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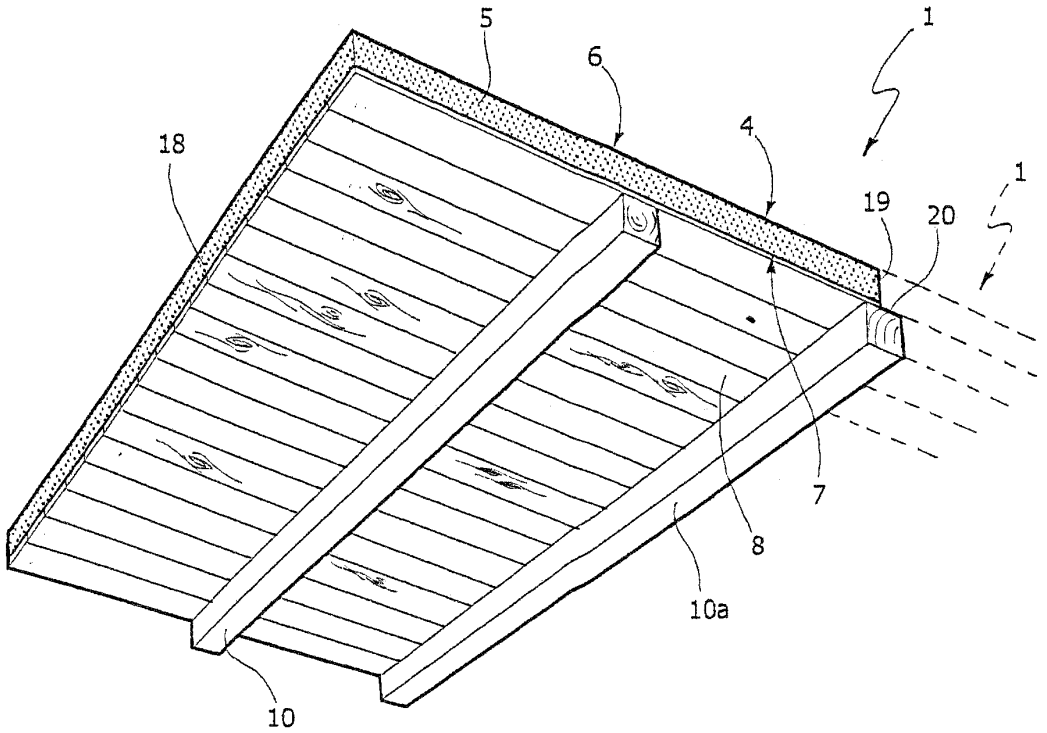
(54) **A prefabricated panel for the manufacture of floors and roofs**

(57) A prefabricated panel (1) for the manufacture of floors and roofs is provided with an upper slab (4), and a plurality of wooden beams (10) arranged at sight under the slab (4); the slab (4) comprises a plate (5) made of shredded wood, which is treated and bound with cement and attached to the beams (10).

FIG. 1



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Description

[0001] The present invention relates to a prefabricated panel for the manufacture of floors and roofs.

[0002] For the manufacture of floors there are known prefabricated panels comprising a plurality of wooden beams, defining respective lower panel beads, and an upper slab made of reinforced concrete, which is cast and made monolithic with the settling beams, so as to make the transport and the assembly of the prefabricated panel at the building sites where the laying is later carried out convenient.

[0003] The need is felt to improve the prefabricated panels of the type just described above, specifically as far as the reduction of their specific weight and the improvement of the thermal insulation and sound-absorbing features is concerned.

[0004] It is the object of the present invention to provide a prefabricated panel for the manufacture of floors and roofs, allowing to achieve the above mentioned requirement in a simple and cost-effective manner.

[0005] According to the present invention a prefabricated panel is provided for the manufacture of floors and roofs; the panel comprising:

- an upper slab; and
- a plurality of wooden beams arranged at sight under said slab and integrally connected to said slab;

characterized in that said slab comprises a plate made of shredded wood, which has been treated and bound with cement and fixed to said beams.

[0006] The invention will now be described with reference to the accompanying drawings, which show a non-limiting embodiment thereof, in which:

- Figure 1 shows a perspective view of a preferred embodiment of the prefabricated panel for the manufacture of floors and roofs according to the present invention;
- - Figure 2 shows an enlarged section view of a detail of a variant of the prefabricated panel in Figure 1.

[0007] In Figure 1, numeral 1 indicates a prefabricated panel, which is drawn near to other panels 1 of a similar type for the manufacture of a floor or roof.

[0008] The panel 1 comprises an upper slab 4 comprising a plate 5 made of conglomerate, consisting of shredded wood (which is also designated "chipped" wood) which is bound with cement. Before being mixed with cement, the shredded wood has been treated to make the binding with the cement itself possible. For instance, a material displaying such features is known by the brand name of "PLS" (registered trademark). As far as the method for treating the wood and making its binding with the cement possible, a mineralization process is cited by way of example: after having been shredded in small fibers displaying different size, the wood is desiccated at high temperature and mixed with mineral powders and other ecological products which make it inert. Such a method is known, for instance, from European patent No. EP0517577 filed on June 2nd, 1992, which is here integrally recalled for the sake of completeness in description and for the required parts.

[0009] After the shredded wood has been treated, it appears as a granular product in the loose form: for the manufacture of the plate 5, a cement 42.5 and water is kneaded in a normal concrete mixer.

[0010] A dosage example is the following:

- 1000 liters of shredded and mineralized wood;
- 300-350 kg of cement 42.5;
- 180-220 liters of water.

[0011] The kneading is obtained by dry mixing the loose wood with the cement, so as to properly distribute the two elements, to which the water is then gradually added. The obtained kneading is immediately cast in appropriate moulds, such as to form the shape intended for the plate 5.

[0012] Water-, electric- and/or heating-system tubings may already be arranged in the moulds to directly embed such tubings in the casting.

[0013] In the preferred embodiment shown, the plate 5 is manufactured with a uniform thickness, with an extrados 6 (upper surface) and an intrados 7 (lower surface) which are flat.

[0014] When an upper surface 6 ready to receive any flooring is to be obtained, a sand and cement shaving is performed on the fresh casting after molding.

[0015] In addition to the plate 5, the slab 4 comprises a painted boarding 8, consisting of wooden laths which are reciprocally arranged side by side and attached to the lower surface 7, for instance by means of screws or nails.

[0016] The panel 1 further comprises a plurality of wooden beams 10, which are arranged at sight under the slab 4, against the boarding 8, and are orthogonal to the laths of the boarding 8 itself.

[0017] Instead of the boarding 8, the lower surface 7 is finish-free and is plastered after the panel 1 has been laid to form the floor or the roof: in this case, each wooden beam 10 is wrapped by a nylon film (not shown) to be protected during plastering. Such a film is then removed once the plaster has dried.

[0018] The beams 10 are integrally connected to the plate 5, by means of metal steel elements, after the forming of the plate 5, and are selected and positioned on the basis of design and resistance calculations. With reference to figure 2, each beam 10 is preferably attached to the plate 5 by means of a plurality of screws 11, having respective threaded rods 12 which partially engage the beam 10 and partially engage the plate 5, whereas the heads 13 of the screws 11 are arranged along the upper surface 6, by means of the interposition of respective washers (not shown). In the solution depicted, the beam

10 is arranged directly in contact against the lower surface 7, without the boarding 8. Along the axis 15 of each screw 11, a related washer 16 is interposed between the beam 10 and the lower surface 7: the two opposite faces 17 of the washer 16 are toothed or knurled to embed both into the beam 10 and into the plate 5, to increase the friction and the transmission of the stresses between the beam 10 and the slab 4.

[0019] According to variants that are not shown, the lower surface 7 has a different shape from a flat shape: for instance, it defines a plurality of elongated seats each of which partially houses a related beam 10.

[0020] With reference to figure 1, at the side ends of the panel 1, the slab 4 has an edge 18 that does not have the beams 10 and an edge 19 that carries a beam 10a, which comprises a portion 20 which laterally protrudes with respect to the edge 19 itself: during the laying, the panel 1 is bound to another adjacent panel 1 (partially shown with a broken line), a side edge of which is overlapped and then attached to the portion 20 of the beam 10a by means of screws.

[0021] The manufacturing of floors and roofs with beams 10 at sight by using the panels 1 at sight is simple and fast, because it is only necessary to reciprocally couple the panels, and possibly plaster the lower surface 7 in case the boarding 8 is missing.

[0022] From the above, it is apparent that the use of PLS of the plate 5 allows to make the slab 4 lighter with respect to the prefabricated panels with a concrete slab: indeed, the plate 5 has a relatively low specific weight in the range between 800 and 1000 kg/m^3.

[0023] In virtue of this feature, the panel 1 also allows to avoid the increase in weight of old load-bearing walls during the restoration of buildings. Again because of its low specific weight, the panel 1 may also be manufactured displaying a greater size that the panels of the known art.

[0024] Furthermore, PLS is a very good thermal insulating and sound-absorbing material. Specifically, roofs and floors manufactured with the panels 1 have an insulating coefficient 8 times higher, with a specific weight 2 times lower, than a cement or concrete slab.

[0025] Furthermore, the panel 1 ensures operational rapidity, assembly ease, safety and stability of the structures, and a considerable saving as far as costs are concerned. Indeed, the panels 1 are manufactured at the factory, and are then carried to the building site for the laying step: in this manner, up to 90% of the time required for the laying may be saved as compared to products which are cast or assembled directly on the building site.

[0026] Furthermore, in virtue of the coupling by means of metal elements between the beams 10 and the PLS-made plate 5, the transversal sections and the thickness of the weight-bearing element of the panel 1 may considerably be reduced.

[0027] Indeed, as the beams 10 and the slab 4 do not only rest on each other, but are attached, some of the stress is relieved on the linear weight-bearing beams 10, which in this case are manufactured of solid wood. The attachment between beams 10 and slab 4 avoids reciprocal movements between the extrados of the wood and the intrados of the slab, so it leads the wood of the beams 10 and the PLS of the plate 5 to "cooperate", thus exploiting the properties of the two materials at best, that is inducing the wood to work in traction and the slab 4 in compression. The combination or coupling between the two elements implies the individuation of a common neutral axis, which is displaced downwards for the PLS, and is displaced upwards for the wood, with respect to the case in which they are subjected to a simple flexion. The extent by which the neutral axis is displaced, is a function of the geometry of the panel 1. In general, the traction flexing stresses are absorbed to a greater extent by the wooden beads 10, whereas the compression stresses are absorbed by the PLS plate 5.

[0028] When the plate 5 has an embedded framework therein, the latter may also be of the so-called "light" type, as the plate 5 is mostly stressed by compression.

[0029] In other terms, in virtue of the "cooperating" properties between the wood of the beams 10 and the PLS of the plate 5, prefabricated panels 1 displaying high resistance may be manufactured.

[0030] Finally, the panels 1 have optimal support features, they are light and may cover considerable openings, they have definitely limited thickness and are both sound-absorbing and sound-insulating, as well as having the desired finishing.

[0031] Furthermore, the PLS, which is obtained by a wood mineralization process, is a totally ecological and biocompatible material, that contains no polluting chemical substance. It may be perfectly positioned in the most varied environments with total respect for the environment. It is easily recyclable and therefore does not affect the environmental balance.

[0032] PLS is produced from the recovery of wood discards. In every m^3 of wood, there are stored 820 m^3 of carbon dioxide, which are absorbed by the growing plant; by preserving the wood in its natural state, PLS avoids the return of the carbon dioxide contained therein to the environment, thus making a contribution to minimize the environmental impact of the wood discards.

[0033] PLS ensures a long duration in time of the panel 1: indeed, it does not deform in the presence of water, it does not suffer from freezing, it has a very good resistance to compression and does not require any maintenance during time.

[0034] In virtue of its resistance to compression and its resistance to fire, PLS results being particularly suitable for the construction of structures that must ensure safety, energy saving and high living comfort.

[0035] Finally, in the manufacture of roofs, possible pantiles, tiles, metal sheets and corrugated sheets may be directly attached to the PLS plate 5 by means of nails or dowels. Indeed, PLS has a very good holding to nails (comparable to that of wood) and may be machined or sawed as if it were wood.

[0036] From the above, it is finally apparent that modifications and variants not departing from the scope of protection of the present invention may be made to the panel 1 which is described and depicted, as defined in the accompanying claims.

[0037] Specifically, the panel 1 may have a different shape than that shown and possible intermediate openings. Furthermore, a water-resistant sheathing could be interposed between the boarding 8 and the plate 5.

Claims

1. A prefabricated panel (1) for the manufacture of floors and roofs; the panel comprising:

- an upper slab (4); and
- a plurality of wooden beams (10) arranged at sight under said slab (4) and integrallyconnected to said slab (4);

characterized in that said slab (4) comprises a plate (5) made of shredded wood, which is treated and bound with cement, and attached to said beams (10).

2. A panel according to claim 1, **characterized in that** said plate (5) is attached to said beams (10) by means of metal elements (11, 16).

3. A panel according to claim 1 or 2, **characterized in that** said plate (5) has a uniform thickness.

4. A panel according to claims 2, **characterized in that** said metal elements comprise screws (11), each having a threaded rod (12) which is partially screwed in one of said beams (10) and partially screwed in said plate (5).

5. A panel according to claim 4, **characterized in that** said metal elements comprise, for each of said screws (11), a related washer (16) having two toothed faces which are embedded in said beam (10) and, respectively, in said plate (5).

6. A panel according to any of the preceding claims, **characterized in that** said slab (4) comprises a boarding (8) interposed between the lower surface (7) of said plate (5) and said beams (10) and attached to said plate (5).

FIG. 1

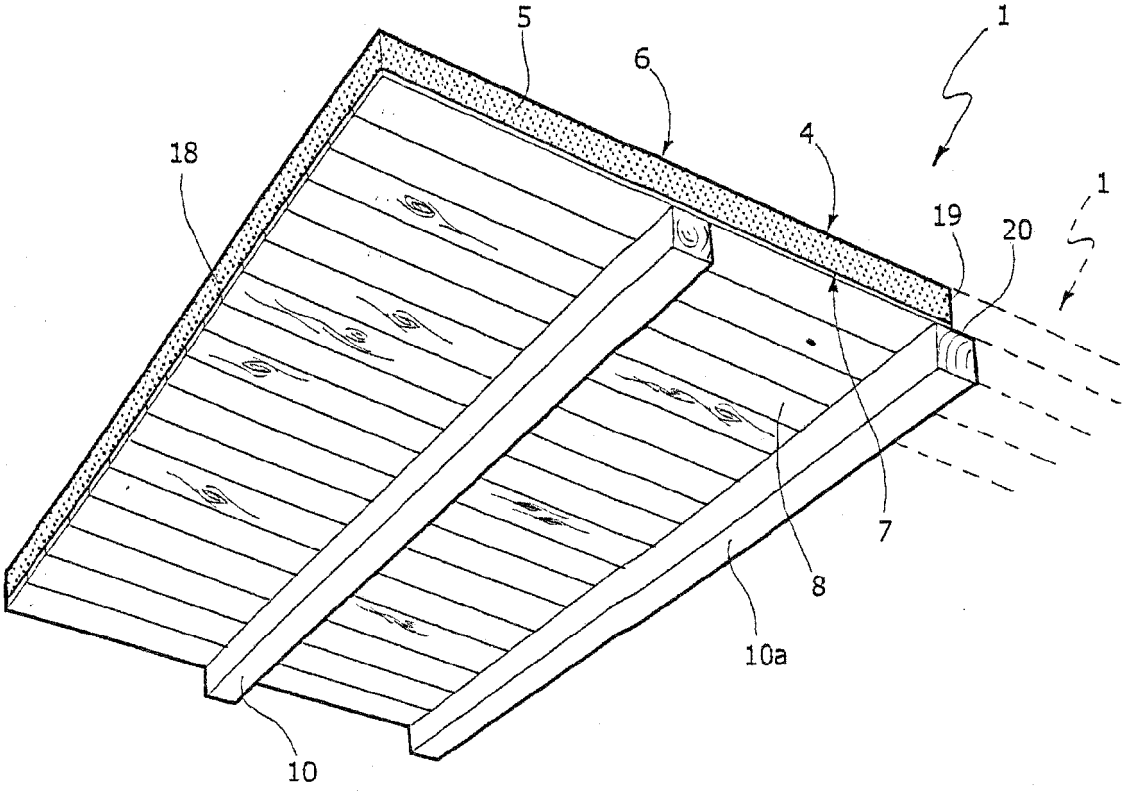
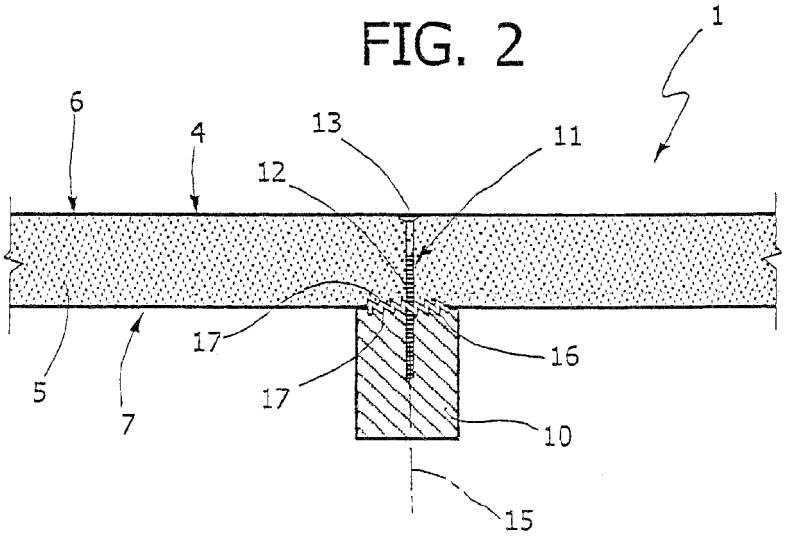


FIG. 2



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 0517577 A **[0008]**