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

(11) **EP 2 241 701 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
20.10.2010 Bulletin 2010/42

(51) Int Cl.:
E04F 15/18 *(2006.01)*

(21) Application number: **10159188.1**

(22) Date of filing: **07.04.2010**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
AL BA ME RS

(30) Priority: **07.04.2009 IT MI20090555**

(71) Applicant: **Ecoplast Nord S.R.L.**
24124 Bergamo (IT)

(72) Inventor: **Zanetti, Marco**
24060 Torre Boldone (IT)

(74) Representative: **Borsano, Corrado et al**
Notarbartolo & Gervasi S.p.A.
Corso di Porta Vittoria, 9
20122 Milano (IT)

(54) **Flat surface for buildings and method for producing same**

(57) A flat surface (P) for buildings of the type comprising at least a first layer (1) in cement, and at least a second flat layer (4), between which there is positioned at least one intermediate layer (2,3) made of thermal and acoustic insulating material substantially composed of a solid layer made of plastic material ground into granules, preferably mixed with water, cement and/or sand.

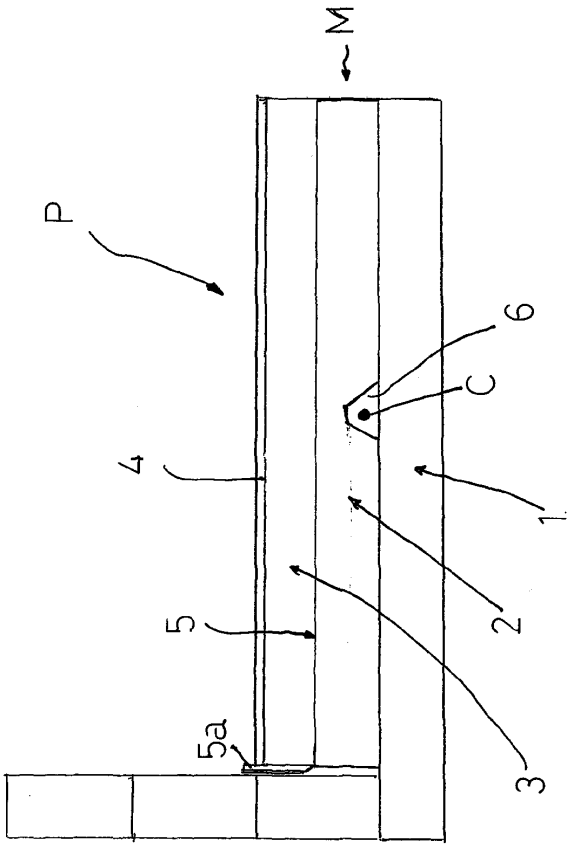

FIG. 1

EP 2 241 701 A2

Description

[0001] The present invention relates to a method for producing a flat surface in use in the building sector, and to the flat surface for buildings thus obtained.

[0002] In particular, the invention in question is advantageously used in the building sector to produce floors or walls in general, especially foundation, of dwellings, commercial or industrial buildings or building constructions in general, to which the description below refers explicitly, however without loss of generality.

[0003] In general, the floors of dwellings or buildings in general have a multi-layer structure wherein a layer of various material adapted, in use, to be facing outward and which can be walked on, such as marble, wood, terracotta, linoleum, ceramic tiles, parquet etc., is fixed to at least one layer principally in cement called foundation slab.

[0004] Currently, one of the greatest problems in the production of floors in the building field is that relative to thermal insulation, that is, the insulating properties that floors must have to prevent as much as possible heat dispersion, in particular in the case of heating systems with panels integrated in the floor, increasingly in demand and used in modern dwellings.

[0005] Another current and considerably important problem is relative to the optimum acoustic insulation that floors must have, in order to limit or decrease as much as possible noise, both from impact transmitted through sound vibrations generated by solids in mutual contact (object being dropped, movement of various objects, footsteps, etc.), or by airborne noise transmitted by sound waves propagated in the air.

[0006] The object of the present invention is therefore to provide a method for producing a surface, such as a floor or a wall, which has optimum properties of thermal insulation, with high resistance to compression, and also having high capacities of reducing both impact and airborne noise.

[0007] Another object of the invention is that of producing a flat surface, such as a multi-layer floor or wall, which is produced through the use of materials that are eco-compatible and very economical, light and with low thermal coefficients, and also having high noise absorption properties.

[0008] According to the present invention there is provided a method for the production of a flat surface in the building sector, in particular a floor, characterized by the fact that it comprises the steps of producing a cement layer; of laying on said cement layer at least a quantity of plastic granules to define at least a first intermediate uniform solid layer made of thermal and acoustic insulating material; and of laying on said intermediate layer an external layer made of various material.

[0009] The present invention is also relative to a flat surface for buildings, of the type comprising at least a first cement layer, and at least a second layer, the surface being characterized by the fact that it also comprises at least an intermediate thermal and acoustic insulating layer, positioned between said first cement layer and said second layer, and substantially comprising a solid layer made of plastic material ground into granules.

[0010] The technical features of the invention, according to the aforesaid objects, are clearly seen from the content of the claims below, and the advantages thereof will be more apparent from the detailed description below made with reference to the accompanying figure which schematically shows a preferred but non-limiting embodiment of the flat surface for buildings produced according to the method in question.

[0011] With reference to the accompanying figure, the letter P indicates as a whole a flat surface for buildings or dwellings in general, in particular a flat surface adapted to define a floor P.

[0012] The floor P has a multi-layer structure M to define a solid assembly, which comprises, from the bottom upward in the accompanying figure, a flat layer 1 or foundation slab in cement, a first intermediate layer 2 appropriately fixed (according to methods known and not described herein) to the upper part of the layer 1, a second intermediate layer 3 appropriated fixed to the upper part of the first intermediate layer 2, and an external layer 4 appropriately fixed on top of the layer 3.

[0013] Specifically, the outer layer 4 is produced in various material adapted, in use, to be horizontally facing upward and outward, that is, to define the visible part of the floor and therefore which can be walked on, such as marble, wood, terracotta, linoleum, ceramic tiles, parquet, etc., and preferably coloured and/or provided with patterns or specific aesthetic characteristics.

[0014] Specifically, the first intermediate layer 2 defines a first screed, very light in weight, provided with high thermal and acoustic insulating properties, very resistant to compression, and preferably formed by a base made of polymeric material, ground into granules, said base being appropriately mixed with cement, or other binding material, and water, and subsequently spread, pressed and smoothed to obtain a solid layer at least five centimetres thick.

[0015] In order to make the first layer 2 particularly insulating from a thermal and acoustic point of view, for example in the case of buildings constructed in particularly cold climates and/or in very noisy areas (large cities, etc.), the proportions of cement or equivalent binding material and water of the aforesaid mixture for forming the layer 2 preferably vary between 100 kg/m^3 and 150 kg/m^3; however, it has be proven that it is advantageously possible to reach up to 400 kg/m^3.

[0016] According to a variant of the present invention, the intermediate layer 2 is formed solely of a defined base amount of polymeric material ground into granules and appropriately pressed and smoothed to obtain a compact layer.

[0017] In particular, it must be stressed that said material in granules preferably includes a ground product obtained from insulating sheaths for covering electrical

cables and the like, and is subjected, before assembly of the solid layer, to a cleaning step for removing metal slag (aluminium, copper, etc.) or the like, so that it contains no dangerous impurities and is regenerated for the specific purpose of complying with current strict regulations in terms of recycling plastic material. This cleaning step preferably comprises feeding the material in granules through vibrating and blowing means adapted to separate and to eliminate impurities and metal slag. There is also provided a step for dividing the granules according to grain size, the dimensions of which can vary from 0.1 to 5 centimetres.

[0018] It should also be noted that this layer 2 can also be used as inert filler in cellular concrete: due to its properties it gives the slab properties of considerable thermal and acoustic insulation and light weigh.

[0019] Inside the layer 2, or alternatively the layer 3, appropriate seats 6 are normally provided (for simplicity only one seat 6 is shown in the layer 2 in the accompanying figure), inside which the connections (indicated with C) for the electrical, heating, air conditioning systems, etc. are positioned.

[0020] Specifically, the second intermediate layer 3 defines a second very light screed which, analogously to the first intermediate layer 2, has high acoustic and thermal insulating and load-bearing properties, and comprises a base of regenerated synthetic polymeric material in granules, which is mixed, also with the addition of additives and structural reinforcements, such as sand or the like, to cement and water, and subsequently spread, pressed and smoothed to obtain a solid layer at least four centimetres thick. The aforesaid mixing takes place with conventional means, for example using concrete mixers, or with screw mixers or screed pumps.

[0021] Preferably, in order to make the second intermediate layer 3 resistant, in particular to compression, such as in the case of high loads (high concentration of people, objects etc.), the proportions of cement and water of the aforesaid mixture for forming the layer 3 are of 250 kg/ m^3; however, it has been proven that it is advantageously possible to reach up to 400 kg/m^3.

[0022] Analogously to the mixture for the layer 2, also for that of the aforesaid layer 3, material in granules preferably comprises a ground product obtained from insulating sheaths for covering electrical cables and the like, and is subjected, before assembly of the solid layer, to a cleaning step for removing metal slag or the like, so that it contains no dangerous impurities for the specific purpose of complying with current strict regulations in terms of recycling plastic material. This cleaning step preferably comprises feeding the material in granules through vibrating and blowing means adapted to separate and to eliminate impurities and metal slag.

[0023] According to a preferred, but non-limiting, embodiment, the layer 3 can be produced using the same mixture of which the layer 2 is composed (up to 99%), sand or the like (up to 99%, with grain size from 0.6 to 6 centimetres, and/or further fibrous material (up to 10 kg/m^3.)

[0024] According to what is illustrated in the accompanying figure, preferably but not limitedly, an insulation mat 5 with lateral band 5a is laid between the layer 2 and the layer 3.

[0025] From the point of view of operation, laying of the various layers of the structure M according to the preferred (non-limiting) embodiment takes place by means of laying of the first intermediate layer 2 on top of the foundation slab layer 1 in cement, optional positioning of the mat 5 and then laying of the second intermediate layer 3, to define a flat and uniform surface that forms the load-bearing structure for the external layer 4. Laying can take place also substantially simultaneously to formation of the foundation slab layer 1.

[0026] It must also be noted that according to a possible variant, not shown, the structure M of the floor P comprises the layer 1, the layer 2 and the layer 4 mutually assembled; instead, according to a further variant, again not shown, the structure M is of the type comprising the layer 1, the layer 3 and the layer 4 mutually assembled.

[0027] In conclusion, the advantages of the structure M of flooring P thus produced are the following:

- excellent thermal and acoustic insulation,
- eco-compatible: the polymeric materials of which the intermediate layers are composed are in fact obtained from the recovery of industrial materials with no toxic substances,
- light and economical, due to the use of recycled materials
- easy and fast to lay,
- certification in accordance with current European regulations.

[0028] The invention thus conceived can be subject to numerous modifications and variants and produced in different sizes, all falling within the scope of the inventive concept described; moreover, all details can be substituted by technically equivalent elements.

Claims

1. A flat surface (P) for buildings, of the type comprising at least a first layer (1) in cement, and at least a second layer (4), the surface (P) being **characterized by** the fact that it also comprises at least one intermediate layer (2,3) made of thermal and acoustic insulating material, positioned between said first layer (1) in cement and said second layer (4), and substantially comprising a solid layer made of plastic granules.

2. The surface according to claim 1, **characterized by** the fact that said solid layer comprises recycled polymeric material, ground into granules and pressed.

3. The surface according to claim 1 or 2, **characterized by** the fact that said first layer (1) in cement is a bottom layer and said second layer (4) is a layer of various material, adapted, in use, to be horizontally facing upward and outward so that it can be walked on, to define a relative flat floor for buildings.

4. The surface according to claim 3, **characterized by** the fact that said solid layer comprises a compressed mixture of water, cement or other binding material and said recycled polymeric material ground into granules.

5. The surface according to claim 4, **characterized by** the fact that said mixture also includes sand or equivalent material.

6. The surface according to claim 4 or 5, **characterized by** the fact that said mixture comprises cement, or other binding material, and water, in proportions between 100 kg/m^3 and 400 kg/ m^3.

7. The surface according to claim 4 or 5, **characterized by** the fact that said mixture comprises cement, or other binding material, and water in proportions between 100 kg/m^3 and 150 kg/ m^3.

8. The surface according to claim 4 or 5, **characterized by** the fact that said mixture comprises cement, or other binding material, and water in proportions of 250 kg/m^3.

9. A method for constructing a flat surface (P) in the building industry, in particular a floor, **characterized by** the fact that it comprises the steps of producing a cement layer (1); of laying on said cement layer (1) at least a quantity of plastic granules to define at least a first intermediate uniform solid layer (2,3) made of compacted thermal and acoustic insulating material; and of laying on said intermediate layer (2,3) an external layer (4) made of various material.

10. The method according to claim 9, **characterized by** the fact that said laying of said quantity of plastic granules comprises the sub-step of mixing according to fixed proportions the quantity of plastic material with water, cement or equivalent binding material, and/or sand and the like.

11. The method according to claim 9 or 10, **characterized by** the fact that said quantity of plastic granules is produced by grinding plastic waste material and by subsequently cleaning the granules obtained from slag or other impurities.

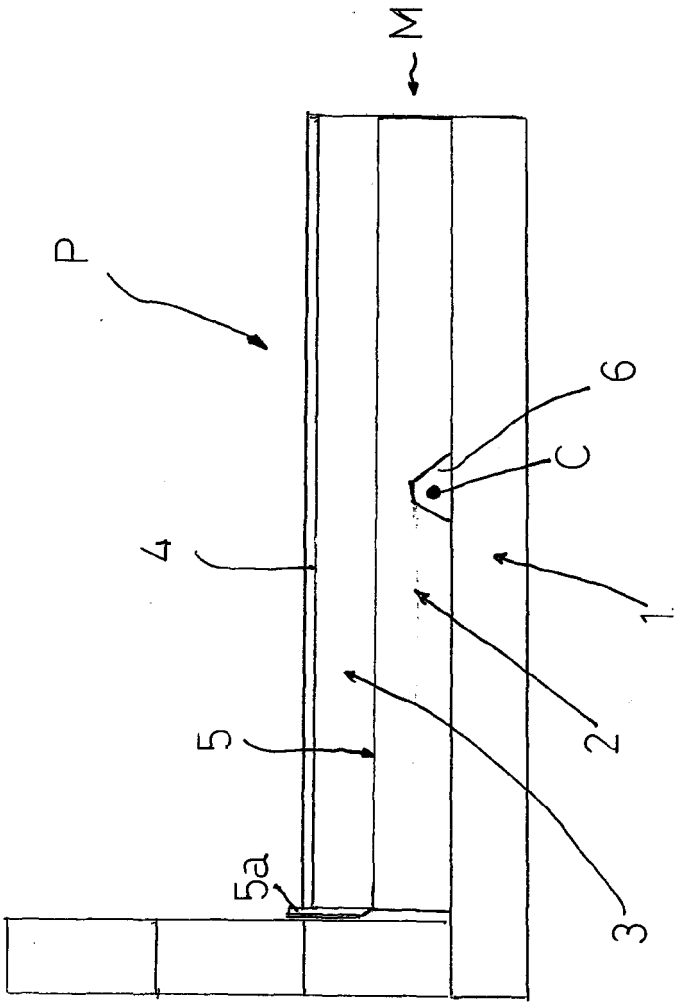

FIG. 1