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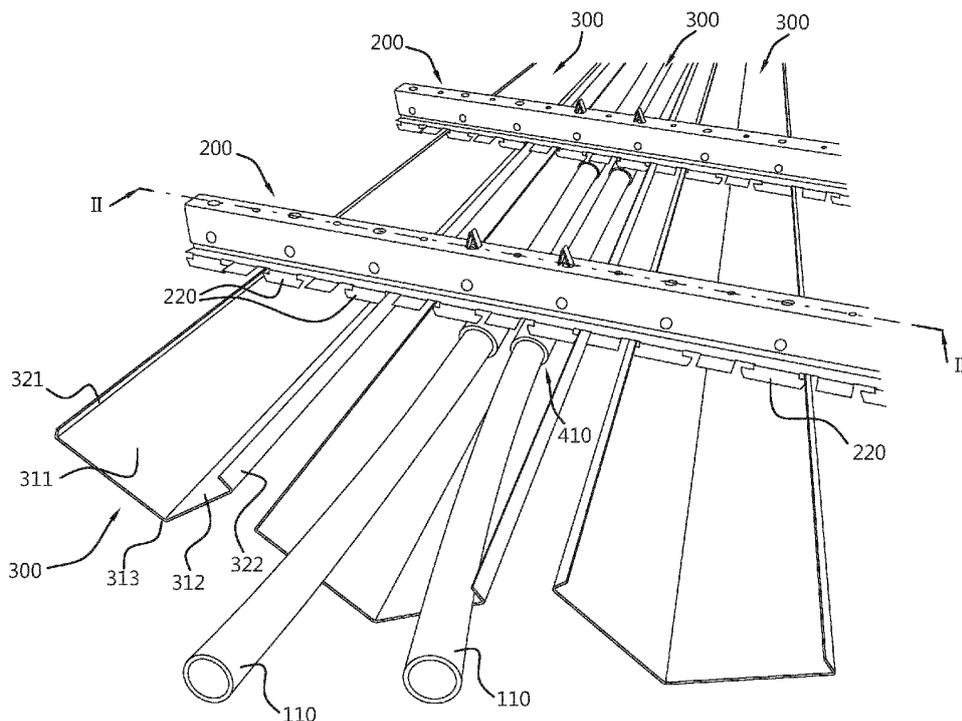
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(54) **IMPROVED CLIMATE CONTROLLING CEILING STRUCTURE**

(57) Ceiling structure for a space, comprising: a pipe system (100) with a plurality of pipe sections (110) extending substantially parallel to each other, which pipe system is configured to transport a fluid for the purpose of controlling the temperature in the space; a plurality of support profiles (200); and a plurality of ceiling profiles (300) which can be coupled at a mutual distance to the support profiles, wherein the ceiling profiles are oriented at an angle relative to the support profiles; wherein a

ceiling profile (300) is open at the top, as seen in a mounted position, for the purpose of receiving therein in each case one or more pipe sections (110) of the pipe system; wherein the ceiling profile has first and second opposite side walls (311, 312), wherein the distance (A) between the first and the second side wall at the position of the bottom is at least two times smaller than the width (B) of the ceiling profile as measured between the first and the second side wall at the position of the open upper side.

Fig. 1



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Description

Field of the invention

[0001] The present invention relates to a ceiling structure for a space, for instance a room in a building, and particularly a so-called climate-controlling ceiling structure in which a pipe system is received.

Background

[0002] Climate-controlling ceiling structures for forming a lowered ceiling are known. In known climate-controlling ceiling structures the lowered ceiling is generally formed by arranging plates on a support structure. These plates typically fit together well. The plates on the side of the lowered ceiling which is not visible are here provided with a pipe system through which a fluid is carried for the purpose of controlling the temperature in the space, i.e. in order to cool or heat the space.

[0003] A drawback of such known climate-controlling ceiling structures is that each plate of the ceiling structure is provided with its own pipe section which must be connected to a pipe section of an adjacent plate. Many connectors are necessary for this purpose, which increases the cost price and complexity of the connecting. Many connections by means of connectors moreover entail an increased risk of leaks occurring.

[0004] Many existing climate-controlling ceiling structures can further be improved in respect of their energy consumption. For the purpose of cooling a building the heat capacity of the building structure itself can be utilized. In this technique use is made of temperature differences occurring outside the building. It is generally warmer during the day than at night, whereby the heat which is stored in the building during the day can be released at night by applying so-called night ventilation, which consists of guiding the colder outside air through the building at night to cool the structure of the building. The building can thus have cooled sufficiently by morning to be gradually heated up again during the day. Since the heat capacity of the building is much greater than the heat capacity of air, the heating in a room of the building to be cooled will progress much more slowly during the day owing to the application of this technique of night ventilation, so that less energy is needed for cooling the space.

[0005] European patent EP 2 420 749 B1 in the name of applicant describes an improved ceiling structure which largely obviates the above stated problems.

Summary of the invention

[0006] Embodiments of the invention have the object of providing a ceiling structure whereby controlling of the temperature can be further improved in efficient manner.

[0007] A first aspect of the invention relates to a ceiling structure for a space, for instance a space of a building.

The ceiling structure comprises a pipe system, a plurality of support profiles and a plurality of ceiling profiles. The pipe system comprises a plurality of pipe sections extending substantially parallel to each other and is configured to transport a fluid, typically water, for the purpose of controlling the temperature in the space (heating and/or cooling). The plurality of ceiling profiles can be coupled at a mutual distance to the support profiles, wherein the ceiling profiles are oriented at an angle relative to the support profiles and are preferably oriented substantially transversely of the support profiles. A ceiling profile of the plurality of ceiling profiles is open at the top, as seen in a mounted position, for the purpose of receiving therein in each case one or more pipe sections of the pipe system. The ceiling profile has first and second opposite side walls, as seen in a mounted position. The distance between the first and the second side wall at the position of the bottom is at least two times smaller, preferably at least three times smaller, more preferably at least five times smaller than the width of the ceiling profile as measured between the first and the second side wall at the position of the open upper side.

[0008] Using such first and second side walls running toward each other in the direction of the bottom creates between two mutually adjacent ceiling profiles a funnel-shaped channel, for instance a channel with a substantially trapezoidal cross-section, through which air is guided upward or downward between the mutually adjacent ceiling elements. This will provide for a kind of Venturi effect in the funnel-shaped channel. The first and second side wall allow a good heat exchange between the heat absorbed in the fluid flowing through the pipe system and the environment. The ceiling profiles can here function in the manner of radiating bodies for the pipe sections received therein, wherein heat is exchanged with the air and the air is fed back into the space under the lowered ceiling by convection. Compared to existing systems, such a technique for controlling the temperature in a space provides additional comfort to the users of the space.

[0009] In some embodiments the air can circulate freely above the lowered ceiling, wherein no insulation is arranged, or insulation is arranged only at determined positions, above the lowered ceiling. The space to be cooled and/or heated is then delimited by the structure of the building and not by the ceiling structure. The air can move freely between the space under the open lowered ceiling and the space above the open lowered ceiling. In this way the air of the space to be cooled and/or heated comes into contact with the structure of the building in improved manner, and the heat capacity of the building structure itself can thus be utilized. The ceiling profiles can further take a simple form, wherein the pipes of the climate-controlling system are received in the ceiling profiles so that the pipes are thus concealed from view.

[0010] The first and/or the second side wall preferably runs obliquely upward from a bottom at an angle of less than 70° relative to a horizontal plane, preferably less

than 60°, still more preferably less than 50°. This angle is preferably greater than 30°. In this way an air channel between mutually adjacent ceiling profiles, which becomes wider toward the bottom of the ceiling profiles, can be obtained in simple manner, with simple ceiling profiles. In embodiments where the width of a ceiling profile is relatively small, it is however also possible to work with an angle of around 70° or even greater than 70°, see also the embodiments of figure 9 which will be discussed hereinbelow.

[0011] In a preferred embodiment the ceiling profile is substantially symmetrical. Both the first and the second side wall then preferably run obliquely upward from the bottom at an angle of less than 70° relative to a horizontal plane, preferably less than 60°, still more preferably less than 50°. This angle is preferably greater than 30°. By using symmetrical ceiling profiles a uniformly distributed air flow can be obtained in the space.

[0012] In a preferred embodiment the ceiling profile has a substantially V-shaped cross-section, wherein the first and second side wall correspond with the legs of the V-shaped ceiling profile and wherein the bottom corresponds with the lower edge of the V-shaped ceiling profile. In such an embodiment the first and second side wall thus converge at the lower edge. Such profiles can be realized in very simple manner and can have a limited width, such that the formed lowered ceiling can be sufficiently open.

[0013] The first side wall preferably forms an angle with the second side wall of between 80° and 110°, more preferably between 85° and 100°. In this way sufficient space can be provided between the first and second side wall to arrange one or more pipe sections. The pipe sections can for instance have a diameter of between 10 and 20 mm.

[0014] The minimum distance between two mutually adjacent ceiling profiles is preferably greater than 10% of the width of a ceiling profile, more preferably greater than 20% of the width. The width is the width measured in a horizontal plane, in the mounted state of a ceiling profile, and typically corresponds with the maximum distance between the first and the second side wall. In some embodiments the minimum distance can even be greater than 40%, 50% or 60% of the width. In this way a sufficiently open lowered ceiling can be obtained.

[0015] The maximum distance between two mutually adjacent ceiling profiles is preferably greater than 80% of the width of a ceiling profile, more preferably greater than 90% of the width, and most preferably greater than the width. When the ceiling profile is V-shaped, the maximum distance will be equal to the width plus the minimum distance between two mutually adjacent ceiling profiles. The air channel between two mutually adjacent ceiling profiles then gradually becomes narrower, wherein the air channel extends over a maximum distance D_{max} at the bottom and over a minimum distance D_{min} at the upper side of the ceiling profiles.

[0016] The width B of the ceiling profile preferably lies

between 30 mm and 110 mm, more preferably between 40 mm and 100 mm, most preferably between 60 mm and 100 mm, and for instance between 70 mm and 90 mm. By limiting the width of the ceiling profiles and providing sufficient distance between adjacent ceiling profiles a sufficiently open ceiling can be obtained.

[0017] The ceiling profile preferably has a height H , as seen in a vertical direction, of between 20 mm and 60 mm, more preferably between 30 mm and 50 mm. Such heights allow for camouflaging of one or more pipe sections on the one hand and a part of the one or more carrier elements for carrying the one or more pipe sections on the other. Such heights additionally guarantee a sufficiently large radiation surface surrounding the one or more pipe sections. The one or more pipe sections are preferably mounted in the ceiling profiles such that they make contact with the ceiling profiles.

[0018] The height H is preferably greater than one third of the width B , i.e. $H > B/3$. In this way the air channel will extend over a sufficiently great height and the air channels are repeated a sufficient number of times.

[0019] The ceiling profiles are preferably manufactured from a material with good thermal conductivity, more preferably from metal, for instance from steel, copper, aluminium and the like.

[0020] In an advantageous embodiment the support profiles are provided with a pipe carrying structure for carrying the pipe system. The pipe carrying structure preferably comprises a plurality of carrier elements which can be coupled to the support profiles. Such carrier elements are provided with a receiving part, such as a clamping bracket or a hook in which a pipe section can be suspended. In this way the pipe sections of the pipe system can be coupled to the support profiles in simple manner, after which the ceiling profiles can be arranged over the pipe sections and can be coupled to the support profiles.

[0021] The support profiles are preferably configured for direct coupling to the ceiling profiles. For this purpose the ceiling profile can be provided at the top with a first and second coupling flange which delimit an opening through which one or more pipe sections can be received in the ceiling profile. This first and second coupling flange connect to respectively the first and second side wall. The support profiles can then be provided with downward protruding wings which are configured to co-act with the first and second coupling flanges. The wings can for instance be dovetail-shaped, such that the first and second coupling flanges can engage behind protruding parts of the dovetails.

[0022] According to a possible embodiment, the first and/or second side wall can be provided with a plurality of perforations which are arranged distributed over the surface. This can improve the acoustic properties of the ceiling structure.

[0023] Sound-insulating material can optionally be provided above a number of ceiling profiles. This can improve the acoustics of the space further. This sound-in-

ulating material is preferably arranged in a manner such that a convective flow between the ceiling profiles can take place unimpeded and such that the air above the ceiling profiles can be flushed.

[0024] According to an advantageous embodiment, the pipe system comprises a continuous pipe which is arranged in looping manner, such that a plurality of mutually partially overlapping loops is formed. Such loops can extend from one side of a space to another side of the space, and comprise straight sections lying in the ceiling profiles and arched sections close to the side walls of the space. The pipe sections of the pipe system are preferably sufficiently flexible to enable a continuous pipe to be placed in looping manner. In such a configuration two mutually adjacent pipe sections, which are for instance accommodated in mutually adjacent ceiling profiles or in the same ceiling profile, will typically belong to different loops of the plurality of loops. The advantage of arranging a continuous pipe in looping manner is that the number of connectors can be limited. The placing can also take place in simple manner. After mounting of the support profiles the pipe system can be provided by arranging one continuous pipe or a small number of continuous pipes in looping manner against the support profiles, and such that pipe sections of the loops extend substantially parallel to each other. After this, the ceiling profiles can be arranged over the pipe sections, wherein the ceiling profiles are coupled to the support profiles.

Brief description of the figures

[0025] The above stated and other advantageous features and objects of the invention will become more apparent, and the invention better understood, on the basis of the following detailed description when read in combination with the accompanying drawings, in which:

Figure 1 illustrates a perspective view of an embodiment of a ceiling structure according to the invention; Figure 2 shows a schematic cross-section along the line II-II of the embodiment of Figure 1; Figure 3 shows a perspective detail view of an embodiment of a carrier element in which two pipe sections are received; Figure 4 shows a schematic bottom view of an embodiment of a ceiling structure with a pipe system comprising a plurality of loops; Figures 5, 6, 7 and 8 show cross-sections of a number of other possible embodiments of a ceiling structure according to the invention; and Figure 9 shows a schematic cross-section of yet another embodiment of a ceiling structure according to the invention.

Detailed embodiments

[0026] A first embodiment of the ceiling structure according to the invention is illustrated in figures 1-3. The

ceiling structure is intended for forming a lowered ceiling in a space. The ceiling structure comprises a pipe system 100, a plurality of support profiles 200 and a plurality of ceiling profiles 300. Pipe system 100 is attached to support profiles 200 via a pipe carrying system 400. According to another variant (not illustrated) it is however also possible to provide pipe carrying structure 400 separately of support profiles 200. Pipe system 100 has a plurality of pipe sections 110 extending substantially parallel to each other. Pipe system 100 is configured to transport a fluid, typically water, for the purpose of controlling the temperature in the space. Pipe system 100 can be used to heat and/or to cool the space. The plurality of ceiling profiles are coupled at a mutual distance to the support profiles 200. Ceiling profiles 300 are oriented transversely of support profiles 200.

[0027] Ceiling profile 300 is open at the top for the purpose of receiving therein two parallel pipe sections 110. In the illustrated example there are two pipe sections 110, although the skilled person will appreciate that ceiling profiles 300 can also be configured to receive one pipe section 110 or to receive more than two pipe sections 110. Ceiling profile 300 has a first side wall 311 and an opposite second side wall 312 which extend from the bottom, here a lower edge 313, to the open upper side. In the illustrated embodiment the distance A between first side wall 311 and second side wall 312 is equal to 0 at the position of lower edge 313, and so smaller than the width B of ceiling profile 300. The width B is measured at the position of the open upper side and corresponds here to the maximum distance between first side wall 311 and second side wall 312. In this way an air channel K, which narrows in upward direction and thus brings about a kind of Venturi effect, is obtained between a second side wall 312 of a first ceiling profile and a first side wall 311 of a second ceiling profile 300 lying adjacently thereof. The space immediately above the ceiling profiles preferably allows air circulation through the open lowered ceiling, whereby a good air mixing is obtained of air above and below the lowered ceiling. In addition, the first and second side wall 311, 312 function as heat radiation surfaces which exchange heat with the surrounding area.

[0028] First and second side wall 311, 312 run obliquely upward from the bottom 313 at an angle α_1 , α_2 of less than 70° relative to a horizontal plane, preferably less than 60° , still more preferably less than 50° , and for instance between 40° and 48° . The ceiling profile 300 has a substantially V-shaped cross-section here. First side wall 311 forms an angle β with second side 312 of between 80° and 110° , preferably between 85° and 105° . The width B of ceiling profile 300 preferably lies between 50 mm and 110 mm, more preferably between 60 mm and 100 mm, and still more preferably between 70 mm and 90 mm. Such a width makes ceiling profile 300 suitable for receiving two pipe sections with a diameter of between 10 mm and 20 mm. The minimum distance D_{min} between two mutually adjacent ceiling profiles 300 is preferably greater than 10% of the width B, more prefer-

ably greater than 20% of the width B. The maximum distance Dmax between two mutually adjacent ceiling profiles 300 is preferably greater than 80% of the width B, and in the shown example greater than the width B. Since ceiling profile 300 is substantially V-shaped, the maximum distance Dmax is equal to the width B plus the minimum distance Dmin.

[0029] In a mounted state the ceiling profile 300 preferably has a height H of between 20 mm and 60 mm, preferably between 30 mm and 50 mm, as seen in vertical direction. The height H is preferably greater than one third of the width B, i.e. $H > B/3$. In this way the air channel K will extend over a sufficiently great height, and the distance between two air channels K remains sufficiently small.

[0030] Provided for the purpose of attaching pipe sections 110 to support profiles 200 are carrier elements 410 which can be coupled to the support profiles 200. Carrier elements 410 are here configured to receive in each case two pipe sections 110. Carrier element 410 is here provided with two mounting arms 411, 412 which can be anchored in two corresponding holes in support profile 200. Carrier element 410 is provided on its underside with two cylindrical receiving parts 421, 422 for receiving therein in each case a pipe section 110. Instead of cylindrical receiving parts 421, 422, use can be made of any other suitable carrying means, for instance hooks or clamping means of a different form. In the illustrated example carrier elements 410 are separate elements which can be coupled in support profile 200, although the skilled person will appreciate that the carrier elements can also form an integral whole with support profiles 200.

[0031] Ceiling profiles 300 can preferably be coupled directly to support profiles 200. Ceiling profile 300 can for this purpose be provided at the top with a first and a second coupling flange 321, 322 which protrude inward from respectively the first and second side wall 311, 312 and are intended to co-act with dovetail-shaped wings 220 which protrude downward from support profile 200.

[0032] The first and/or second side wall 311, 312 can optionally be provided with a plurality of perforations arranged distributed over the surface. This can improve the acoustic properties of the ceiling structure. Sound-insulating material can optionally be provided above a number of ceiling profiles 300. This can improve the acoustics of the space further. This sound-insulating material is preferably arranged in a manner such that a convective flow between ceiling profiles 300 can take place unimpeded and such that the air above the ceiling profiles can be flushed. This sound-insulating material (not shown) preferably extends vertically above one or more ceiling profiles 300 of the plurality of ceiling profiles. These can for instance be vertically mounted panels. The sound-insulating material can optionally be partially incorporated in a ceiling profile 300. A ceiling profile 300 can thus as it were form a support for an acoustic panel.

[0033] Figure 4 illustrates schematically that pipe system 100 can comprise one continuous pipe which is ar-

ranged in looping manner. In the simplified example of Figure 4 four loops L1, L2, L3, L4 can be distinguished. The liquid is fed through a first leg 1 of the first loop L1 to a second, parallel leg 1' of the first loop L1, and from there to the second loop L2 and so on. Each loop L1, L2, L3, L4 comprises two substantially parallel pipe sections 110 which are intended to be received in ceiling profiles 300, and two curved sections 120 which can be situated at an outer end of the ceiling. Curved sections 120 of loops L1, L2, L3, L4 thus overlap each other outside ceiling profiles 300. Depending on the flexibility of the pipes, smaller or larger loops can be opted for. Figure 4 shows an example with one continuous pipe, but the skilled person will appreciate that looping patterns are also possible, wherein a plurality of continuous pipes are combined with each other.

[0034] Figure 5 illustrates another possible variant of a ceiling structure according to the invention. In the variant of Figure 5 only one pipe section 110 is received per ceiling profile 300. Different ceiling profiles 300 are further combined with each other. It is thus possible to combine profile elements 300 with one oblique first or second side wall 311, 312 with gutter-like ceiling profiles 300'. In this variant the distance A at the bottom 313 is at least three times smaller than the width B of ceiling profile 300, i.e. so $A < B/3$. The width B of ceiling profile 300 here preferably lies between 20 mm and 90 mm, more preferably between 25 mm and 60 mm, and can thus be shorter than the width B of the variant of figures 1-3. The angular ranges for the angles α_1 , α_2 can be similar to those described above.

[0035] Figure 6 shows a variant in which ceiling profiles 300 have a trapezoidal cross-section. First and second side walls 311, 312 connect to a bottom wall 313. The angles α_1 , α_2 at which the first and second side wall 311, 312 run obliquely upward can be similar to the above stated values. In the shown variant three pipe sections 110 are received in each ceiling profile 300, but the skilled person will appreciate that trapezoidal variants are possible in which only one or two pipe sections are provided per ceiling profile 300. The distance A is at least twice as small as the width B, i.e. $A < B/2$. The above stated ranges also apply to H, Dmin and Dmax.

[0036] Figures 7 and 8 illustrate two other possible variants. Corresponding components are designated with the same reference numerals. Figures 7 and 8 show that the first and second side wall can comprise curved parts (see Figure 7) and/or can become wider in step-like manner (see Figure 8). The above stated ranges likewise apply to the indicated values A, B, H, Dmin, Dmax.

[0037] Figure 9 illustrates several other possible variants. Corresponding components are designated with the same reference numerals. Figure 9 shows variants of a V-shaped ceiling profile 300 in which only one pipe section is provided in a V-shaped ceiling profile 300. Figure 9 further shows that the shape and the dimensions of the V-shaped ceiling profile 300 can be adapted to the shape and dimensions of a pipe section 110 in different

ways. At the bottom 313 ceiling profile 300 can thus substantially follow the shape of a pipe section 110, see the three embodiments on the right in figure 9. According to another option, a pipe section 110 can lie at a distance from bottom 313 and make contact with the first and second side wall 311, 312 at two discrete locations.

[0038] First side wall 311 forms an angle b with second side 312 which preferably lies between 30° and 110° , preferably between 40° and 90° . The width B of ceiling profile 300 preferably lies here between 20 mm and 90 mm, more preferably between 25 mm and 60 mm. Such a width makes ceiling profile 300 suitable for receiving one pipe section with a diameter of between 10 mm and 20 mm. The minimum distance D_{min} between two mutually adjacent ceiling profiles 300 is preferably greater than 20% of the width B , more preferably greater than 30% of the width. Since ceiling profile 300 is substantially V-shaped, the maximum distance D_{max} is equal to the width B plus the minimum distance D_{min} . In a mounted state the ceiling profile 300 preferably has a height H of between 20 mm and 60 mm, preferably between 30 mm and 50 mm, as seen in vertical direction. The height H is preferably greater than one third of the width B , i.e. $H > B/3$.

[0039] The skilled person will appreciate that the invention is not limited to the above described embodiments and that many modifications and variants are possible within the scope of the invention, which is defined solely by the following claims.

Claims

1. Ceiling structure for a space, comprising:

a pipe system (100) with a plurality of pipe sections (110) extending substantially parallel to each other, which pipe system is configured to transport a fluid for the purpose of controlling the temperature in the space;
 a plurality of support profiles (200); and
 a plurality of ceiling profiles (300) which can be coupled at a mutual distance to the support profiles, wherein the ceiling profiles are oriented at an angle relative to the support profiles and are preferably oriented substantially transversely of the support profiles;

wherein a ceiling profile (300) of the plurality of ceiling profiles is open at the top, as seen in a mounted position, for the purpose of receiving therein in each case one or more pipe sections (110) of the pipe system;

wherein the ceiling profile (300) has first and second opposite side walls (311, 312), as seen in a mounted position, wherein the distance (A) between the first and the second side wall at the position of the bottom is at least two times smaller, preferably at least three

times smaller, more preferably at least five times smaller than the width (B) of the ceiling profile as measured between the first and the second side wall at the position of the open upper side.

2. Ceiling structure according to the foregoing claim, wherein at least one of the first and the second side wall runs obliquely upward from a bottom (313) at an angle (a_1 , a_2) of less than 70° relative to a horizontal plane, preferably less than 60° , still more preferably less than 50° .

3. Ceiling structure according to any one of the foregoing claims, wherein the ceiling profile (300) is substantially symmetrical and the first and the second side wall run obliquely upward from the bottom (313) at an angle of less than 70° relative to a horizontal plane, preferably less than 60° , still more preferably less than 50° .

4. Ceiling structure according to any one of the foregoing claims, wherein the ceiling profile has a substantially V-shaped cross-section, wherein the first and second side wall (311, 312) correspond with the legs of the V-shaped ceiling profile and the bottom (313) corresponds with the lower edge of the V-shaped ceiling profile.

5. Ceiling structure according to any one of the foregoing claims, wherein the first side wall (311) forms an angle (b) with the second side wall (312) of between 80° and 110° .

6. Ceiling structure according to any one of the foregoing claims, wherein the plurality of ceiling profiles, in a mounted state, have a width (B) as seen in a horizontal plane, and wherein the minimum distance (D_{min}) between two mutually adjacent ceiling profiles thereof is greater than 10% of the width (B), preferably greater than 20% of the width (B).

7. Ceiling structure according to any one of the foregoing claims, wherein the maximum distance (D_{max}) between two mutually adjacent ceiling profiles thereof is greater than 80% of the width (B) of the ceiling profile, preferably greater than 90% of the width (B), more preferably greater than the width (B).

8. Ceiling structure according to any one of the foregoing claims, wherein the ceiling profile (300), in a mounted state, has a width (B) as seen in a horizontal plane of between 50 mm and 110 mm, preferably between 60 mm and 100 mm, still more preferably between 70 mm and 90 mm; and/or wherein the ceiling profile (300), in a mounted state, has a height (H) as seen in vertical direction of between 20 mm and 60 mm, preferably between 30 mm and 50 mm

9. Ceiling structure according to any one of the foregoing claims, wherein the support profiles (200) are provided with a pipe carrying structure (400) for carrying the pipe system. 5
10. Ceiling structure according to the foregoing claim, wherein the pipe carrying structure (400) comprises a plurality of carrier elements (410) which can be coupled to the support profiles. 10
11. Ceiling structure according to any one of the foregoing claims, wherein the support profiles (200) are configured for direct coupling to the ceiling profiles (300). 15
12. Ceiling structure according to the foregoing claim, wherein the ceiling profile (300) is provided at the top with a first and second coupling flange (321, 322) which delimit an opening through which one or more pipe sections can be received and which connect to respectively the first and second side wall, (311, 312); and wherein the support profiles (200) are provided with downward protruding wings (220) which are configured to co-act with the first and second coupling flanges (321, 322); and/or wherein at least one of the first and second side wall is provided with a plurality of perforations arranged distributed over the surface. 20
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13. Ceiling structure according to any one of the foregoing claims, wherein two pipe sections (110) extending parallel to each other are received in the ceiling profile (300). 30
14. Ceiling structure according to any one of the foregoing claims, wherein the pipe system comprises a continuous pipe which is arranged in looping manner, such that a plurality of mutually partially overlapping loops (L1, L2, L3, L4) is formed, wherein two mutually adjacent pipe sections of the plurality of pipe sections belong to different loops of the plurality of loops. 35
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15. Ceiling structure according to any one of the foregoing claims, wherein the pipe sections of the pipe system are flexible. 45

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Fig. 2

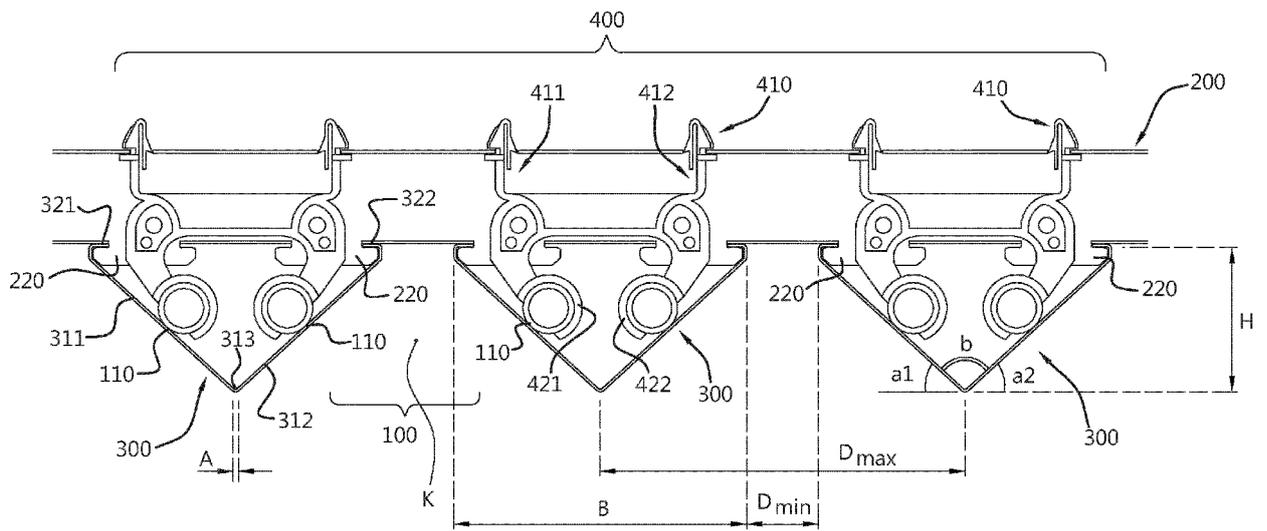


Fig. 3

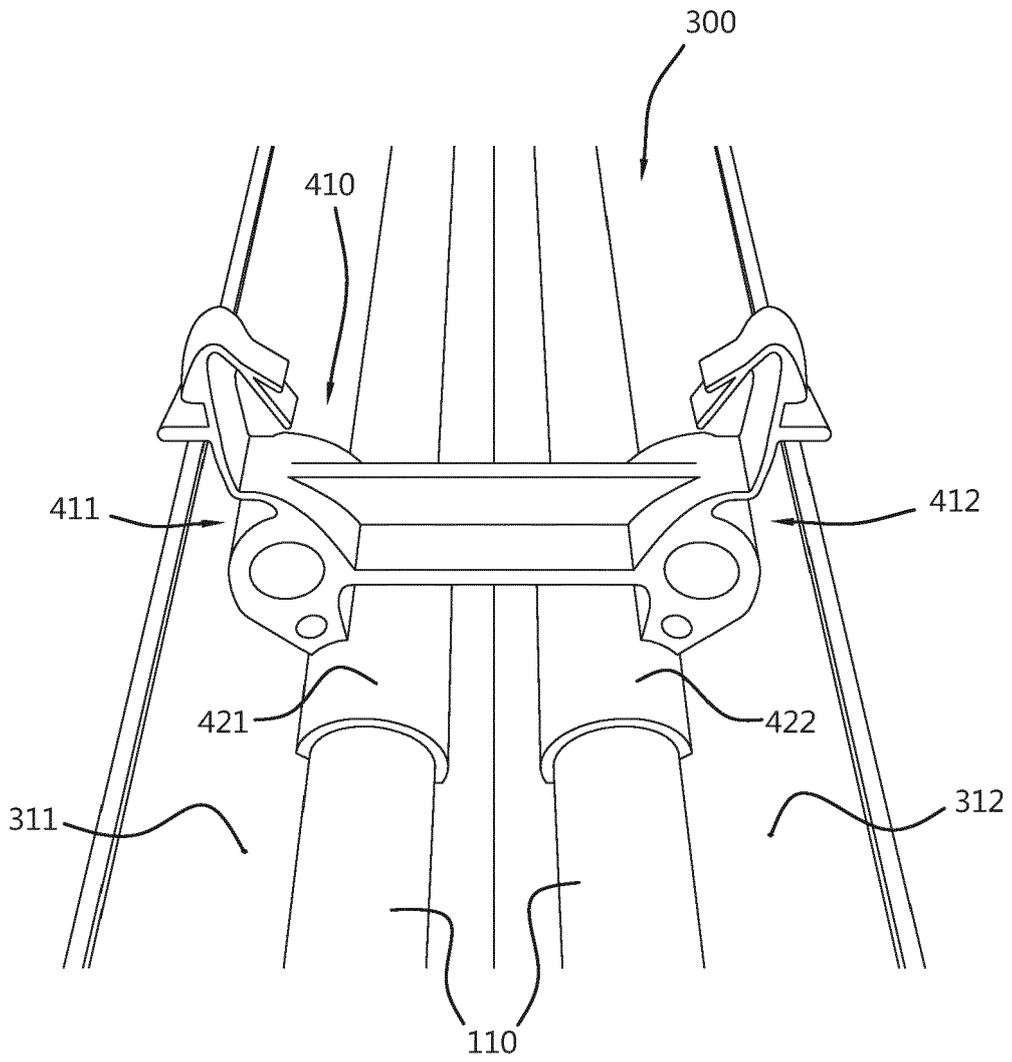


Fig. 4

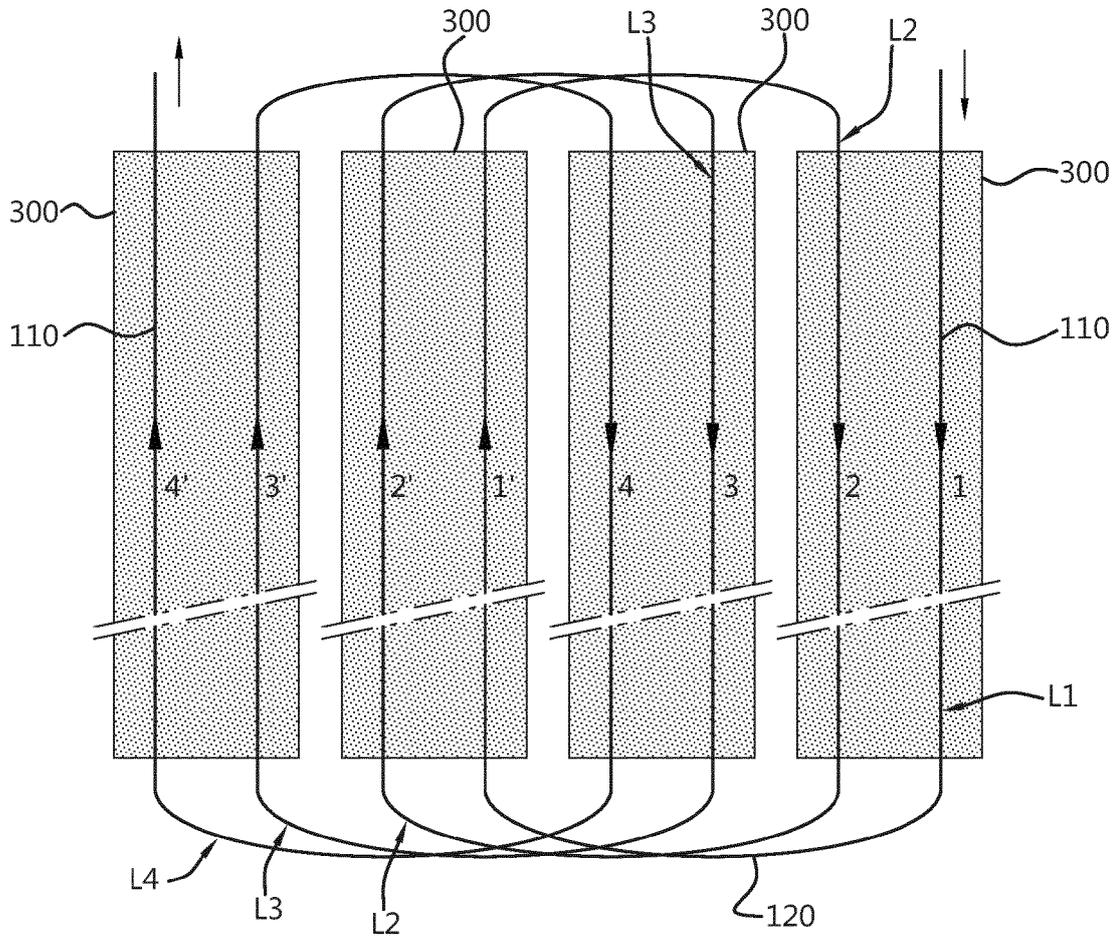


Fig. 5

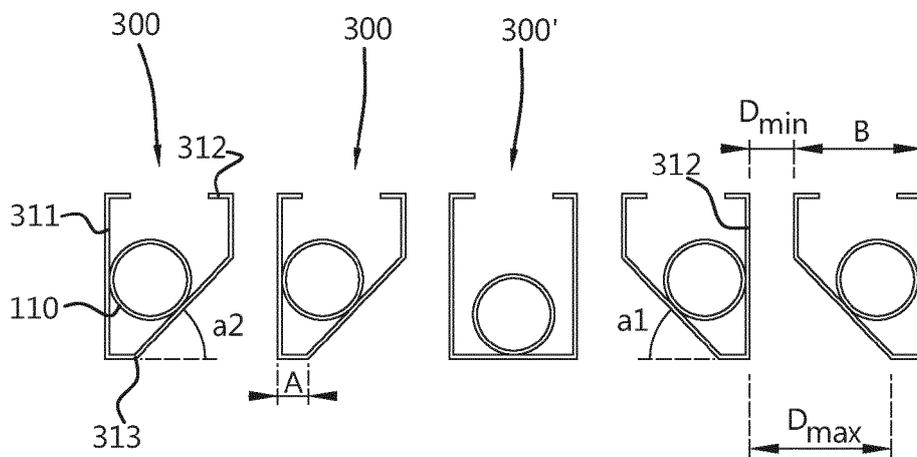


Fig. 6

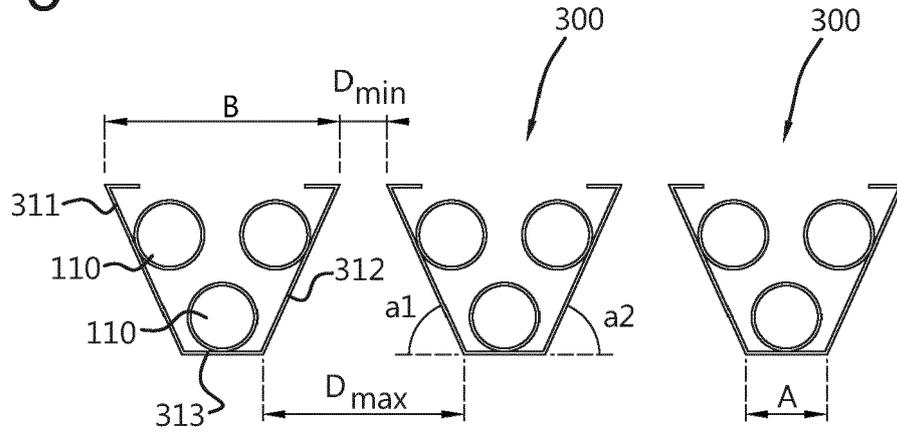


Fig. 7

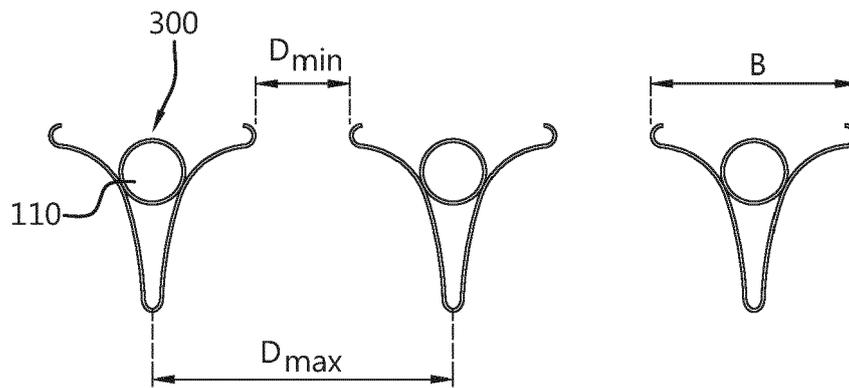
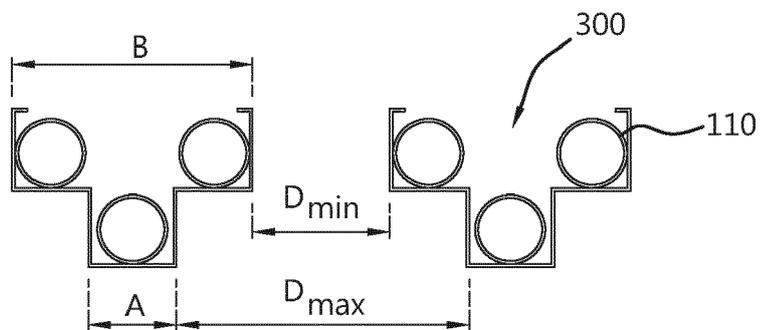


Fig. 8



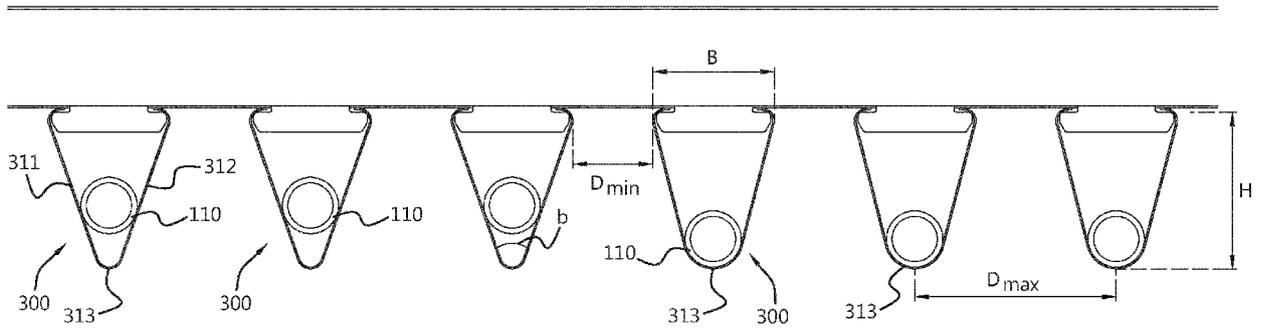


Fig. 9



EUROPEAN SEARCH REPORT

Application Number
EP 21 15 2306

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| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|--|---|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
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