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(54) **Floor element**

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EP 2 060 693 B1

Description

[0001] This invention relates to a floor element comprising a bottom plate, which is made of a first concrete material and wherein the bottom plate forms a bottom layer of the floor element, and a first upper layer which is provided on top of the bottom layer and which comprises at least a first substantially plate-shaped upper module which is applied on top of a top plate surface of the bottom plate and connected thereto.

[0002] The invention further relates to a method for manufacturing such a floor element and to a floor which comprises at least one floor element according to the present invention.

[0003] FR-A- 1444277 (Fig. 3 and 4) shows a floor element according to the preamble of claim 1.

[0004] Prefabricated concrete floor elements have, since decades successfully been used in residential and non-residential building. A floor is usually constructed by positioning a plurality of prefabricated concrete elements with their upright longitudinal sides against each other and with their mounting edges laying on supporting construction parts, such as walls and beams. Usually, in a next step, a covering or finishing layer is applied on top of the thus constructed floor. The floor elements are usually made of reinforced and/or pre-stressed concrete. The use of pre-stressed concrete is preferred, because such floor elements can withstand higher loads compared to reinforced concrete floor elements. The easy positioning and immediate ability of carrying loads renders the prefabricated concrete elements particularly suitably for a quick and efficient building of floors. To reduce their weight, the concrete floor elements usually comprise a plurality of hollow channels which extend in longitudinal direction of the floor element.

[0005] Usually electric conduits, pipes and tubes are applied along the floor surface. Often, these elements are positioned on top of the floor elements and are incorporated into the finishing or covering layer poured on top of the floor elements. This may however lead to undesired height differences between the different rooms in the building, i.e. between "non-conduit comprising floors" and "conduit comprising floors", unless a covering layer of equal thickness is applied in each of the rooms of the building. However, such a method has the disadvantage that, in each of the rooms, the floor is unnecessarily thick, while the thickness does not add to the function of the floor. This unnecessary material consumption often involves an undesired high load of the floor in most of the rooms.

[0006] Another method known in the art is to apply, on site, slots in the floor elements, to accommodate electric conduits, pipes and tubes. Often, the slots are obtained by locally removing part of the prefabricated elements. However, the application of such slots after the floor elements have been produced, substantially reduces the strength and bearing capacity of the floor, in particular in the case the slot extends in transversal direction of the floor element. As a result, the floor must be supported at its bottom side and the slots need to be re-filled with concrete, after the conduits have been positioned into the grooves. Moreover, the application of slots in the already hardened concrete has the disadvantage that it is difficult and very time consuming and goes at the expense of the load bearing capacity of the floor element. Therefore, the person skilled in the art will usually choose for other building methods.

[0007] EP-B-1214483 and NL-1011955 describe two other methods for applying slots in floor elements.

[0008] EP-B-1214483 describes a hollow-core plate, which comprises a lower reinforced concrete flange, an upper concrete flange and concrete ribs connecting the lower and upper flange in such a way that a number of hollow channels are formed between the lower and upper flange. The lower flange has a thickness which is larger than the thickness of the upper flange and is dimensioned such that the lower flange is capable of withstanding and transmitting transverse forces to the mounting edges of the hollow-core plate resting on the supporting construction parts. At least one slot is formed in an upper part of the floor element, which is provided for receiving slots or electric wiring. The slot extends in horizontal direction at an angle with respect to the reinforcement and in height direction maximally as far as the lower flange. The slot is formed during the manufacturing process of the hollow-core plate by removing a suitable amount of material from the still fresh concrete. After insertion of the appropriate conduits in the slots of the floor element, the slots are filled again with a less high quality material. The removal of concrete to form the slots risks to adversely affect the mechanical properties of the floor element. Other disadvantages of this method are that it is labour-intensive and that the slots have rough and irregular edges, which makes the placement of conduits in the slots more difficult.

[0009] NL1011955 describes a floor element with a plurality of adjacent longitudinal hollow channels. A recess is provided in an upper part of the floor element, which can be used for receiving ducts or the same. The recesses are formed by compressing part of the still fresh concrete and closing the hollow channels near the recess. The recesses may extend in longitudinal or transversal direction of the floor element, over part of or the whole width of the floor element. The thickness of the concrete floor parts surrounding the recess is substantially higher than the thickness of the concrete floor parts beneath and above the channels, such that the strength of the floor element is not adversely influenced by the formation of the recesses in the floor element. The main disadvantages of this floor element are that compression of the still fresh concrete to form the recesses is labour-intensive and that the recesses have rough and irregular edges and surfaces, which makes the positioning of pipes and conduits in the recesses more difficult.

[0010] Summarizing, the known methods for applying slots in prefabricated floor elements, during production

of the floor element, have the disadvantage that they are labour-intensive because still fresh concrete needs to be removed or compressed and that the thus formed slots have rough and irregular edges and faces. The in situ formation of slots in a pre-fabricated floor element may only be done by removing material from the prefabricated floor elements, which is labour-intensive since it involves removal of the already hardened concrete. Moreover, the existing methods involve the risk to adversely affect the strength and bearing capacity of the floor.

[0011] It is an object of the present invention to provide a floor element, in which slots can be provided in an easy and flexible way without needing to break or remove part of the floor element.

[0012] This is achieved with a floor element showing the technical features of the characterizing part of the first claim.

[0013] Thereto, the floor element according to the present invention is characterized in that the first and the second upper module are positioned with respect to each other in such a way that at least one accessible slot is provided between them and wherein the position of the first and second upper module is adjustable with respect to the botton plate so that said at least one accessible slot is adjustable.

[0014] A floor element according to the present invention comprises at least three floor parts, being a bottom plate and a first and a second substantially plate-shaped upper module. The floor element is constructed by applying at least the first and the second upper module on top of the bottom plate and connecting them thereto. Contrary to the known floor elements, in which the floor element is first manufactured and then partly broken down in order to fulfill a desired functionality, the floor element according to the present invention does not require material removal but to the contrary is built up modularly until it has attained the required shape, dimensions and bearing capacity to fulfill the desired functionality. Since no material needs to be removed, the individual floor elements keep their mechanical properties and load bearing capacity.

[0015] Moreover, because the at least first and second upper module are connected to the bottom plate, they form one structural and load-bearing unit and each floor part contributes to the load-bearing capacity of the floor element as a whole. The connection between the first and second upper module with the bottom plate also allows a transfer of forces from the first and second upper module to the bottom plate and vice versa. The connection between the first and second upper module with the bottom plate also assures that shearing forces between the bottom plate and the first and the second upper module are neutralized.

[0016] The bottom plate on the one hand and the at least first and second upper module on the other hand are manufactured as separate modules. The positioning and connection of the at least first and second upper module with the bottom plate can be done in-situ on the construction site, but is preferably done in the factory where the floor parts are manufactured.

[0017] The floor element according to the present invention can be provided with slots in a very simple way by positioning the first and the second upper module appropriately with respect to each other and connecting them to the bottom plate. The obtained slot is an adjustable slot, meaning that it may extend in any possible direction and may have any desired dimensions in height, width and depth and that the direction and dimensions can be adjusted and controlled after having manufactured the different floor parts, and this without having to break down or remove part of the material of the floor element. By adjusting the dimensions of the first and the second upper module and by applying and connecting the first and the second upper module accordingly on the bottom plate, the dimensions, orientation and position of the slots can be varied easily, depending on the desired application.

[0018] As a result thereof, the floor element according to the present does not require a different mould for every different required dimension or orientation of the slot. Other advantages are that the manufacturing cost of the floor element may be decreased and that the functionality of the floor element can be easily adjusted.

[0019] The slot provided in the floor element according to the present invention is an accessible slot, meaning that the slot may be accessed from outside after the floor element has been build up.

[0020] Another advantage is that the slots have a sharp finishing. In fact, the slots are limited by the upright sides of the first and second upper module and part of the top surface of the bottom plate. Since the bottom plate and the first and second upper module are prefabricated floor parts, they are usually limited by sharp sides and surfaces. This sharp finishing and lining of the slots makes it easier to place elements, such as conduits or wiring, into the slots.

[0021] As a result, the slot applied in the floor element according to the present invention is suitable for taking up conditioning elements, such as electrical wirings or heating and/or cooling ducts or any other elements considered suitable by the person skilled in the art. The dimensions, orientation and position of the slot can be controlled and adjusted, depending on the number of conditioning elements to be inserted into the slot and depending on the required position and orientation of the conditioning elements. Because the slot is accessible from outside, the insertion of the conditioning elements into the slot can be done easily, without having to break or remove part of the floor element. In case one or more of the inserted elements is damaged, the elements can be accessed and replaced easily, without having to replace or break down the entire floor element. Moreover, the sharp finishing and lining of the slot makes it easier to insert elements, such as conduits or wiring, into the slots, without the risk of getting hurt by the rough edges of the slot.

[0022] The top surface of the bottom plate and the bot-

tom surface of the first and/or second upper module preferably comprise cooperating positioning means with a complementary shape. The positioning means may for instance comprises a cooperating ridge and groove with a complementary shape, a protrusion and recess, a tongue and groove or a combination of two or more thereof or any other shape considered suitable by the person skilled in the art. These positioning means allow increasing the accuracy of the positioning of the at least first and second upper module on the bottom plate and increase the transfer of forces to the bottom plate.

[0023] The invention is further elucidated in the appending figures.

[0024] Figure 1 shows a schematic view of the floor element according to the present invention.

[0025] Figure 2 shows a more detailed view of the floor element according to the present invention.

[0026] As can be seen on figure 1, and in detail on figure 2, the floor element 1 according to the present invention comprises at least three floor parts, namely a bottom plate 2 and a first 3 and a second 4 substantially plate-shaped upper module. The bottom plate 2 is delimited by a top 5 and bottom 6 plate surface, two upright longitudinal sides 7, 8 and two upright transverse sides 9, 10. The first substantially plate-shaped upper module 3 is delimited by a top 11 and a bottom 12 module surface, two upright longitudinal sides 13, 14 and two upright transverse sides 15, 16. The first upper module 3 is applied with its bottom module surface 12 on the top plate surface 5 of the bottom plate 2 and is connected thereto. The second substantially plate-shaped upper module comprises a top 17 and a bottom module surface 18, two upright longitudinal sides 19, 20 and two upright transverse sides 21, 22. The second upper module 4 is, similarly to the first upper module 3, applied with its bottom module surface 18 on the top plate surface 5 of the bottom plate 2 and is connected thereto. The bottom plate 2 forms a bottom layer of the floor element. The first and second upper modules form a first upper layer of the floor element.

[0027] The thickness of the first 3 and second 4 upper modules may be the same or different, but is preferably the same, such that the application of additional layers on top of the first upper layer can be done in an easier way.

[0028] The first 3 and the second 4 module are positioned with respect to each other in such a way that at least one accessible and adjustable slot is provided in between them. The slots are preferably provided to receive first conduit elements, which can be inserted in a very easy way (not shown). These first conduit elements can be any type of ducts considered suitable by the person skilled in the art, such as electrical wirings, ducts, elements for conditioning the floor element, such as elements for heating or cooling the floor element, or a combination thereof.

[0029] The position of the first and the second upper module with respect to each other is adjustable. As a result, the thus formed slot is easily adjustable. With adjustable is meant that the position and the dimension of the slot can be changed without needing to remove part of the floor element or without having to perform any other labour intensive activities. In fact, by changing the position of the first and the second upper module on the bottom plate and the distance between the first and the second upper module, the position and dimensions of the slot can be changed. This change can be performed in the factory or on site, such that the floor element can be adjusted depending on the needs on the construction site.

[0030] The bottom plate is made of a first concrete material. This first concrete material can be the conventionally used concrete, a mixture of granular materials, natural or artificial, which are bounded with a binding agent, such as cement, polymers or asphalt, to a stone-like material. A suitable classification with respect to concrete materials is a classification according to weight by volume, because a lot of properties of concrete materials are directly or indirectly coupled to the weight by volume. The concrete standard NEN-EN 206-1 distinguishes, based on (artificial, dry) volume by weight, the following concrete materials: light concrete with a volume by weight of 200-2000 kg/m^3, normal concrete with a volume by weight of 2000 - 2600 kg/ m^3 and heavy concrete with a volume by weight exceeding 2600 kg/m^3. Other classifications are possible based on the manufacturing method, such as for instance pouring concrete, prefab concrete and during-the-work poured concrete, based on the strength, such as for instance high strength concrete and ultra high strength concrete, based on a constituent, such as fiber reinforced concrete, or based on a binding agent, such as for instance cement concrete, asphalt concrete, polymer concrete,... Every other type of concrete material known to the person skilled in the art can be used as a first concrete material. The first concrete material of the bottom plate 2 of the floor element preferably comprises reinforcement means 29 as is shown in figure 1. As a result of the presence of such a reinforcement in the bottom plate of the floor element, the floor element is able to withstand, compressive forces as well as pulling forces, which leads to a floor element with an increased load-bearing capacity. The bottom plate 2 of the floor element is therefore preferably made of reinforced concrete. More preferably, the bottom plate is made of pre-stressed concrete, which leads to floor element which is able to withstand even higher loads compared to floor elements made of pre-stressed concrete. The edges of the floor element may additionally be provided with reinforcement elements 30 as is shown in figure 1 to allow even higher loads on the mounting edges of the floor element.

[0031] The bottom plate may be a massive plate or a so-called hollow-core plate, i.e. a plate which comprises a number of hollow channels which extend in longitudinal direction of the floor element, leading to a material- and weight reduction. The reinforcement means 29 may ex-

tend above or beneath or above as well as beneath the hollow channels 28. The bottom plate may also be provided with second conduit elements which are incorporated in the first concrete material. These second conduit elements can be the same or differ from the first conduit elements provided in the slots of the floor element. The second conduit elements can be provided above or beneath the reinforcement and above or beneath the hollow channels. The incorporated conduit elements may or may not be connected to the reinforcement means 29.

[0032] The modular build up of the floor element allows manufacturing the first 3 and the second 4 upper module in another material than concrete. The first 3 and the second 4 upper module may for instance be made of a composite material, a composite material which comprises a foam core, a fiber reinforced plastic material, a fiber reinforced composite material, or any other material which is considered suitable by the person skilled in the art. The fibers may be metal fibers, natural fibers, plastic fibers, glass fibers or any other type of fibers considered suitable by the person skilled in the art. In case the first 3 and the second upper module are made of a material which is different from concrete, the material of the first 3 and second 4 upper module may fulfill an additional functionality, for instance an acoustic insulating, a thermal insulating or a vibration-damping functionality. The use of another material than concrete allows building up a floor with a decreased weight. The first 3 and the second 4 upper module may be a massive module or a hollow-core module with hollow channels extending in longitudinal or transversal direction of the floor element or at any angle with respect to the longitudinal direction of the floor element. The first 3 and second 4 upper module may further comprise reinforcement means, which lead to a floor element with a higher load-bearing capacity. If required, third conduit elements may be incorporated into the first and/or second upper module, whereby the third conduit elements may be the same or different from the first and/or second conduit elements.

[0033] One or more module slots 27 can be applied in the first 3 and/or in the second 4 upper modules. These module slots 27 can be provided during manufacturing of the module or after manufacturing of the module, in the factory or on situ. These module slots 27 can be in connection with the at least one slot 23 between the first 3 and second 4 upper module. The position, orientation, width and depth of the module slots 27 can be adjusted as considered suitable by the person skilled in the art.

[0034] The floor element built-up with a bottom plate 2 and a first 3 and second 4 upper module may comprise only one slot 23, provided between two upright sides of the adjacent upper modules 3,4, or two or more ducts 23, 31. On figure 2 the first 3 and second 4 upper module are positioned with respect to each other in such a way that a space is left between the first upright transversal side 15 of the first upper module 3 and the second upright transversal side 22 of the second upper module 4, which space forms a first duct 23 of the floor element. The floor element may comprise one or more additional slots 31 obtained by positioning the first and second upper module in such a way on the bottom plate that a space is left between the upright edges 7, 8, 9, 10 of the bottom plate and one or more of the upright edges 13, 14, 15, 16, 19, 20, 21, 22 of at least one of the first and second upper module 3, 4. On figure 2 a space is left between the first longitudinal upright edge 14 of the first upper module 3 and the second longitudinal upright side 8 of the bottom plate 2, which space forms a slot 31. The different slots may have the same or varying dimensions and/or orientation.

[0035] The first upper layer may comprise only two substantially plate-shaped upper modules, but may comprise more than two upper modules placed on top of the bottom plate and connected thereto as is shown in figure 1. By positioning the different upper modules with respect to each other, one or more slots 23, 31 can be provided between them. Again, the different slots 23, 31 may have varying dimensions and/or orientation.

[0036] The top plate surface 5 of the bottom plate 2 and the bottom module surface 12, 18 of the first 3 and/or second 4 upper module preferably comprise cooperating positioning means 24, 25 with a complementary shape as is shown in figure 2. These positioning means 24, 25 can for instance comprise a cooperating rib and groove, a protrusion and recess, a tongue and groove or any other means considered suitable by the person skilled in the art, or a combination of two or more thereof. The shape of the positioning means 24, 25 can be round, line-shaped, rectangular, concave, convex or any other shape considered suitable by the person skilled in the art, or a combination of two or more thereof. The top plate surface 5 of the bottom plate 2 can for instance be provided with a rectangular groove which cooperates with a corresponding cooperating rectangular rib, with the same dimensions as the groove and provided on the bottom module surface of for instance the first upper module. Cooperating positioning means assure a larger contact surface between the first/second module 3, 4 and the bottom plate 2. These positioning means 24, 25 also simplify the application and fixation of the position of the first 3 and second 4 upper modules on the bottom plate 2.

[0037] One or more additional layers may be applied on top of the first upper layer. Every additional upper layer comprises one or more substantially plate-shaped upper modules which are applied on top of the underlying layer and which are preferably connected to an upper module surface of an underlying module. The different upper layers can fulfill different functionalities. An upper layer can for instance be made of an electrically insulating material, as a result of which interference with electrical devices is minimized or avoided. Another possibility is to provide the upper layer with a thermal insulating, acoustic insulating or vibration damping material.

[0038] By providing several upper layers on top of the bottom plate 2, several types of conduit elements can be inserted and incorporated on several levels within the

floor element. In this way slots in the lower level of the floor element may be provided to incorporate elements that require a minimum amount of accessibility, and slots in a higher level of the floor element may be provided to incorporate elements that require a high level of accessibility. The upper modules which are positioned on top of the first upper layer may be the same or differ from the first upper module. They can be made of the same or different material, but are preferably made of a different material such that every layer fulfills a different functionality. Some layers may or may not comprise slots or module slots, may or may not incorporate conduit elements,...

[0039] A finishing plate 26 can be applied on top of the top upper layer, as is shown in figure 1. This finishing plate 26 can be made of any material considered suitable by the person skilled in the art. Preferably, the finishing plate 26 forms a finishing layer of the floor element. The different layers of the floor element can have a different finishing level, depending on the functionality of the floor element and on the fact if these layers will be visible or not after construction of the floor. In case a floor surface is built on a certain floor in a building, the bottom plate surface preferably has a higher finishing level, such that it can function as the ceiling of the room beneath. In a garage for instance, the finishing level is less important and the bottom plate surface of the bottom plate can be rougher.

[0040] The floor element can be manufactured in several ways. The bottom plate 2 and the first 3 and the second 4 upper module are preferably made as separate modules which are then put together on site or in the factory. The composition of the floor element is preferably done in the factory, such that the different floor parts 2, 3, 4 do not need to be loaded and unloaded separately. The size, orientation and position of the slots 23, 31 can be varied by applying the first 3 and the second 4 upper module accordingly on the bottom plate and connecting them to the bottom plate 2. The modular build-up allows postponing the application of slots to a later stage in the building process, without having to cut in the floor element or remove an amount of material from the floor element. Another advantage of the modular build-up is that it is not necessary to have a different mould for every change in dimensions of the slot. Slots 23 of a different width are for instance obtained by positioning the first 3 and second 4 upper module closer or more remotely from each other. The application of slots 23 in the floor element therefore gets cheaper and less time consuming. Moreover, it is possible to apply slots 23, 31 in the floor element without adversely influencing the structure of the bottom plate. Moreover, because the at least first 3 and second 4 upper modules are connected to the bottom plate, the three modular parts 2, 3, 4 form one supporting unit and each floor part contributes to the load-bearing capacity of the whole floor element.

[0041] The at least one slot 23 between two upper modules 3, 4 and/or the module slots 27 applied in an upper module and/or the slots 31 between upright sides of the first/second upper module and the upright sides of the bottom plate can be covered with a cover. Preferably, a cover is provided for those slots that require easy access later on, preferably the ones which are provided in a higher positioned layer of the floor element.

[0042] The connection between the first 3 and second 4 upper module on the bottom plate 2 allows a transfer of forces of the at least first 3 and second 4 upper module to the bottom plate 2. The type of connection determines the amount of transfer. The connection is preferably such that a maximum transfer of forces can be provided.

[0043] An optimal transfer of forces can for instance be obtained by connecting the at least first 3 and second 4 upper modules with the aid of an adhesive to the bottom plate, wherein the floor parts may or may not be provided with positioning means, but are preferably provided with positioning means 24, 25. At least one of the at least first 3 and second 4 upper module can be connected with glue, cement or concrete to the bottom plate or with any other adhesive considered suitable by the person skilled in the art. The adhesive can be applied on the entire upper plate surface of the bottom plate and/or on the entire bottom module surface of at least one of the at least first and second upper module or on only part thereof. The adhesive allows connecting the different floor parts to form one structural unit and thus allows an optimal transfer of forces of the at least one of the at least first and second upper module to the bottom plate and vice versa.

[0044] Another possibility is to mechanically connect the at least first 3 and second 4 upper module with the bottom plate 2. The mechanical connection can for instance be done with screws, hooks, clamps, or any other mechanical connection means considered suitable by the person skilled in the art.

[0045] Summarizing, the first and the second upper module can be connected to the bottom plate by cooperating positioning means, an adhesive, mechanical connecting means or any other means considered suitable by the person skilled in the art, or any combination thereof.

[0046] The use of positioning means to increase the accuracy of the positioning 24, 25 and to provide in a better transfer of forces between the different layers, is not limited to the lower layer and the first upper layer. Positioning means 24, 25 can be used to position consecutive layers on top of each other, for instance a second upper layer on top of a first upper layer. The same applies for the connection of consecutive layers with each other. The connection can be done in the same way as the connection between the bottom layer and the first upper layer or any combination thereof.

[0047] By positioning at least one floor element according to the present invention with its mounting edges on supporting construction parts, such as walls and beams, a floor can be built up. In general, several floor elements will be placed next to each other to build up the floor. The different floor elements are usually positioned with their

upright longitudinal sides against each other and are or are not connected to each other. The upright longitudinal sides of the floor element can be flat, but are preferably provided with positioning means which are provided to cooperate with corresponding positioning means with a complementary shape on an adjacent upright side of the adjacent floor element. These positioning means can comprise a cooperating tongue and groove or a protrusion and recess or any other type of positioning means considered suitable by the person skilled in the art or a combination of two or more thereof.

Claims

1. A floor element (1) to build up a floor by placing several such elements next to each other comprising a bottom plate (2), which is made of a first concrete material and forms a bottom layer of the floor element (1), first upper layer provided on top of the bottom layer, wherein the first upper layer comprises at least a first substantially plate-shaped upper module (3), which is applied on top of a top plate surface (5) of the bottom plate (2) and connected thereto, wherein the first upper layer further comprises a second substantially plate-shaped upper module (4), which is applied on top of the top plate surface (5) of the bottom plate (2) and connected thereto, **characterised in that** the first (3) and the second (4) substantially plate-shaped upper module are positioned with respect to each other in such a way that at least one accessible slot (23) is provided between them, wherein the position of the first and second upper module (3, 4) is adjustable with respect to the bottom plate (2) so that said at least one accessible slot (23) is adjustable.

2. A floor element according to claim 1, **characterized in that** the top plate surface (5) of the bottom plate (2) and a bottom module surface (12, 18) of at least one of the first (3) and second (4) plate-shaped upper module are provided with cooperating positioning means (24, 25) with a complementary shape.

3. A floor element according to anyone of the preceding claims, **characterized in that** the at least one slot (23) extends in longitudinal or transversal direction of the floor element, or at any angle with respect to the longitudinal direction of the floor element.

4. A floor element according to anyone of the preceding claims, **characterized in that** the floor element further comprises a cover provided for covering the at least one slot.

5. A floor element according to anyone of the preceding claims, **characterized in that** the floor element comprises at least one additional upper layer applied on top of the first upper layer, wherein each of the at least one additional upper layers comprises at least one additional substantially plate-shaped upper module, which is applied on top of and connected to a top module surface of a plate-shaped upper module positioned below it.

6. A floor element according to anyone of the preceding claims, **characterized in that** the floor element comprises a finishing plate (26) which is applied on top of and connected to a top module surface of an upper plate-shaped upper module positioned below it and which is provided for forming a top finishing layer of the floor element.

7. A floor element according to anyone of the preceding claims, **characterized in that** the bottom plate comprises a plurality of hollow channels (28) which extend in longitudinal direction of the floor element.

8. A floor element according to anyone of the preceding claims, **characterized in that** the first concrete material comprises reinforcement means (29).

9. A floor element according to anyone of the preceding claims, **characterized in that** the bottom plate (2) is made of pre-stressed concrete.

10. A floor element according to anyone of the preceding claims, **characterized in that** the bottom plate (2) comprises first conduit elements which are incorporated in the first concrete material.

11. A floor element according to anyone of the preceding claims, **characterized in that** the at least first (3) and second (4) plate-shaped upper module are made of a material chosen from composite material, fiber reinforced plastic material, concrete, reinforced concrete, fiber reinforced concrete or a mixture of two or more thereof.

12. A floor element according to anyone of claims 1-11, **characterized in that** the at least first (3) and second (4) plate-shaped upper module are made of a second concrete material, which is the same as or different from the first concrete material of the bottom plate.

13. A floor element according to anyone of the preceding claims, **characterized in that** at least one of the at least first (3) and second (4) plate-shaped upper module comprises at least one hollow channel.

14. A floor element according to anyone of the preceding claims, **characterized in that** at least one of the at least first (3) and second (4) plate-shaped upper module comprises reinforcement means.

15. A floor element according to anyone of the preceding claims, **characterized in that** at least one of the at least first (3) and second (4) plate-shaped upper module comprises second conduit elements which are incorporated in the at least one of the at least first (3) and second (4) plate-shaped upper module.

16. A floor element according to anyone of the preceding claims, **characterized in that** the floor element comprises at least one module slot (27) provided in at least one of the at least first (3) and second (4) plate-shaped upper module.

17. A floor element according to claim 16, **characterized in that** the at least one module slot (27) extends in longitudinal or transversal direction of the floor element or at any other angle with respect to the longitudinal direction of the floor element.

18. A floor element according to anyone of claims 16-17, **characterized in that** the floor element comprises a module cover provided for covering the at least one module slot.

19. A floor element according to anyone of the preceding claims, **characterized in that** the at least first (3) and second (4) plate-shaped upper module are connected with the bottom plate using connection means chosen from the group of an adhesive or a mechanical connection or a combination thereof.

20. A method for manufacturing a floor element according to any of the preceding claims, wherein in a first step a bottom plate (2) is manufactured to provide the bottom layer of the floor element, wherein in a second step the first plate-shaped upper module (3) is manufactured, which is applied on top of the bottom plate (2) and which is connected thereto, wherein in a third step the second plate-shaped upper module (4) is manufactured, which is applied on top of the bottom plate and which is connected thereto, wherein the first (3) and the second (4) plate-shaped upper module form the first upper layer of the floor element, **characterised in that** the first (3) and the second (4) plate-shaped upper module are positioned on the bottom plate (2) in such a way that said at least one accessible slot 23 is provided between them.

21. A method according to claim 20, **characterized in that** one or more additional upper layers are applied on top of the first upper layer.

22. A method according to anyone of claims 20-21, **characterized in that** a finishing plate (26) is applied for forming a top finishing layer of the floor element.

23. A method according to anyone of claims 20-22, **characterized in that** at least one of the at least first (3) and second (4) plate-shaped upper module is connected with the bottom plate (2) with connection means chosen from the group of an adhesive or a mechanical connection means or a combination thereof.

24. A floor comprising at least one floor element according to anyone of claims 1-19 or at least one floor element obtained with a method according to anyone of claims 20-23.

Patentansprüche

1. Fußbodenelement (1) zum Aufbauen eines Fußbodens durch Anordnen mehrerer derartiger Elemente nebeneinander, umfassend eine untere Platte (2), die aus einem ersten Betonmaterial hergestellt ist und eine untere Schicht des Fußbodenelements (1) bildet, eine erste obere Schicht, die oben auf der unteren Schicht vorgesehen ist, wobei die erste obere Schicht mindestens ein erstes im Wesentlichen plattenförmiges oberes Modul (3) umfasst, welches oben auf eine obere Plattenoberfläche (5) der unteren Platte (2) aufgebracht und damit verbunden ist, wobei die erste obere Schicht ferner ein zweites im Wesentlichen plattenförmiges oberes Modul (4) umfasst, welches oben auf die obere Plattenoberfläche (5) der unteren Platte (2) aufgebracht und damit verbunden ist, **dadurch gekennzeichnet, dass** das erste im Wesentlichen plattenförmige obere Modul (3) und das zweite im Wesentlichen plattenförmige obere Modul (4) in Bezug auf einander auf eine Weise positioniert sind, dass zwischen diesen mindestens ein zugänglicher Spalt (23) vorgesehen ist, wobei die Position des ersten und des zweiten oberen Moduls (3, 4) in Bezug auf die untere Platte (2) einstellbar ist, so dass der mindestens eine zugängliche Spalt (23) einstellbar ist.

2. Fußbodenelement nach Anspruch 1, **dadurch gekennzeichnet, dass** die obere Plattenoberfläche (5) der unteren Platte (2) und eine untere Moduloberfläche (12, 18) von mindestens einem aus der Gruppe umfassend das erste plattenförmige obere Modul (3) und das zweite plattenförmige obere Modul (4) mit zusammenwirkenden Positioniermitteln (24, 25) von komplementärer Form versehen sind.

3. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, dadurch gekenntzeichnet, dass sich der mindestens eine Spalt (23) in Längs- oder Querrichtung des Fußbodenelements oder in jedem beliebigen Winkel in Bezug auf die Längsrichtung des Fußbodenelements erstreckt.

4. Fußbodenelement nach einem beliebigen der vor-

hergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Fußbodenelement ferner eine Abdekkung umfasst, die zum Abdecken des mindestens einen Spalts vorgesehen ist.

5. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Fußbodenelement mindestens eine zusätzliche obere Schicht umfasst, die auf die erste obere Schicht aufgebracht ist, wobei jede der mindestens einen zusätzlichen oberen Schichten mindestens ein zusätzliches im Wesentlichen plattenförmiges oberes Modul umfasst, das oben auf eine obere Moduloberfläche eines darunter positionierten plattenförmigen oberen Moduls aufgebracht und damit verbunden ist.

6. Fußbodenelements nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Fußbodenelement eine Deckplatte (26) umfasst, die oben auf eine obere Moduloberfläche eines darunter positionierten oberen plattenförmigen oberen Moduls aufgebracht und mit dieser verbunden ist und die zum Bilden einer oberen Deckschicht des Fußbodenelements vorgesehen ist.

7. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die untere Platte mehrere hohle Kanäle (28) umfasst, die sich in Längsrichtung des Fußbodeneiements erstrecken.

8. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das erste Betonmaterial Bewehrungsmittel (29) umfasst.

9. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die untere Platte (2) aus Spannbeton hergestellt ist.

10. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die untere Platte (2) erste Leitungselemente umfasst, die in das erste Betonmaterial eingebunden sind,

11. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) aus einem Material hergestellt sind, das aus der Gruppe umfassend Verbundstoff, faserverstärkten Kunststoff, Beton, bewehrten Beton, faserverstärkten Beton oder eine Mischung aus zwei oder mehreren davon ausgewählt wird.

12. Fußbodenelement nach einem beliebigen der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) aus einem zweiten Betonmaterial hergestellt sind, welches dasselbe wie das erste Betonmaterial der unteren Platte oder davon verschieden ist.

13. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eines aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) mindestens einen hohlen Kanal umfasst.

14. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eines aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) Bewehrungsmittel umfasst.

15. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** mindestens eines aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) zweite Leitungselemente umfasst, die in das mindestens eine aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) eingebunden sind.

16. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das Fußbodenelement mindestens einen Modulspalt (27) umfasst, der in mindestens einem aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) vorgesehen ist.

17. Fußbodenelement nach Anspruch 16, **dadurch gekennzeichnet, dass** sich der mindestens eine Modulspalt (27) in Längs- oder in Querrichtung des Fußbodenelements oder in jedem beliebigen anderen Winkel in Bezug auf die Längsrichtung des Fußbodenelements erstreckt.

18. Fußbodenelement nach einem beliebigen der Ansprüche 16-17, **dadurch gekennzeichnet, dass** das Fußbodenelement eine Modulabdeckung umfasst, die zum Abdecken des mindestens einen Modulspalts vorgesehen ist.

19. Fußbodenelement nach einem beliebigen der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) mit der unteren Platte mittels Verbindungsmitteln

verbunden sind, die aus der Gruppe umfassend einen Klebstoff oder eine mechanische Verbindung oder eine Kombination daraus ausgewählt werden.

20. Verfahren zum Herstellen eines Fußbodenelements nach einem beliebigen der vorhergehenden Ansprüche, wobei in einem ersten Schritt eine untere Platte (2) hergestellt wird, um die untere Schicht des Bodenelements vorzusehen, wobei in einem zweiten Schritt das erste plattenförmige obere Modul (3) hergestellt wird, welches oben auf die untere Platte (2) aufgebracht und damit verbunden wird, wobei in einem dritten Schritt das zweite plattenförmige obere Modul (4) hergestellt wird, welches oben auf die untere Platte aufgebracht und damit verbunden wird, wobei das erste plattenförmige obere Modul (3) und das zweite plattenförmige obere Modul (4) die erste obere Schicht des Fußbodenelements bilden, **dadurch gekennzeichnet, dass** das erste plattenförmige obere Modul (3) und das zweite plattenförmige obere Modul (4) auf eine Weise auf der unteren Platte (2) positioniert werden, dass der mindestens eine zugängliche Spalt 23 zwischen diesen vorgesehen wird.

21. Verfahren nach Anspruch 20, **dadurch gekennzeichnet, dass** eine oder mehrere zusätzliche obere Schichten oben auf die erste obere Schicht aufgebracht werden.

22. Verfahren nach einem beliebigen der Ansprüche 20-21, **dadurch gekennzeichnet, dass** zum Bilden einer oberen Deckschicht des Fußbodenelements eine Deckplatte (26) aufgebracht wird.

23. Verfahren nach einem beliebigen der Ansprüche 20-22, **dadurch gekennzeichnet, dass** mindestens eines aus der Gruppe umfassend das mindestens erste plattenförmige obere Modul (3) und zweite plattenförmige obere Modul (4) mit der unteren Platte (2) mittels Verbindungsmitteln verbunden wird, die aus der Gruppe umfassend einen Klebstoff oder ein mechanisches Verbindungsmittel oder eine Kombination daraus ausgewählt werden.

24. Fußboden, umfassend mindestens ein Fußbodenelement nach einem beliebigen der Ansprüche 1-19 oder mindestens ein Fußbodenelement, das mittels eines Verfahrens nach einem beliebigen der Ansprüche 20-23 hergestellt wurde.

Revendications

1. Élément de plancher (1) pour construire un plancher en plaçant plusieurs de ces éléments les uns à côté des autres, comprenant une plaque de fond (2) qui est constituée d'un premier matériau en béton et forme une couche de fond de l'élément de plancher (1), une première couche supérieure prévue au-dessus de la couche de fond, dans lequel la première couche supérieure comprend au moins un premier module supérieur (3) sensiblement en forme de plaque, qui est appliqué au-dessus d'une surface de plaque supérieure (5) de la plaque de fond (2) et y est relié, dans lequel la première couche supérieure comprend en outre un deuxième module supérieur (4) sensiblement en forme de plaque, qui est appliqué au-dessus de la surface de plaque supérieure (5) de la plaque de fond (2) et y est relié, **caractérisé en ce que** le premier (3) et le deuxième (4) module supérieur sensiblement en forme de plaque sont positionnés l'un par rapport à l'autre de telle manière qu'au moins une fente accessible (23) soit prévue entre eux, la position du premier et du deuxième module supérieur (3, 4) étant ajustable par rapport à la plaque de fond (2) de sorte que ladite au moins une fente accessible (23) est ajustable.

2. Élément de plancher selon la revendication 1, **caractérisé en ce que** la surface de plaque supérieure (5) de la plaque de fond (2) et une surface de module inférieure (12, 18) dudit au moins un du premier (3) et du deuxième (4) module supérieur en forme de plaque sont pourvues de moyens de positionnement coopérants (24, 25) avec une forme complémentaire.

3. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ladite au moins une fente (23) s'étend dans la direction longitudinale ou transversale de l'élément de plancher, ou à un quelconque angle par rapport à la direction longitudinale de l'élément de plancher.

4. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de plancher comprend en outre un cache pour couvrir ladite au moins une fente.

5. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de plancher comprend au moins une couche supérieure additionnelle appliquée au-dessus de la première couche supérieure, dans lequel chacune desdites au moins une couche supérieure additionnelle comprend au moins un module supérieur additionnel sensiblement en forme de plaque, qui est appliqué au-dessus d'une surface de module supérieure d'un module supérieur en forme de plaque positionné en dessous et y est relié.

6. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de plancher, comprend une plaque de finition (26) qui est appliquée au-dessus d'une surface

supérieure d'un module supérieur en forme de plaque positionné en dessous et y reliée, et qui est prévue pour former une couche de finition supérieure de l'élément de plancher.

7. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la plaque de fond comprend une pluralité de canaux creux (28) qui s'étendent dans la direction longitudinale de l'élément de plancher.

8. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le premier matériau de béton comprend des moyens de renforcement (29).

9. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la plaque de fond (2) est réalisée en béton précontraint.

10. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** la plaque de fond (2) comprend des premiers éléments de conduit qui sont incorporés dans le premier matériau de béton.

11. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque sont réalisés dans un matériau choisi parmi un matériau composite, un matériau en plastique renforcés par des fibres, un béton, un béton renforcé, un béton renforcé par des fibres ou un mélange de deux ou plus de deux de ceux-ci.

12. Élément de plancher selon l'une quelconque des revendications 1-11, **caractérisé en ce que** lesdites au moins premier (3) et deuxième (4) module supérieur en forme de plaque sont réalisés dans un deuxième matériau de béton qui est le même que le premier matériau de béton de la plaque de fond ou est différent de celui-ci.

13. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque comprend au moins un canal creux.

14. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque comprend des éléments de renforcement.

15. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** ledit au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque comprend des deuxièmes éléments de conduit qui sont incorporés dans ledit au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque.

16. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'élément de plancher comprend au moins une fente de module (27) prévue dans au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque.

17. Élément de plancher selon la revendication 16, **caractérisé en ce que** ladite au moins une fente de module (27) s'étend dans la direction longitudinale ou transversale de l'élément de plancher ou à un quelconque angle par rapport à la direction longitudinale de l'élément de plancher.

18. Élément de plancher selon la revendication 16 ou 17, **caractérisé en ce que** l'élément de plancher comprend en outre un cache de module prévu pour couvrir ladite au moins une fente de module.

19. Élément de plancher selon l'une quelconque des revendications précédentes, **caractérisé en ce que** lesdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque sont reliés à la plaque de fond à l'aide de moyens de liaison choisis dans le groupe d'un adhésif ou d'une liaison mécanique ou d'une combinaison de ceux-ci.

20. Procédé de fabrication d'un élément de plancher selon l'une quelconque des revendications précédentes, dans lequel lors d'une première étape, une plaque de fond (2) est fabriquée pour fournir la couche de fond de l'élément de plancher, dans lequel lors d'une deuxième étape, le premier module supérieur (3) en forme de plaque est fabriqué, lequel est appliqué au-dessus de la plaque de fond (2) et est relié à celle-ci, dans lequel lors d'une troisième étape, le deuxième module supérieur (4) en forme de plaque est fabriqué, lequel est appliqué au-dessus de la plaque de fond et est relié à celle-ci, dans lequel le premier (3) et le deuxième (4) module supérieur en forme de plaque forment la première couche supérieure de l'élément de plancher, **caractérisé en ce que** le premier (3) et le deuxième (4) module supérieur en forme de plaque sont positionnés sur la plaque de fond (2) de telle manière que ladite au moins une fente accessible (23) soit prévue entre eux.

21. Procédé selon la revendication 20, **caractérisé en ce qu'**une ou plusieurs couches supérieures additionnelles sont appliquées au-dessus de la première

couche supérieure.

22. Procédé selon la revendication 20-21, **caractérisé en ce qu'**une plaque de finition (26) est appliquée pour former une couche de finition supérieure de l'élément de plancher.

23. Procédé selon la revendication 20 - 22, **caractérisé en ce qu'**au moins un desdits au moins premier (3) et deuxième (4) module supérieur en forme de plaque est relié à la plaque de fond (2) par des moyens de liaison choisis dans le groupe composé d'un adhésif ou d'un moyen de liaison mécanique ou d'une combinaison de ceux-ci.

24. Plancher comprenant au moins un élément de plancher selon l'une quelconque des revendications 1 - 19 ou au moins un élément de plancher obtenu avec un procédé selon l'une quelconque des revendications 20 - 23.

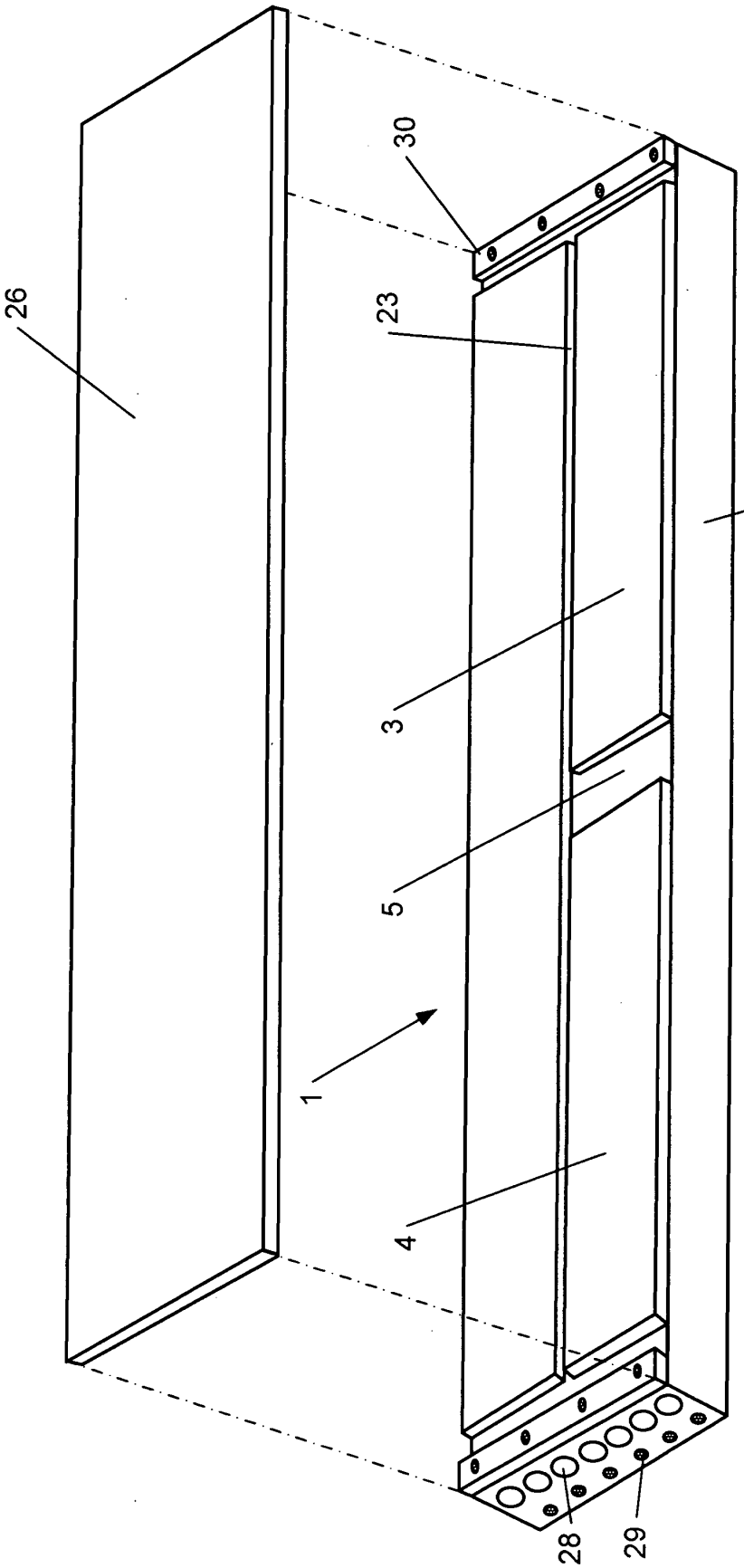


Fig. 1

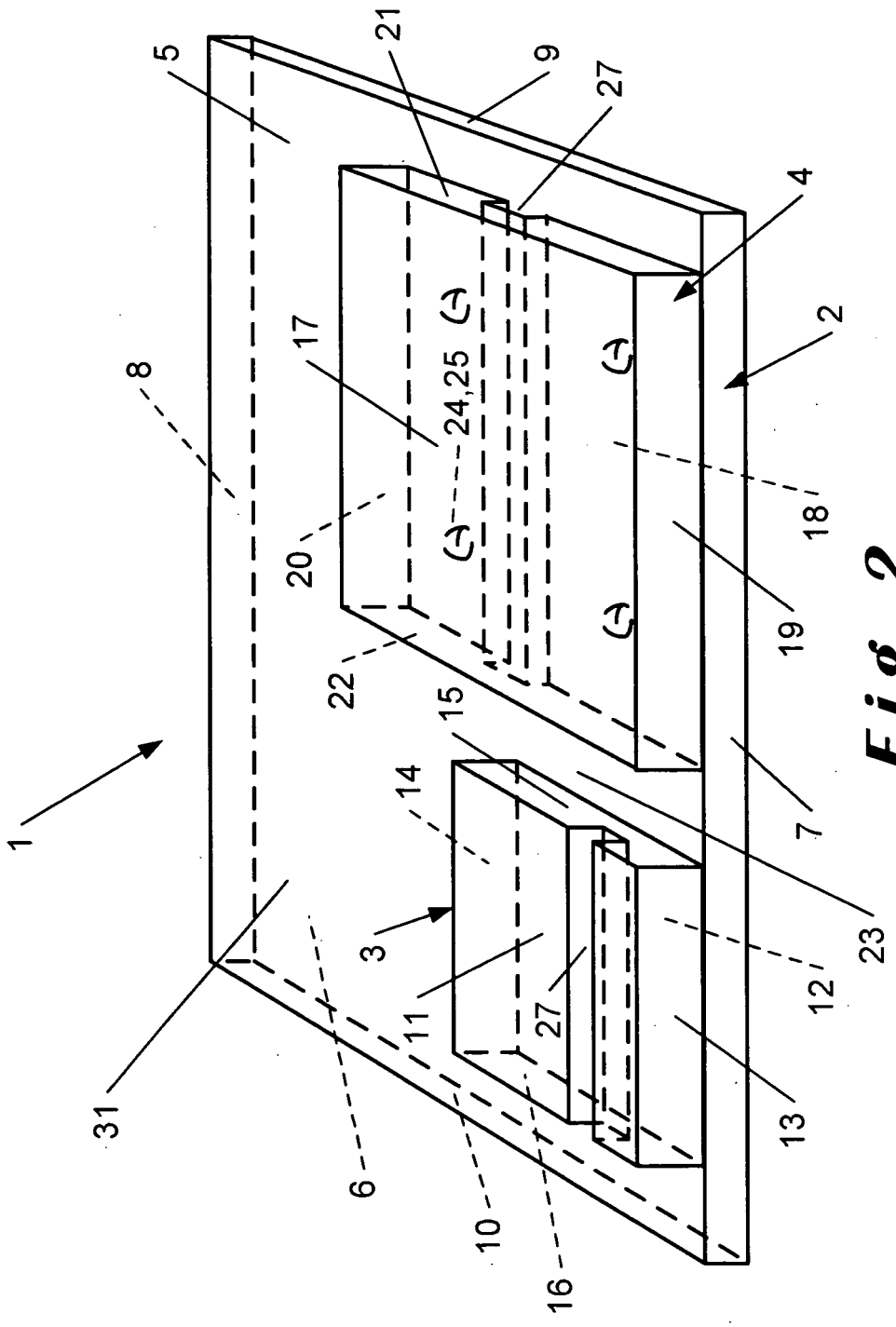


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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