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(54) **CONCRETE SLAB WITH DRAINAGE HOLES**

(57) A prefab concrete slab (1) comprising:
a concrete slab having an upper surface and a lower surface;
a plurality of inserts (5) defining holes extending from an upper surface to a lower surface of the concrete slab;
wherein the inserts have a conical shape with the holes defined thereby having an increasing cross-sectional area from the upper surface towards the bottom surface of the tile.

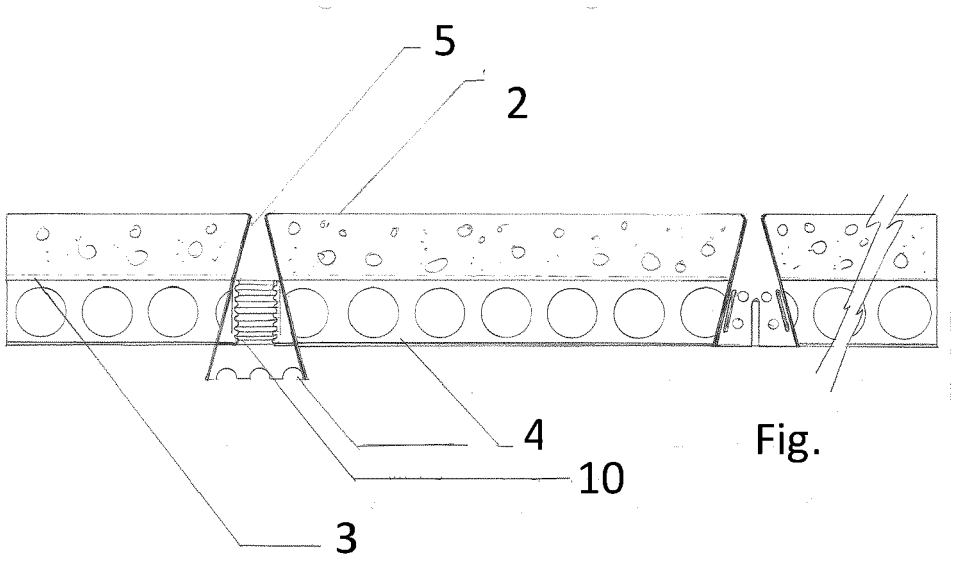

Fig.

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Description

Field of the Invention

[0001] The present invention concerns a prefab concrete tile having drainage holes, in particular a concrete tile including a plurality of inserts defining the drainage holes extending from an upper surface of the tile to a lower surface of the tile.

Background to the Invention

[0002] Concrete pads are very durable and used in a variety of applications such as walkways, driveways, parking's and the like. In general, concrete surfaces are formed by preparing a surface on which concrete is to be poured and subsequently constructing a casing about the periphery of the concrete slab to be laid. It is known to provide such concrete pads with means to allow water drainage. In for example US6585449, a grid of cones is provided in the casing prior of pouring the concrete.

[0003] Apart from the *in-situ* pouring of concrete, concrete pads can also be realized by laying concrete tiles. This offers the advantage that the concrete can be poured in a controlled environment of a production site and that the concrete surfaces can be finished (or smoothened) to a higher extend than is possible with *in-situ* poured concrete. Moreover, such tiles can easy be removed and re-used.

[0004] When using tiles to create a concrete surface or pad, drainage remains an important property, especially for vast surfaces or for surfaces where no separate water discharge means such as gutters are provided.

[0005] This water discharge needs to be efficient and low in maintenance. In eg. US2005/0224690, a tile with a grid of water discharge inserts embedded therein is disclosed, with the inserts having a fixed cross-section over the entire thickness of the tiles. Such design of the inserts however requires a lot of cleaning work earth, sand and small waste particles tend to accumulate in the holes, these particles may function as a filter that eventually gets blocked when too much waste or clusters of water impermeable materials form, or which particles subsequently can be washed out of the holes and litter the concrete surface due to impinging rain. In both cases cleaning of the concrete surface and/or holes is necessary after each rain shower.

[0006] It is clear from the above that a market need exists for concrete tiles having an efficient and low maintenance water drainage capacity.

Summary of the Invention

[0007] The present invention is defined in the appended independent claims. Preferred embodiments are defined in the dependent claims. In particular, the present invention concerns a prefab concrete tile comprising:

- a concrete slab having an upper surface and a lower surface;
- a plurality of inserts defining holes extending from an upper surface to a lower surface of the concrete slab;

wherein the inserts have a conical shape with the holes defined thereby having an increasing cross-sectional area from the upper surface towards the bottom surface of the tile.

[0008] In a first preferred embodiment, the inserts protrude from the lower surface of the concrete slab, wherein the section of the inserts protruding from the lower surface of the concrete slab may be perforated or comprise a water discharge opening in their wall part.

[0009] The prefab concrete tile according to any of the preceding claims, wherein the inserts are connected to one another by a grid.

[0010] Said grid may partially protrude from the bottom surface to the concrete slab.

[0011] The prefab concrete tile according to any of the preceding claims, comprising a height adjustment means. These height adjustment means are preferably provided in the holes defined by three or more of the inserts in the tile. More preferably, each height adjustment means comprises an actuation point to allow adjusting the height of the particular height adjustment means, which actuation point is accessible by inserting a tool in the concerned hole.

Brief description of the Figures

[0012]

Fig. 1 shows a perspective view of a prefab concrete tile according to a first aspect the present invention;
Fig. 2 shows a cross-section of a prefab concrete tile according to line II-II in Fig. 1 ;
Fig. 3 shows a top view of a grid and inserts of a prefab concrete tile prior to pouring concrete;
Fig. 4 shows a side view of the grid and inserts of Fig. 3;
Fig. 5a & 5b show two embodiments of an insert of a prefab concrete tile according to the present invention;
Fig. 6 shows an exploded view of the grid of a prefab concrete tile according to a second aspect of the present invention.

Detailed Description of the Invention

[0013] In general, the present invention relates to a concrete tile, poured and dried prior to laying the tile on a desired place to form a concrete access surface. Fig. 1 schematically illustrates a prefab concrete tile according to a first aspect of the present invention, the tile comprising a concrete slab having an upper surface configured to form an access surface for pedestrians and/or

traffic, and a lower surface opposed to the upper surface.

[0014] Embedded in the concrete slab and as shown in Fig. 2 is a plurality of inserts defining holes, in particular cones extending from the upper surface to the lower surface of the slab. According to the invention the cones are oriented such that their cross-sectional area increases from the upper surface of the tile towards the bottom lower surface of the tile. This however does not exclude that the upper surface of the tile can be chamfered at the interface of the concrete and an upper edge of each insert, thereby creating a through hole through the tile with a double conical structure, in particular a small cone with diminishing cross sectional area extending from the upper surface of the tile to several millimeters (1 to 10 mm) below the upper surface and a larger cone defined by the inserts. The inserts can also be made as double conical structures with a sidewall defining a small cone with diminishing cross sectional area on top of a larger cone with increasing cross sectional area such that the inserts extend from the upper surface of the tile to below the lower surface of the tile.

[0015] The inserts preferably protrude from the lower surface of the concrete slab to form a support for the tile. The protruding part of the inserts may be embedded in a surface whereon the tiles are laid or can actually support the tile, leaving a space between the lower surface of the concrete slab of each tile and the ground there below, which space can function as a water buffer. In this case, the protruding insert part preferably has a perforated wall or a wall part with a non-continuous lower rim such as to allow a waterflow out of the insert under the concrete slab into the water buffer.

[0016] As shown in Figures 3 & 4, the inserts are preferably arranged and connected to one another in a grid structure, with grid members extending between neighboring inserts. Such grid structure is beneficial in immobilizing the inserts in a casing when pouring concrete to produce the concrete tile and may act as a concrete reinforcing. The grid members can be configured as battens and may protrude from the lower surface of the concrete slab in a finished concrete tile of the present invention. As illustrated in Fig. 5a & 5b, the inserts may comprise longitudinally oriented slits, such that the inserts can be slid over the grid structure, preferably at an intersection of the grid such as to fix the inserts in place on the grid.

[0017] The inserts are preferably manufactured in a polymeric material selected from the group comprising: preferably polyethylene, polyester or polyethylene terephthalate or polyethylene naphthalene, polyoxymethylene and or admixtures thereof.

[0018] In a tile according to the present invention, all inserts are oriented in the same way, meaning that all inserts define an conical through hole through the tile whereby the cone is oriented such that the cross-sectional area increases from the upper surface of the tile towards the bottom lower surface of the tile.

[0019] The wall of the inserts at the upper surface of the concrete slab (or in case of a chamfer at the interface of the concrete and an upper edge of each insert) hereby defines the smallest cross-section of the cones and is preferably comprised between 0,10 and 3,5 cm^2, whereas the cross-section at the bottom of the insert, which is the largest cross-section of the cone is comprised between 1,5 and 55 cm^2. Due to the conical structure of the inserts, the inserts can be filled with a water impermeable filler material such as a mixture of stones of different dimensions to create a kind of water filter, without the risk that the filler material or stones, sand, earth, or accumulated litter splashes from the holes to the upper surface of the concrete tile under influence of impinging water droplets. A concrete tile according to the present invention preferably comprises between 20 and 400 inserts per m^2.

[0020] The openings by perforation of the wall of the inserts or the openings created therein by the non-continuous lower rim are preferably dimensioned small enough to prevent the filler material from migrating through these openings, yet these openings are dimensioned large enough to prevent easy clogging. To this end, the openings may be designed with a non-circular edge, eg. a square, oval or irregular shape.

[0021] The present invention also concerns a prefab concrete tile comprising:

- a concrete slab having an upper surface and a lower surface;
- a plurality of inserts defining holes extending from an upper surface to a lower surface of the concrete slab;

height adjustment means configured to be adjustably connected to said inserts wherein the height adjustment means can be shifted in a longitudinal direction of the inserts and thereby adjust the extend wherein the height adjustment pieces protrude from the inserts at a bottom of the tile.

[0022] As not all surfaces on which a concrete surface is to be laid are perfectly flush, it is desirable to provide concrete tiles with a height- or level adjustment means.

[0023] In this aspect of the invention, the inserts can have any kind of cross-sectional design, and can be configured as for example a conical shape or a straight tube.

[0024] The wall of the inserts at the upper surface of the concrete slab is preferably comprised between 0,10 and 3,5 cm^2. And a concrete tile according to this aspect of the invention preferably comprises between 20 and 400 inserts per m^2.

[0025] According to this aspect of the invention, height adjustment means are provided in at least three inserts of a tile, each positioned such as to form a triangle enclosing a maximal surface area of the tile. Clearly, depending on the dimensions and weight of the tile, more height adjustment means per tile can be provided.

[0026] The adjustment means preferably comprise on the one hand a first piece that is fixed to the grid and on

the other hand, a base piece that engages with the first piece and is movable in view of that first piece.

[0027] The first piece can for example be configured as a hollow ring or circular tube comprising an inner thread, whereas the base piece is in that case configured as a rod with an outer thread engaging the inner thread of the hollow ring or tube, such that by rotating the base piece, this base piece shifts in a longitudinal direction of the holes (normal to the surface of the concrete tile). The first piece is preferably fixed to the inserts or to the grid structure connecting a plurality of inserts. The connection can be achieved by providing the first piece at one or more intersections of the grid as shown in Fig. 6 whereafter the inserts as shown in Fig. 5a or 5b can be slid over the grid such that the first piece is located inside the insert.

[0028] The first piece and the base piece are preferably positioned along the central axis of the holes, whereby the base piece comprises an actuation point such as a screwhead allowing rotating the base piece in the first piece of the height adjustment means by inserting a screwdriver in the concerned hole and thereby allowing adjusting the position of the base piece versus the first piece and hence the concrete slab of the tile.

[0029] The base piece in this case comprises an end portion that defines the actual support of the tile. By adjusting the position of the base piece versus the first piece, the distance of the tile to an underfloor can be adjusted while the tile remains in place in the horizontal direction.

[0030] Clearly, to prevent rotation of the base piece in view of a lower surface, the height adjustment means may comprise a first piece that is connected to the inserts by and intermediate bush ring, such that the first piece is locked in position versus the insert but can freely rotate in view of the insert. In this case, actuation of the height adjustment means can be performed by rotating on the first piece to obtain a vertical movement of the base piece in view of the inserts. In such embodiment, the end portion of the base piece defining the actual support of the concrete tile may comprise a roughened surface or a kind of protruding pins preventing the base piece from rotating in view of the underfloor. In such embodiment, the first piece may be configured as a tube with a closed upper end that where the actuation point can be provided. The screw thread of the first piece is as such protected from direct impact from optional stones, sand, or litter present in the insert.

[0031] Alternatively, the first piece of the height adjustment means can be provided on the grid structure outside of the inserts, whereby the first piece is formed integrally with the battens or provided on the battens by welding, an adhesive or by a mechanical coupling such as a clip connection. The base piece can be a foot structure provided on a threaded bolt with a screw thread configured to cooperate with the screw thread in the first piece.

1 Prefab concrete tile
2 upper surface
3 lower surface
4 grid
5 inserts
6 small cone
7 large cone
8 longitudinal slits
9 perforations/non-continuous lower rim
10 height adjustment means
11 base piece
12 first piece

Claims

1. A prefab concrete tile comprising:

   • a concrete slab having an upper surface and a lower surface;
   • a plurality of inserts defining holes extending from an upper surface to a lower surface of the concrete slab;

   wherein the inserts have a conical shape with the holes defined thereby having an increasing cross-sectional area from the upper surface towards the bottom surface of the tile.

2. The prefab concrete tile according to claim 1, wherein the inserts protrude from the lower surface of the concrete slab.

3. The prefab concrete tile according to claim 2, wherein the section of the inserts protruding from the lower surface of the concrete slab are perforated.

4. The prefab concrete tile according to any of the preceding claims, wherein the inserts are connected to one another by a grid.

5. The prefab concrete tile according to claim 4, wherein said grid partially protrudes from the bottom surface to the concrete slab.

6. The prefab concrete tile according to any of the preceding claims, comprising a height adjustment means.

7. The prefab concrete tile according to claim 6, wherein the height adjustment means are provided in the holes defined by three or more of the inserts in the tile.

8. The prefab concrete tile according to claim 7, each height adjustment means comprising an actuation point to allow adjusting the height of the particular height adjustment means, which actuation point is accessible by inserting a tool in the concerned hole.

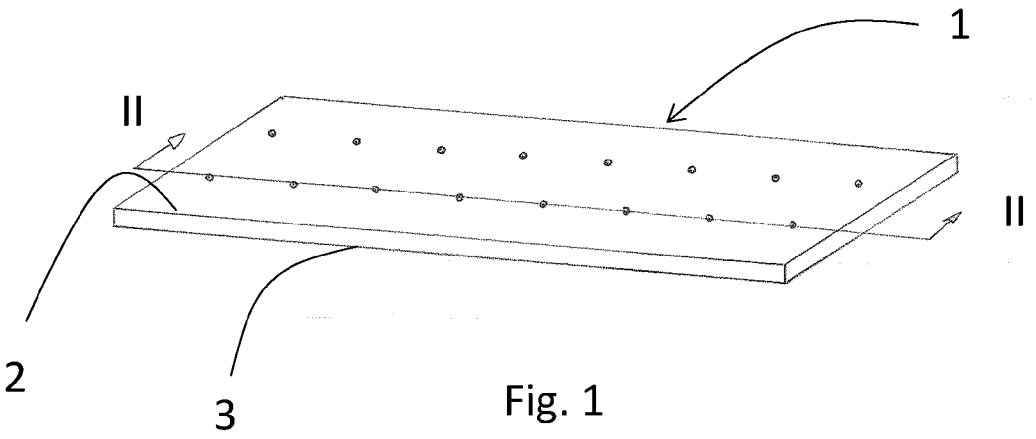

Fig. 1

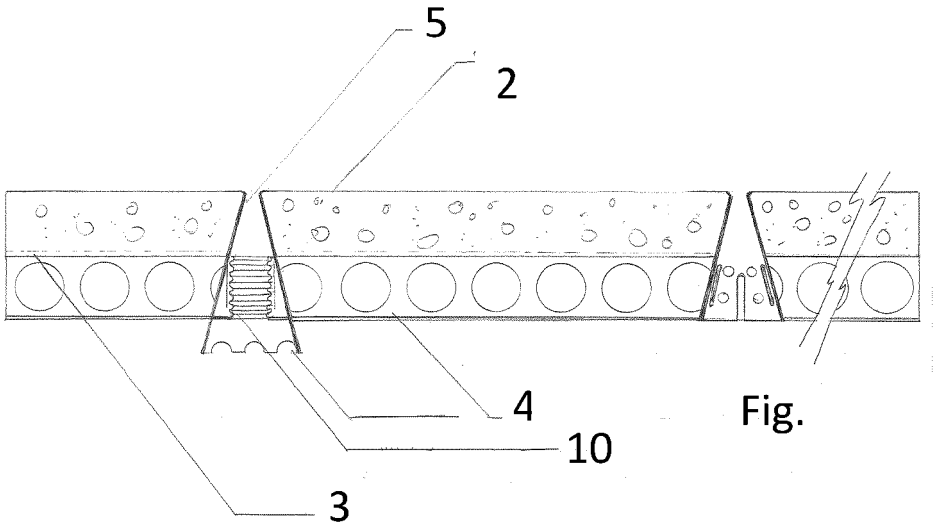

Fig.

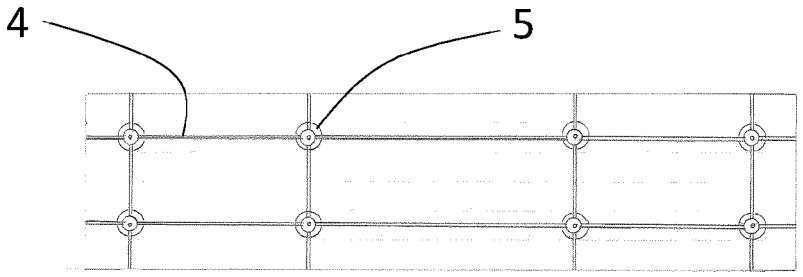

Fig. 3

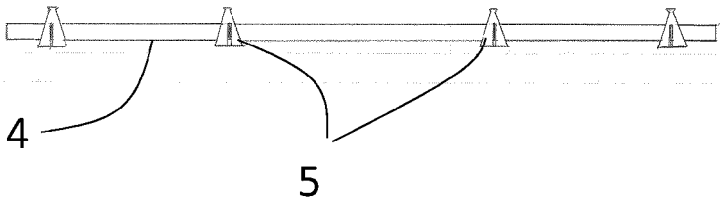

Fig. 4

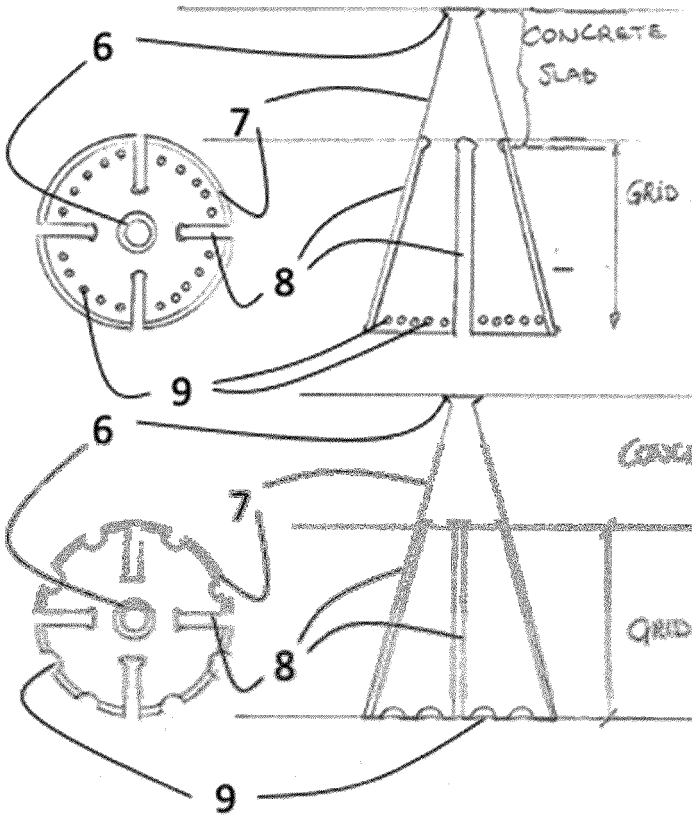

Fig. 5a

Fig. 5b

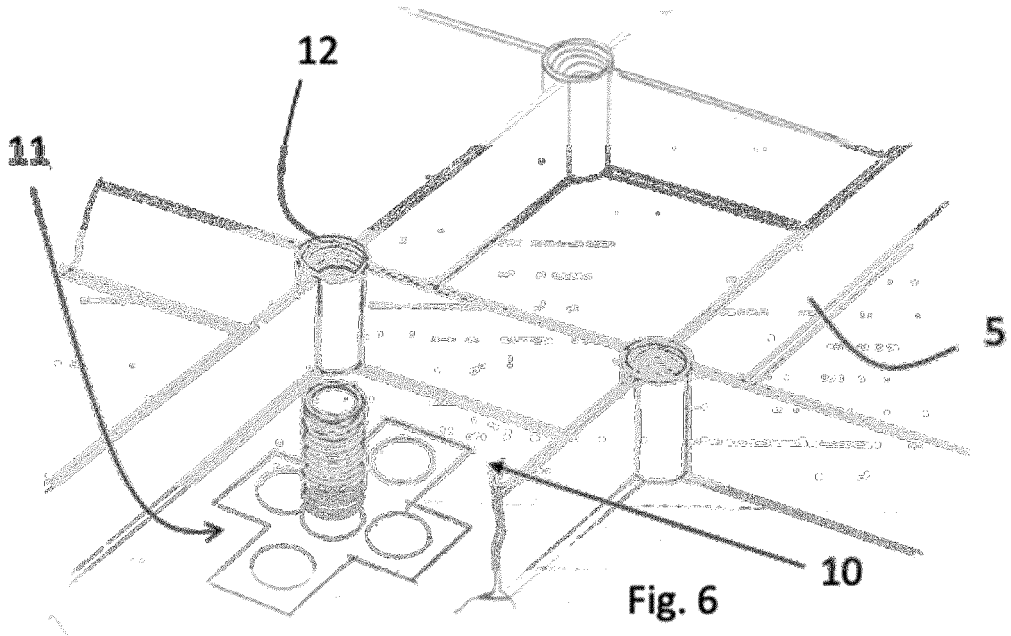

Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 22 15 5696

DOCUMENTS CONSIDERED TO BE RELEVANT

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Y	* paragraphs [0001], [0005] - [0007],	6	E01C5/08
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 July 2022	Kremsler, Stefan

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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