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(71) Applicant: **F.LLI Vinci S.r.l.**
09025 Sanluri (IT)

(72) Inventor: **Vinci, Salvatore**
09025 Sanluri (IT)

(74) Representative: **De Ros, Alberto et al**
Notarbertolo & Gervasi S.p.A.
Corso di Porta Vittoria 9
20122 Milan (IT)

(54) **Floor block and modular floor element**

(57) A floor block comprising a first box-shaped body (2) in which at least one seat (23, 23') is defined on at least one side of the box-shaped body (2); said seat being partially open and able to accommodate a joist and en-

velop a lower part of said joist. A modular floor element comprising a floor block in which (23, 23', 23'', 23''') the same number of prefabricated joists (25, 25', 25'', 25''', 25'''') are inserted/formed.

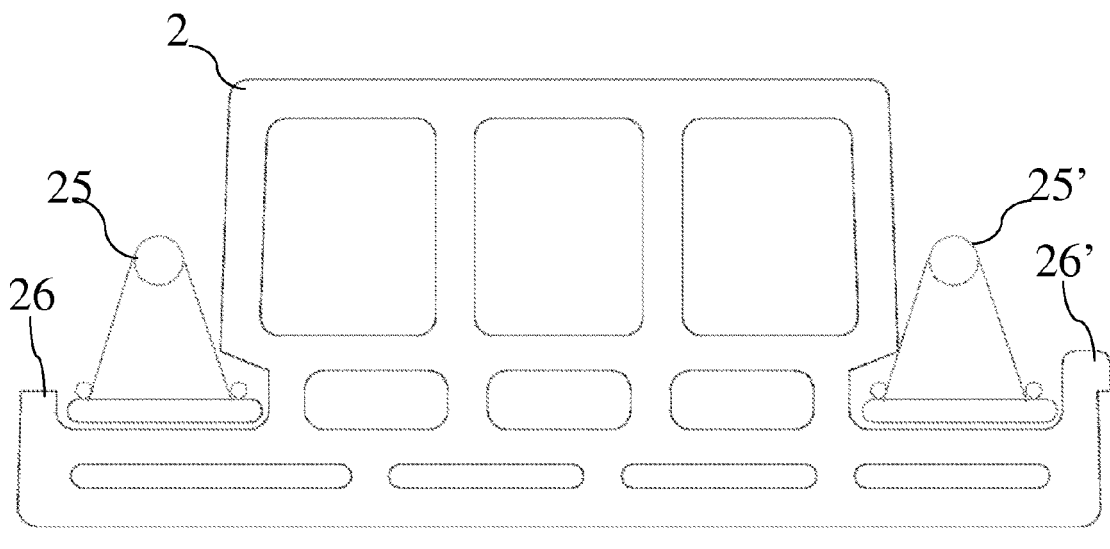


Fig. 3

Description

Field of the invention

[0001] The present invention relates to a floor block and a modular floor element.

Prior art

[0002] The floors currently implemented are floors assembled in place and finished with a casting of concrete. In particular, with reference to Figure 1, which shows the known prior art, prefabricated joists 15, 15' (made from metal) are positioned perpendicular to the frame of the principal beams, and the spaces between one joist and another are filled by the insertion of perforated floor blocks 1 (made from clay). A casting of concrete covers the floor by filling each additional gap between the joists and perforated floor blocks, thus defining a single body. The perforated floor blocks and joists are therefore elements that have the shape of a long and narrow stem; typically, to create a floor requires not less than a dozen perforated floor blocks and not less than a dozen joists (placed side by side), but often many more.

[0003] A view from the bottom of a floor thus formed according to the prior art shows a frame of joists interlaid with rows of perforated floor blocks.

[0004] With reference to Figure 1 of the prior art, a perforated floor block according to the known technique comprises a box-shaped body elongated in a direction perpendicular to the section shown in the figure and comprising suitable concave rounded areas 12 and 12' for support adjacent to a lower base 11 and complementary to the shape of a prefabricated joist.

[0005] Any tracks for the recessing of electrical cables and/or equipment must therefore follow the same frame and be created in the perforated floor blocks so as not to damage the joists and compromise the stability of the floor.

[0006] For the purpose of insulating the floor thermally, the prior art teaches the use of expanded clay or sheets of insulating materials to be installed on the extrados of the floor, or to be attached to the intrados of the floor, because the joists incorporated into the concrete define thermal bridges, especially when the floor is a covering of a central part of a factory or flooring on open spaces (piles).

[0007] It is known that if the floor is not suitably insulated, condensation and humidity are formed in the winter in the vicinity of the thermal bridges which, over time, causes deterioration of the concrete defining the joists, thus exposing the rebars and making them susceptible to attack from oxidising agents.

[0008] From the French patent application FR2323835A1, a terra cotta perforated floor block with a particular shape is known; by placing two perforated floor blocks side by side, we create a seat capable of accommodating a beam (indicated by 1 in the figures)

made of cement or pre-stressed material. Despite the particular form, the assembly of a floor that uses a perforated floor block is performed entirely on site, taking care to position the perforated floor blocks and the beams in relation to each other in an orderly and correct manner.

[0009] From European patent application EP1916350A2, a perforated floor block is known that is made of a flat strip (indicated by 2 in the figures) made from brick or wood to which is centrally fixed a box-shaped element (indicated by 5 in the figures) made of plastic, which is in effect a shell open at the bottom; the strip has three grooves: two lateral grooves (indicated by 24 in the figures) and one central groove (indicated by 23 in the figures); the lateral grooves are suited to accommodating the joists (indicated by 6 in the figures) made from metal and a casting (indicated by 7 in the figures) made from cement to secure the joists in the grooves; the central groove is suited to accommodating the protrusions (indicated by 55 in the figures) of the box-shaped element having a conical shape (see Fig. 2) and a casting (indicated by 4 in the figures) made of cement to secure the box-shaped element in the groove; the lateral edges (indicated by 54 in the figures) of the box-shaped element rest on the joists; and it should be noted that the sectional views can give the impression that the projections extend along the entire length of the box-shaped element, but they are in fact cones. It is therefore understood that such a perforated floor block comprises an element made from a clay material and an element from a plastic material, and must be manufactured on site due to the presence of the box-shaped element to be fixed to the lower strip by means of a cement casting; in addition, the box-shaped element can be fixed to the lower strip only after the joists have been fixed (again using a cement casting) to the strip itself (otherwise the joists may damage the lateral edges of the box-shaped element if they were inserted after the box-shaped element was fixed to the strip).

Summary of the invention

[0010] The purpose of the present invention is to provide a floor block and modular floor element suitable for resolving the above problems.

[0011] The object of this invention is a floor block and a modular floor element according to claim 1.

[0012] This floor block is entirely made of clay and is therefore very easy and inexpensive to produce, is completely prefabricated and is suited to simply being moved alongside other identical blocks, and is therefore very easy and inexpensive to implement. In addition, the joists are simply inserted into the respective seats without any particular fixation before the single casting of cementitious aggregate over the entire floor; this is an additional reason for its ease of use and affordability.

[0013] According to a preferred variant of the invention, said floor block may consist of at least one prefabricated joist in said seat defined by the same floor block. There-

fore, the object of this invention is also a modular element according to claim 7.

[0014] Another purpose of this invention is to provide a method for manufacturing a modular floor element suitable for resolving the above problems.

[0015] The object of this invention is also a method for manufacturing a modular floor element according to claim 8.

[0016] The dependent claims describe preferred embodiments of the invention, forming an integral part of the present description.

[0017] A first highly advantageous embodiment of the present invention (see claims 3 and 4) provides that the floor block comprises at least a first box-shaped body and a second box-shaped body; said first and second box-shaped bodies comprise a lower projecting part in common; said first and second box-shaped bodies and said projecting part define at the bottom a seat for a joist in an intermediate zone of the perforated floor block, more particularly in an intermediate zone of said projecting part. More generally and even more advantageously, the floor block may include a plurality of box-shaped elements side by side and a plurality of seats for joists: two seats are in two lateral zones of the floor block and the other seats are in the intermediate zones of the floor block between adjacent box-shaped elements. In this way, a real floor panel can be created that can have a width of around one metre (or even more) and can be completely prefabricated; therefore, to make a floor by means of such a floor block (which is a panel), very few floor blocks (for example, three or four) are sufficient when placed side by side, and therefore the construction is fast and simple.

[0018] A second highly advantageous embodiment of the present invention (see claim 5) provides that the floor block comprises a first hooked lateral edge and a second compatible lateral edge (more particularly with a matching shape) with said first hooked edge, so that a floor block clings to a previously placed adjacent floor block. It is obvious that such a hook does not have any structural function, but serves to prevent thermal bridges in a very simple way even if, during the phase of laying these floor blocks, they were not perfectly laid side by side (which can easily happen at a construction site).

Brief description of the figures

[0019] Further features and advantages of the invention will become more evident in the light of the detailed description of the preferred but not exclusive embodiments of a floor block and a modular floor element, illustrated by way of non-limiting example, with the aid of the enclosed design figures wherein:

Fig. 1 represents a perforated block of the prior art; Fig. 2 represents a perforated block according to this invention;

Fig. 3 shows a perforated block according to the previous figure, including additional components and

their respective seats;

Fig. 4 represents a variant of a perforated block comprising a greater number of seats for said additional components according to the previous figure;

Fig. 5 represents an additional variant comprising a greater number of seats than the previous figure;

Fig. 6 is a perspective representation of a pair of perforated blocks according to the variant in Fig. 4 joined to each other.

[0020] The same numbers and the same reference letters in the figures identify the same elements or components.

Detailed description of a preferred embodiment of the invention

[0021] With reference to Figure 2, a preferred perforated floor block according to this invention comprises a box-shaped body 2 elongated in a direction perpendicular to the section represented in Figure 2 and comprising suitable rounded areas 22 and 22' providing additional support to a prefabricated joist shape, and comprising a lower base 21 of the box-shaped body 2 defining a projecting part 24 below the box-shaped body 2 and shaped to envelop at least one prefabricated joist beneath it.

[0022] Therefore, with reference to the section of Figure 2, a seat 23 or 23' is defined, partially open at the top and able to accommodate a prefabricated joist, on at least one side of the box-shaped body 2.

[0023] The perforated floor block is composed of clay material, preferably made from a conglomerate of expanded clay, and preferably produced by extrusion. By assembling the perforated floor blocks, it is possible to create prefabricated floor panels with a length equal to or compatible with an entire floor span.

[0024] The expanded clay is preferably derived from capture in special rotating clay ovens at a maximum temperature of around 1200° C. It is therefore an inert, light granular substance that is insulating, resistant and natural. The conglomerate for creating the perforated block is obtained by mixing expanded clay, limestone powder, cement and water. In this way, a conglomerate with the consistency of damp earth is obtained, which can be worked by extrusion with high-pressure vibrating pressing machines, with a mass density of between 600-800 Kg/m³. Advantageously, a floor created from such a perforated floor block has its prefabricated joists insulated at the bottom from said part 24 projecting at the bottom to the box-shaped body 2 of the perforated blocks; see Figure 3. Advantageously, it is possible to create perforated floor blocks adapted to accommodate, at the bottom, a single prefabricated joist 25 or one joist for each of the sides of the box-shaped body as shown in Figure 3.

[0025] According to another embodiment of the invention, with reference to Figure 4, a perforated block may define two (2,2') or more box-shaped bodies having a lower protruding element 24 in common, so as to define

2 or 3 seats 23, 23' or 23, 23,' and 23'' designed to accommodate an identical number of prefabricated joists 25, 25' or 25, 25' and 25''.

[0026] Therefore, said intermediate seats 23'' in Figure 4 and 23'', 23''' in Figure 5 are defined by two adjacent box-shaped bodies (2,2' or 2',2'', or 2'',2''') and by a lower projecting element 24 in common between them.

[0027] According to this embodiment, we define a module possibly comprising the prefabricated joists already inserted/formed in the respective seats.

[0028] Figure 5 shows a variant consisting of four joists 25,25',25'',25''' inserted/formed in an equal number of respective seats 23,23',23'',23'''.

[0029] Advantageously, the presence of this lower projecting body 24 insulates the joists at the bottom, and permits the creation of the tracks for the integration of electrical or thermal equipment in any direction, so that it is therefore no longer obligatory to create tracks parallel to the floor frame.

[0030] In addition, the thermal insulation implicitly defined by the shape of the perforated block prevents the formation of condensation on the lower part of the joist with consequent deterioration of the concrete cover.

[0031] It is preferred that, after the perforated blocks have been obtained, independently of the number of seats to accommodate the prefabricated joists, we arrange in said seats just the joist reinforcements and perform the casting of concrete to create the base of the joists directly in the seats defined by the perforated block, so as to prefabricate the joist directly in the perforated block. In this way, a type of prefabricated panel is obtained, which is ready to be installed and defines a modular element of a floor.

[0032] The geometrical and structural characteristics that can be given to the individual parts and structural elements described, in accordance with the Technical Standards in force, permit great flexibility in the dimensions of the floor and the reinforced cement ribs.

[0033] Advantageously, according to the structural and calculation requirements, it is possible to vary the height of the floor, the span of the prefabricated panel obtained, and the gap between one joist and the next.

[0034] Advantageously, the intrados is homogeneous in appearance and does not have protrusions or recesses, is made completely from expanded clay and can therefore be directly coated with any type of coating and/or shaving. It is not necessary to perform pretreatments of the intrados with cleaning, grippers and the use of special shavers, as is the case for floors with composite slabs with a bottom plate made from concrete or polystyrene and similar synthetic materials. In fact, in the case of perforated blocks/modules of expanded clay, the adhesion to any coating, be it premixed or traditional, is completely optimal.

[0035] According to a second preferred feature of the invention, with particular reference to Figure 6, said perforated block/panel 2 (2') may comprise a hooked lateral edge 26' compatible with an opposite edge 26 of the pan-

el 2 (2') to define a joint with the latter during the installation of a succession of adjacent perforated blocks. Said hooked lateral edge 26' has the advantage of causing a perforated block to cling onto an adjacent perforated block.

[0036] A preferred production process for a prefabricated panel based on the perforated blocks/modules of this invention includes the following steps:

- 10 - production of perforated blocks/modules from expanded clay by extrusion by means of suitable moulds with a machine, preferably an automatic pressing machine,
- curing of the product obtained in the previous step within suitable maturing cells,
- 15 - insertion of previously sized prefabricated joists into the seats 23 defined by said perforated blocks/modules to obtain a structural element, or insertion of just the joist reinforcements in said seats and casting of concrete in said seats to form the same number of prefabricated joists;
- 20 - possible storage of the structural element obtained on suitable wooden supports, placed at suitable distances, to complete the maturing of the clay and/or the concrete defining the joists.
- 25

[0037] A subsequent creation of a floor comprising the panels of this invention includes the following steps:

- 30 - arrangement of shoring of a floor to be created using said structural elements,
- installation of said structural elements,
- arrangement of shuttering,
- installation of possible additional reinforcement,
- 35 - casting of concrete,
- form removal of the manufactured product obtained.

[0038] It is preferred that the panels be handled using suitable lifting eyes anchored in the concrete of the ribs and inserted into the panel during the production phase.

[0039] It is also preferred, in accordance with the rules of the trade, that:

- 40 - the support shoring is arranged orthogonally to the texture of the floor (cross-piece); the distance between the cross-piece depends on the calculated span, the thickness of the floor and the expected loads on the deck, during the laying phase and the concrete casting; distances varying between 1.5 m and 2.00 m or different are anticipated;
- 45 - the creation of the shuttering next to the supports with planking of a width suited to the dimensions of the zone of the concrete formwork buttress required by the structural calculations.
- 50

[0040] Advantageously, thermal bridges are eliminated in the floor obtained; a substantial improvement is obtained in the acoustic insulation and passive acoustic

requirements compared to ordinary brick-cement floors, with a notable reduction in acoustic bridges.

[0041] According to another feature of the invention, by varying the thickness of said lower protruding element 24, it is possible to create fire-retarding structures (REI 60-90-120-180) by increasing the thickness of the same element which, in a floor obtained, defines a type of insulating base.

[0042] Therefore, the panel can also be used to great advantage in environments subject to fire prevention measures and with specific fire resistance requirements.

[0043] The elements and features illustrated in the different preferred embodiments may be combined while remaining within the scope of protection of the present application.

Claims

1. A floor block in a clay material, comprising a first box-shaped body (2, 2') in which at least one seat (23, 23', 23", 23''') is defined on at least one side of the box-shaped body (2); said seat being partially open and adapted to accept a joist and envelope a lower part of said joist. 20
2. The floor block according to claim 1, in which said seat (23, 23', 23", 23''') is partially defined by said box-shaped body (2, 2') and partially defined by a part (24) protruding at the bottom of the box-shaped body (2) defining a seat (23, 23') for each side of said box-shaped body (2). 30
3. The floor block according to claim 1, additionally comprising a second box-shaped body (2'), said first and second box-shaped bodies comprising a common protruding part (24) at the bottom, said first and second box-shaped bodies and said bottom protruding part (24) defining an additional joist seat (23'') in an intermediate zone of the perforated floor block, in particular in an intermediate zone of said protruding part (24). 35 40
4. The floor block according to claims 2 and 3, in which said box-shaped bodies and said respective seats (23, 23', 23" and 23''') are of any number. 45
5. The floor block according to any of the previous claims, additionally comprising a first hooked lateral edge (26') opposite to a second lateral edge (26) compatible with said first hooked edge (26'), such that a floor block clings to an adjacent, previously laid, floor block. 50
6. The floor block according to claim 1, in which said clay material is a conglomerate of expanded clay, lime powder, cement and water. 55
7. A modular floor element comprising a floor block according to any of claims 1 to 6, in which a joist, in particular prefabricated joist (25, 25', 25", 25''') is inserted/formed in one or more of said seats (23, 23', 23", 23'''). 5
8. A method of manufacturing a modular floor element according to claim 7, comprising the following steps: 10
 - production of a floor block in an expanded clay material via extrusion,
 - curing of the product obtained in the previous step, and
 - insertion of one or more previously sized prefabricated joists (25, 25', 25", 25''') in one or more of said seats (23, 23', 23", 23'''), or insertion of just the joist reinforcements in said seats (23, 23', 23", 23''') and casting concrete in said seats to form as many prefabricated joists. 15
9. A floor comprising at least one floor block according to any of claims 1 to 6.
10. A floor comprising at least one modular floor element according to claim 7. 25

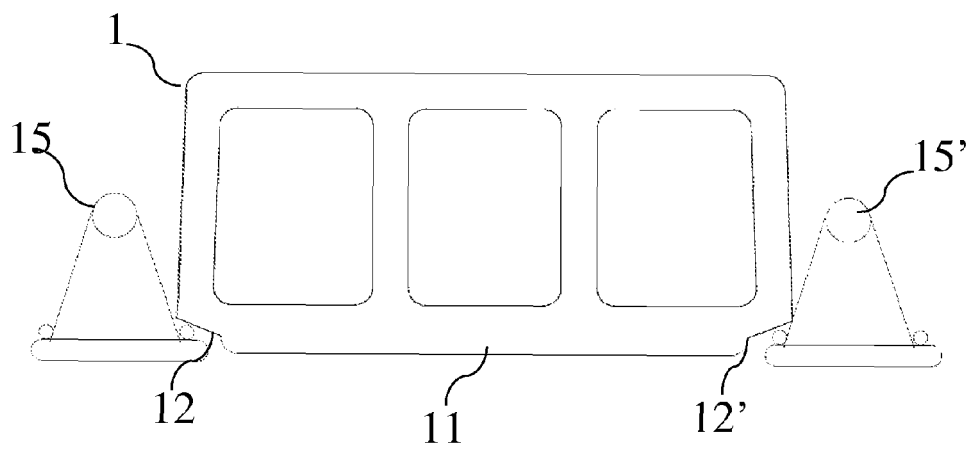


Fig. 1 (prior art)

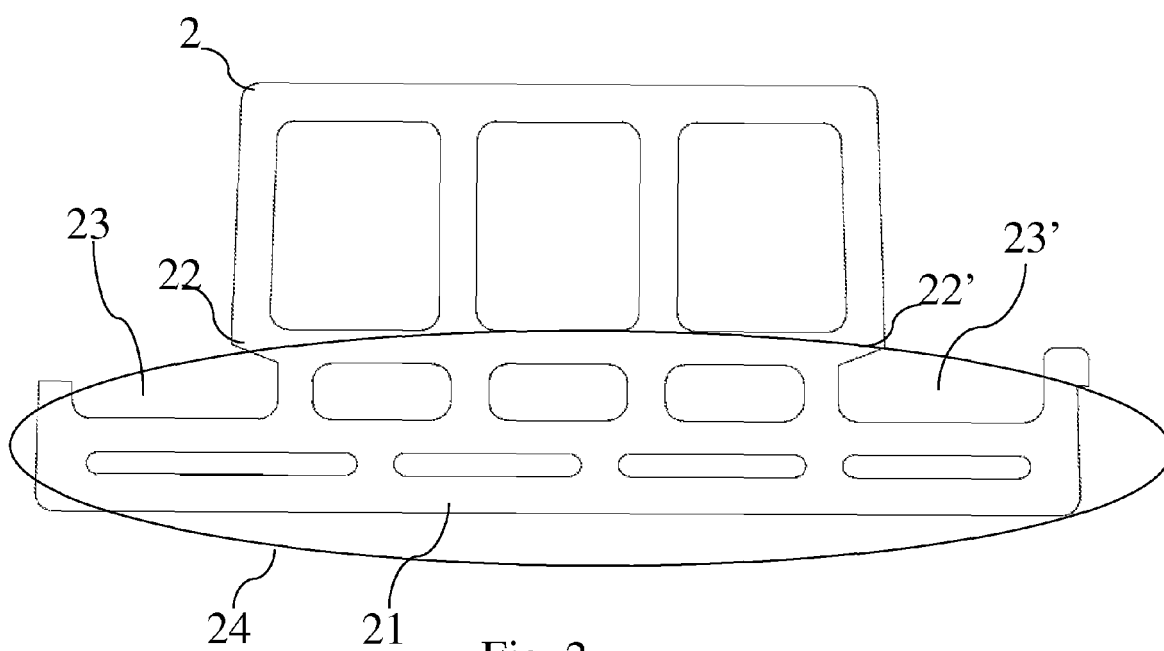


Fig. 2

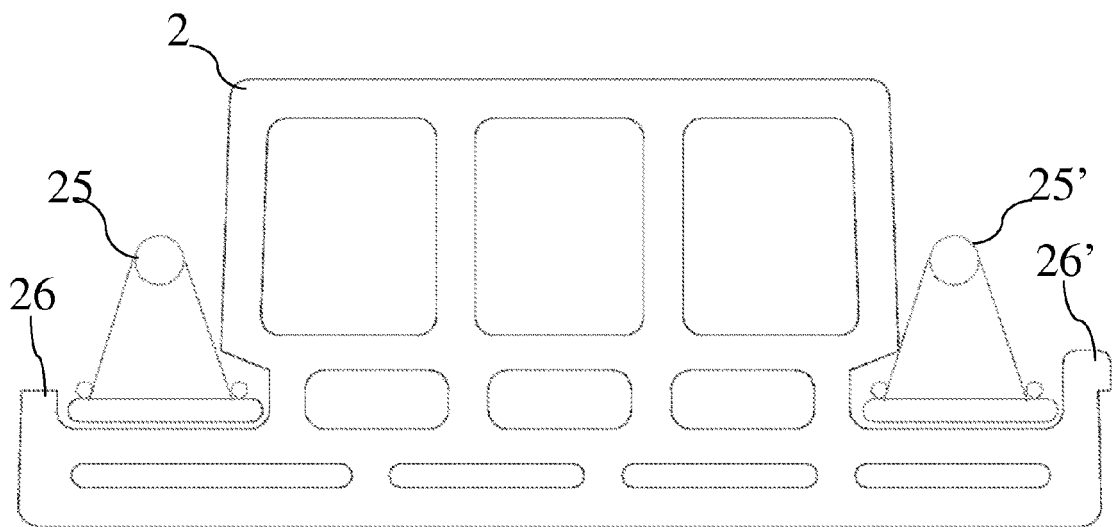


Fig. 3

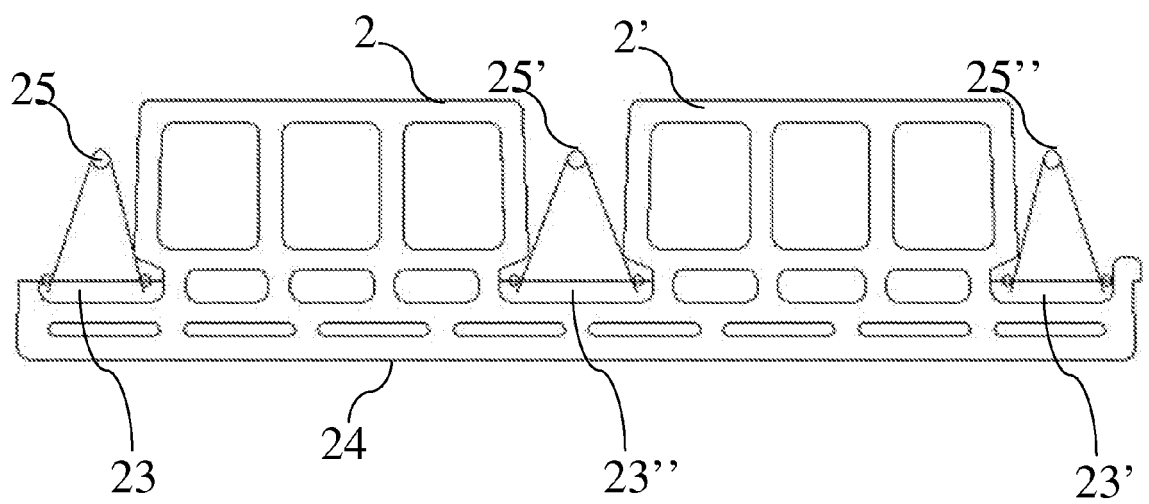


Fig. 4

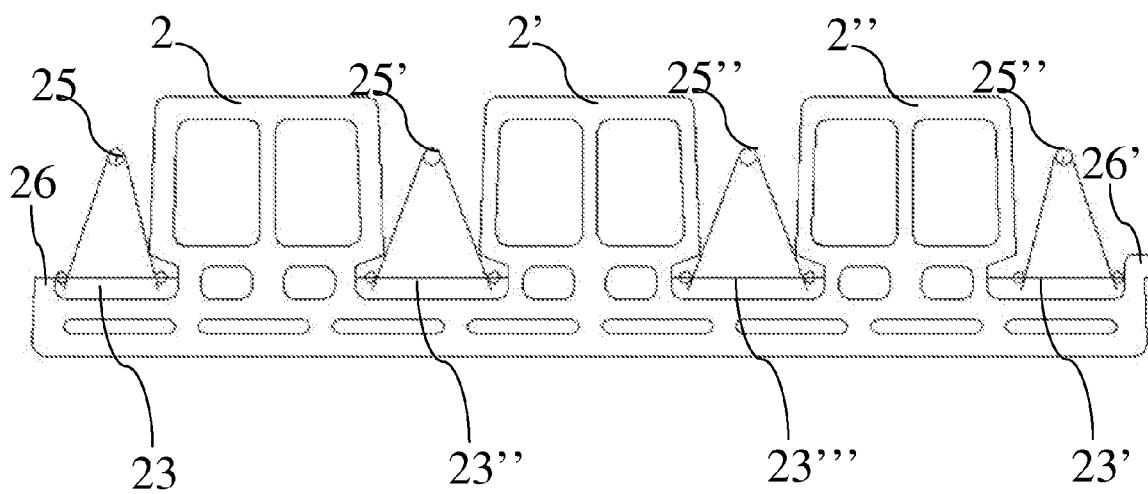


Fig. 5

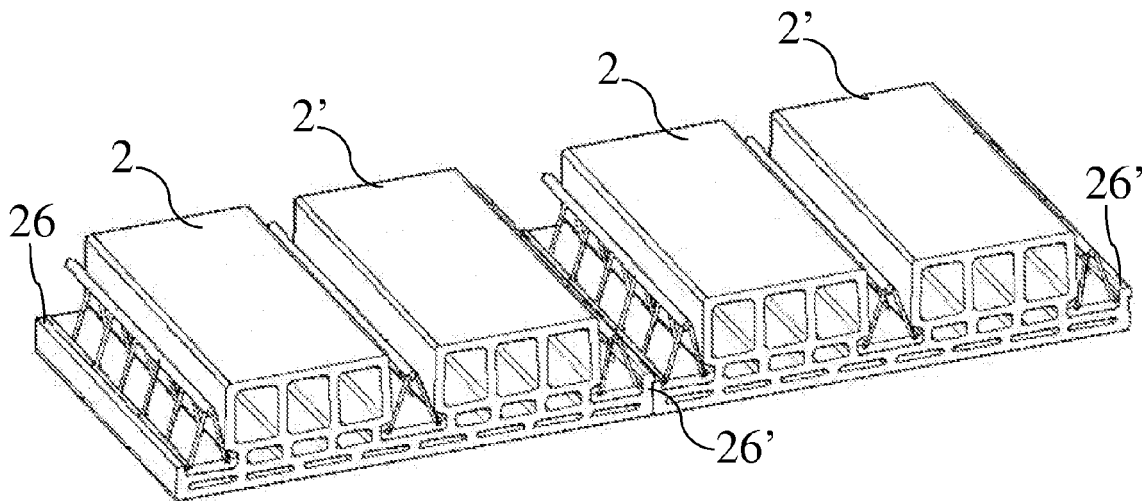


Fig. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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