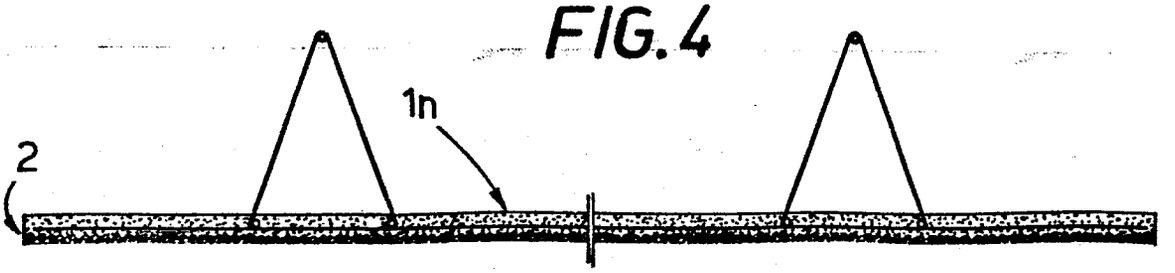


FIG. 4



0149433

FIG. 5

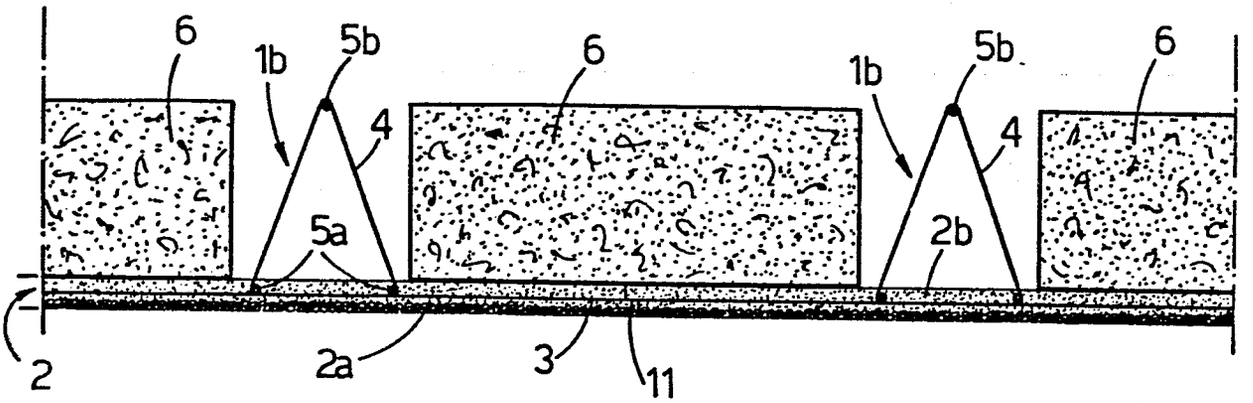


FIG. 6