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(54) **FLOOR PLATE PROVIDED WITH A DOVETAIL PLATE**

(57) A floor plate 1 comprises a slab 3 provided with a top side 3a and a bottom side 3b having on the top side a plurality of parallel and spaced-apart channels 5 open at the top and having a dovetail-shaped cross-section, and on the bottom side of the slab further channels 7 present between these channels which further channels are open at the bottom and also have a dovetail-shaped cross-section. On the top side of the slab in the channels

5, climate pipes 17 and 19 are present for heating and / or cooling purposes. By integrating these pipes with the slab instead of installing them on the floor plate, a reduction of the thickness of the floor is achieved when using the floor plate in a building. On the bottom side of the slab there is sound-insulating material 11 in the further channels 7.

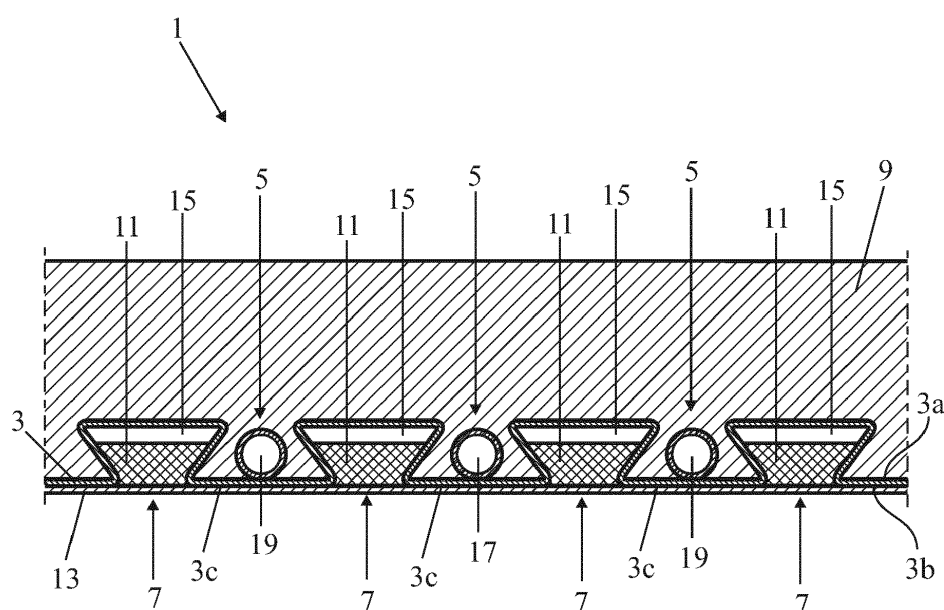


FIG. 2

Description

Technical field of the invention

[0001] The invention relates to a floor plate comprising a slab provided with a top side and a bottom side having in the top side a plurality of parallel spaced-apart channels open at the top and having a dovetail-shaped cross-section, where at the bottom side of the slab between these channels, further channels are formed which are open at the bottom and also have a dovetail-shaped cross-section.

Background of the invention

[0002] Such a floor plate is generally known. With the known floor plate a concrete layer is present on the top side of the slab and in the channels. The slab (dovetail slab) is usually made of steel and forms the reinforcement of the floor plate. The special shape of the dovetail profile provides the necessary sturdiness of the concrete. During the production process, the concrete flows into the specially formed channels, so that no movement is possible after drying any more. Insulation material, for example mineral wool, is often placed against the bottom side of this known floor plate in order to improve the acoustics of the floor. Furthermore, heating pipes for underfloor heating are often installed on the floor plate at a later stage of the construction process, after which a concrete finishing layer is applied. The disadvantage of the use of this known floor plate is that in the end the floor is relatively thick.

Summary of the invention

[0003] An object of the invention is to provide a floor plate of the type described in the preamble which, when used, requires less space and has at least the same or better properties than the known floor plate. To this end, the floor plate according to the invention is characterized in that in the channels climate pipes for heating and / or cooling purposes are present on the top side of the slab. By integrating the pipes with the slab in lieu of installing them on top of the floor plate, a reduction of the thickness of the floor is achieved when using the floor plate in a building.

[0004] The floor plate according to the invention may be used for both new-build and renovation of existing buildings. In the case of new-build, the floor plate forms a separation between two storeys, where a concrete layer is present on the top side of the slab and in the channels, which concrete layer serves as the floor of the storey above. During renovation, the floor plate is placed on an existing separating plate between two storeys and acts as a new raised screed of the storey. A coating is then cast on the dovetail slab or plate material is applied to the dovetail slab. If so desired, utility lines may be applied to the existing concrete separating layer underneath the

dovetail slab of this screed.

[0005] Preferably, cooling pipes and heating pipes are alternately present in the successive adjacent channels. By installing the separate pipes for cooling and heating, the cooling and heating activities may be effected more efficiently, because the differing temperature requirements during the seasons can then be met.

[0006] An embodiment of the floor plate according to the invention is characterized in that a plurality of the climate pipes are filled with a substance (phase-change materials) that changes phase when heated to a few degrees above a desired temperature and when cooled down to a few degrees below a desired temperature, where as a result of the phase change heat is absorbed from the environment or heat is released to the environment, respectively. By storing and releasing the energy during the day-night cycle, considerable energy savings are achieved as well as a comfortable indoor climate.

[0007] A further embodiment of the floor plate according to the invention is characterized in that sound-insulating material is present in the further channels on the bottom side of the slab. By integrating the sound-insulating material with the slab, no additional space is needed and the thickness of the floor plate when used in a building is not increased. It should be noted that the use of sound-insulating material may also be applied to a floor plate where no climate pipes are present in the channels at the top.

[0008] For the bottom side of the floor plate to function directly as a ceiling, a sheet is preferably fitted to parts of the bottom side of the slab which are present between the further channels, which sheet extends over the open bottom sides of the further channels. The sheet then forms the screed and is for example glass fleece.

[0009] For further improving the acoustics of the floor plate, an embodiment of the floor plate according to the invention is characterized in that an empty space is present between the sound-insulating material and the top sides of the further channels. This empty space or cavity acts as a Helmholtz resonator and therefore has a sound-damping effect. A Helmholtz resonator is an acoustic resonator that consists of a volume of air that is connected to the outside air through an opening in a channel. If the opening is hit by a sound wave, there will be a variable overpressure at the entrance to the opening. The mass of the gas in the opening is moved to and fro under the influence of this overpressure and the volume of gas in the cavity will be compressed and expanded.

Brief description of the drawings

[0010] The invention will be further elucidated below on the basis of an example of embodiment of the floor plate according to the present invention represented in the drawings, in which:

Fig. 1 is a perspective view of an embodiment of the floor plate according to the invention; and

Fig. 2 is a cross-sectional view of the floor plate shown in Fig. 1.

Detailed description of the drawings

[0011] Figs. 1 and 2 show an embodiment of the floor plate according to the invention in a perspective and a cross-sectional view, respectively. The starting point for the manufacture of this floor plate 1 is a steel plate 3 which in a cross-sectional view consists of a plurality of successive adjacent dovetail shapes which form boundaries of channels 5 on the top side 3a of the slab and form boundaries of further channels 7 on the bottom side 3b of the slab. The slab is then placed with the bottom side 3b facing upwards, after which insulation material 11 is applied to the further channels, for example mineral wool flakes for sound insulation. The amount of insulation material is insufficient to fill the entire space in the further channels. Subsequently, a sheet 13, for example glass fleece, is placed (glued) against the parts 3c of the bottom 3b of the slab 3 which are present between the further channels 7 and which sheet closes the open side of the further channels 7. The slab is then turned around, with the insulation material 11 sinking against the sheet 13 and empty spaces 15 developing between the insulation material and the slab, as a result of which an additional sound-damping effect is obtained.

[0012] Subsequently, climate pipes 17 and 19 can be placed in the channels 5 which are open at the top, after which a layer of concrete 9 is placed on the top side 3a of the slab 3 and in the channels 5. For the sake of clarity, the layer of concrete 9 is indicated in dashed lines in Fig. 1. The climate pipes 17 and 19 may be pipes that can be used for heating as well as cooling or alternating cooling lines 17 and heating lines 19 may be provided. Also a plurality of the climate pipes may be filled with a so-called phase-change material, whereby energy is stored during the day-night cycle and released again and thus considerable energy savings are achieved and a comfortable indoor climate is obtained.

[0013] Although the present invention is elucidated above on the basis of the given drawings, it should be noted that this invention is not restricted whatsoever to the embodiment shown in the drawings. The invention also extends to any embodiments deviating from the embodiment shown in the drawings within the context defined by the claims.

Claims

1. Floor plate (1) comprising a slab (3) provided with a top side (3a) and a bottom side (3b) having in the top side a plurality of parallel spaced-apart channels open at the top (5) and having a dovetail-shaped cross section, where at the bottom side of the slab between these channels, further channels (7) are formed which are open at the bottom and also have

a dovetail-shaped cross-section, **characterized in that** in the channels climate pipes (17, 19) for heating and / or cooling purposes are present on the top side of the slab.

2. Floor plate as claimed in claim 1, **characterized in that** cooling pipes (17) and heating pipes (19) are alternately present in the successive adjacent channels (5).
3. Floor plate as claimed in claim 1 or 2, **characterized in that** a plurality of the climate pipes are filled with a substance that changes phase when heated to a few degrees above a desired temperature and when cooled down to a few degrees below a desired temperature, where as a result of the phase change heat is absorbed from the environment or heat is released to the environment, respectively.
4. Floor plate as claimed in claim 1, 2 or 3, **characterized in that** sound-insulating material (11) is present in the further channels (7) on the bottom side of the slab (3).
5. Floor plate as claimed in claim 4, **characterized in that** a sheet (13) is fitted to parts (3c) of the bottom side of the slab (3) which are present between the further channels, which sheet extends over the open bottom sides of the further channels (7).
6. Floor plate as claimed in claim 4 or 5, **characterized in that** an empty space (15) is present between the sound-insulating material (11) and the top sides of the further channels (7).
7. Floor plate as claimed in claim 4, 5 or 6, **characterized in that** a concrete layer (9) is present on the top side of the slab and in the channels.

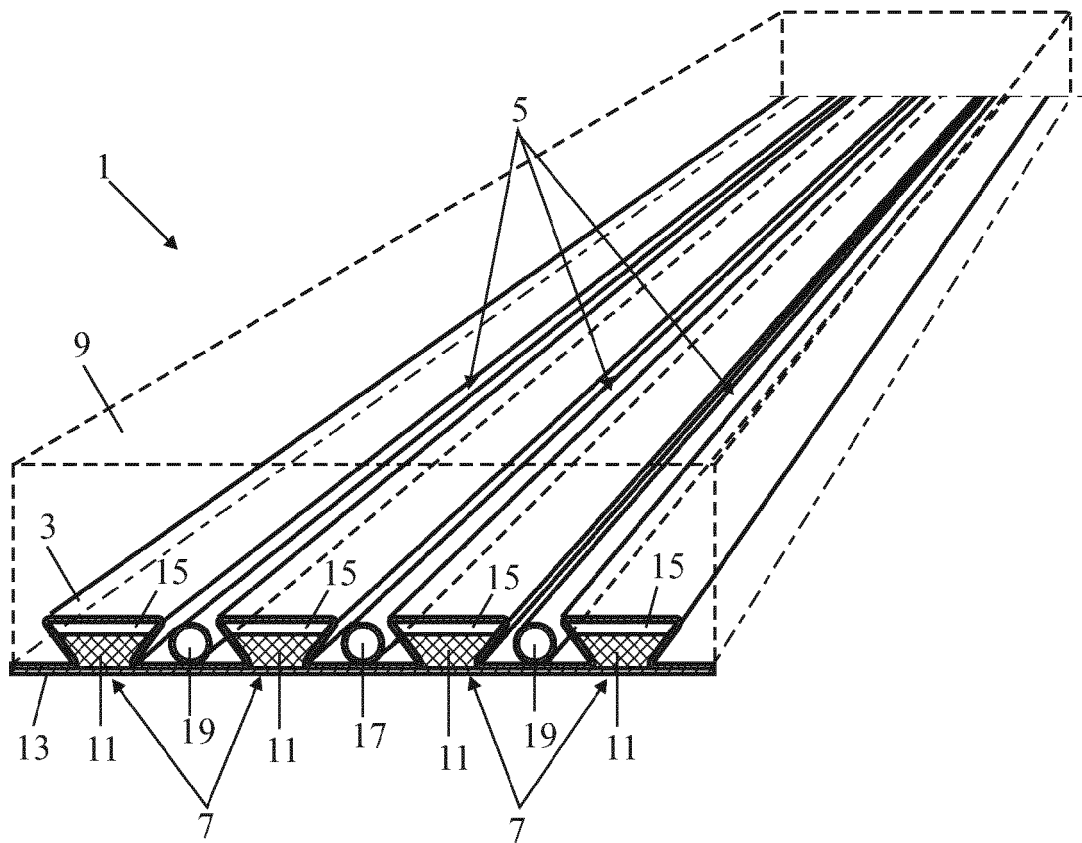


FIG. 1

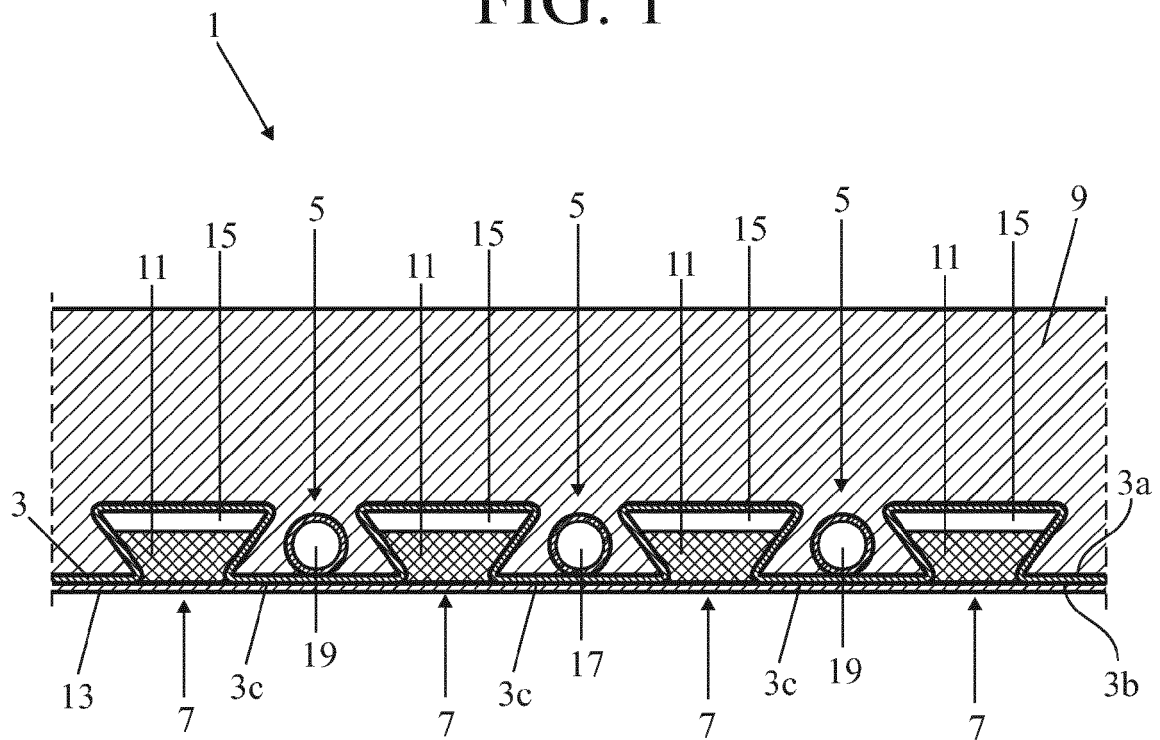


FIG. 2



EUROPEAN SEARCH REPORT

Application Number
EP 18 18 2149

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EPO FORM 1503 03.82 (P04C01)

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			TECHNICAL FIELDS SEARCHED (IPC)
			E04B E04C F24D F24F E04F
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 15 November 2018	Examiner Petrinja, Etjel
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82