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(54) **Suspended ceiling system and method**

(57) The present invention relates to a suspended ceiling system (100, 500) for a room having a structural ceiling. The system (100, 500) comprising: a body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) attachable to said structural ceiling, at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c), such as a wire, a line, a cable, a cord, a thread, and a ceiling tile (102a-e, 402, 502a-c) with sound absorbing properties. Each string like suspension member (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) is attachable to said ceiling tile (102a-e, 402, 502a-c) at two attachment points (106a-e, 406). Said ceiling tile (102a-e, 402, 502a-c) is suspendable in said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) by means of said at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c). Said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) for each of said at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) defines a suspension member receiving path (205a-c, 305) for reception thereof.

The present invention also relates to a corresponding method.

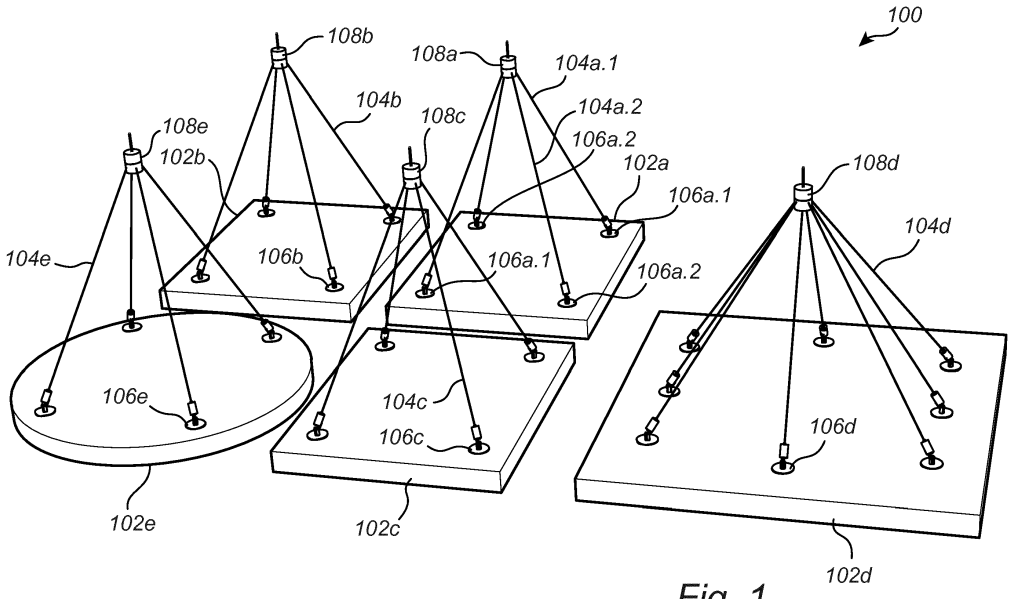

Fig. 1

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Description

Filed of the Invention

[0001] The present invention generally relates to a suspended ceiling system for a room having a structural ceiling and corresponding method for providing a suspended ceiling in a room having a structural ceiling.

Background of the Invention

[0002] When constructing buildings or similar, concrete is often used as it is a cost effective rigid material having a long service life. In concrete buildings, the foundation, the walls, the floor structures and the roof structures are commonly formed by reinforced concrete.

[0003] When using concrete slabs, it is common to use so called suspended ceilings or false ceilings. The suspended ceilings are then provided below the structural ceiling formed by the concrete slabs themselves. The suspended ceilings are commonly made of a number of tiles which are suspended from the concrete slabs forming the structural ceiling.

[0004] In order to mount the tiles of the suspended ceiling, holes are commonly drilled in the structural ceiling. Hooks or similar are then provided in the drilled holes and the tiles are then in turn suspended from the hooks.

[0005] The suspended ceiling may be formed by individually suspended and free hanging ceiling tiles using some form of wire, cord or similar. According to common practice, four wires or more wires may be used to suspend a single ceiling tile. This means that at least four holes commonly has to be drilled in the structural ceiling to suspend a single ceiling tile. The drilling of no less than at least four holes for each tile is for natural reasons time consuming. The time consuming work implies high costs due to e.g. personnel expenses.

[0006] Further, when drilling a significant amount of holes in the structural ceiling of a building there is a risk of damaging or destroying objects which are present in the structural ceiling, i.e. inside a concrete slab.

[0007] In fact, many types of objects may be present in the structural ceiling. For instance it is common to provide channels in which electrical cables are located. Hence, if a hole is drilled into a channel in which an electrical cable is located, there is an obvious risk that the cable might get damaged or destroyed. Even worse, a damaged cable may result in a potential fire hazard.

[0008] Similarly, it is common to provide water pipes in the slabs forming the structural ceilings of a building. When drilling a hole in the structural ceiling, there is then an obvious risk of damaging a water pipe, which might result in a leakage and water damages.

[0009] In many countries, such as e.g. Germany, the Netherlands and France, so called Thermally Active Building Structures, TABS, are becoming increasingly popular, due to its ability to cool the indoor environment of the building. TABS are used to control the indoor environment of a concrete building, by cooling or heating the concrete slabs of the building. In order to achieve this the concrete slabs are provided with channels in form of pipes, ducts or similar. Water having a controlled temperature is then circulated in the channels in order to heat or cool the beams, which in turn heats or cools the building.

[0010] When TABS are used to mainly cool a building, the channels provided in the slabs are situated close to the lower surface of the slab, i.e. close to the structural ceiling of the building. The reason for the channels being provided close to the surface is that an improved efficiency is achieved by this arrangement. In practice, the channels are typically provided only a few centimeters below the concrete surface of the slabs of the building.

[0011] As the concrete slabs of the TABS are penetrated with numerous bends of water filled channels close to the concrete surface there is an even further increased risk of damaging a channel when drilling a hole.

[0012] In order to avoid damages, the drilling locations might be determined if the personnel drilling the holes are aware of the locations of the channels within the slabs. However, the process of determining the drilling locations is time consuming and undesired.

[0013] Naturally, the likelihood of damaging a cable, pipe or channel increases with the number of holes being drilled in the structural ceiling of a building, why there is a desire to reduce the amount of holes being drilled not only due to economical reasons such as personnel and.

[0014] Hence, there is a need for an improved suspended ceiling system for a room having a structural ceiling and method for providing a suspended ceiling in a room having a structural ceiling.

Summary of the Invention

[0015] According to an aspect of the invention, the above is at least partly alleviated by a suspended ceiling system for a room having a structural ceiling, said system comprising: a body unit attachable to said structural ceiling, at least two string like suspension members, such as a wire, a line, a cable, a cord, a thread, and a ceiling tile with sound absorbing properties, wherein each string like suspension member is attachable to said ceiling tile at two attachment points, wherein said ceiling tile is suspendable in said body unit by means of said at least two string like suspension members, and wherein said body unit for each of said at least two string like suspension members defines a suspension member receiving path for reception thereof.

[0016] The present invention is based on the realization that it is possible to reduce the number of fix points or attachment points needed in the structural ceiling to suspend a ceiling tile. This is achieved by suspending the ceiling tile in string like suspension members from a body unit which is attachable to the structural ceiling of a building. In practice, a single body unit having a single fix point may be used to suspend a ceiling tile.

[0017] According to the invention, string like suspension members, such as wires, lines, cables, cords, threads or the like are used to suspend the ceiling tile from the body unit being attachable to the structural ceiling. It should be noted that within the context of this application the term "string like suspension members" may be any type of member showing flexibility and being suitable for suspending a hanging element. Further, the suspension member is attachable to the ceiling tile at two attachment points. The attachment to the ceiling tile may be made using any suitable method. For instance, the suspension member may be connected to a prearranged element on the ceiling tile. The prearranged element may be formed of a portion of the ceiling tile itself or may be an independent element which is e.g. screwed into or glued onto the ceiling tile. Further, the suspension member may be attachable directly to the ceiling tile, by e.g. penetrating the ceiling tile.

[0018] It should be noted that within the context of this application the term "ceiling tile" may be any type of element which is being suspendable from a structural ceiling to form part of or constitute a suspended ceiling. The element may be free hanging in the sense that it does not contact any neighboring elements or does not have any neighboring elements. The element may also be suspendable such that is contacts neighboring elements. For natural reasons the same type of elements may be suspended as free hanging elements or as elements being in contact with neighboring elements. Further, the element may exhibit different shapes and may be made of different materials or material combinations. Furthermore, the element may be a decorative element and/or an element serving a technical purpose such as sound absorption, fire protection or concealing of piping or wiring.

[0019] The wording "sound absorbing properties" conventionally refer properties of a material resulting in that sound energy impinging on the material is partly being absorbed in the sense that the sound energy is transmitted through the material and also transformed into another energy form such as heat or mechanical movement. This means that the amount of sound energy impinging on the material is higher than the amount of energy being reflected by the material. Further, within the context of this application the term "sound absorbing properties" may refer to properties of a material which brings about the acoustics of a room is influenced such that the characteristics of the acoustics become more pleasant for a person present in the room, when the material is present in the room.

[0020] The wording "body unit" may mean any type of element which is being attachable to a structural ceiling and having a path for receiving a suspension member. The body unit may be attachable to the structural ceiling by any suitable means such as being screwed, bolted, glued etc. The path for receiving a suspension member is to be construed as a path defined in the material of the body unit in which the suspension member rests or partly rests, directly or indirectly, when suspending a ceiling tile. The path may for instance be a grove in which the suspension member may rest or may be a channel through which the suspension member may passed. Further, the path may for instance be formed of shoulders or between which the suspension member may extend.

[0021] According to a preferred embodiment, the string like suspension member may comprises a length adjustment device for adjusting a length of said string like suspension member extending between said two attachment points associated thereto. The possibility to adjust the length brings about several advantages. By adjusting the length of the suspension member the distance between the structural ceiling and the ceiling tile may be adjusted, i.e. the height may be adjusted. Also the orientation of the ceiling tile may be adjusted such that the tile is suspended in a inclined angle with respect to the structural ceiling. Similarly, the length adjustment device may be utilized to compensate for an inclined or uneven structural ceiling. A further advantage is that the suspension member may be adjusted such that the any uneven weight distribution between the attachment points is counteracted.

[0022] In an embodiment of the invention, each of said suspension member receiving paths may define two entries, wherein said entries of said suspension member receiving paths are circumferentially distributed. By distributing the entries of the paths circumferentially any unwanted rotation of the ceiling tile may be counteracted.

[0023] In an embodiment of the invention, said entries may be evenly circumferentially distributed, which is advantageous in that unwanted rotation of the ceiling tile and unwanted bending of the suspension member is counteracted.

[0024] According to a preferred embodiment of the invention, said body unit may comprise a locking element for locking of said string like suspension members in said receiving paths, which is advantageous in that undesired tilt of the ceiling tile may be counteracted.

[0025] In an embodiment of the invention, each one of said receiving paths may be a through channel extending through said body unit. By forming the receiving paths as through channels the risk of misplacement and detachment of the suspension members may be reduced.

[0026] In an embodiment of the invention, said body unit may comprise a marking for laser alignment of said body unit, which is advantageous in that accurate positioning of the body unit is facilitated during attachment to the structural ceiling.

[0027] According to a preferred embodiment of the invention, said body unit may comprise two sections which are adjustable in relation to each other. By forming the body unit such that it comprises two sections which are adjustable in relation to each other, the position of the suspension members may be adjusted in relation to the attachment position of the body unit to the structural ceiling. This in turn means that the position of a suspended ceiling tile may be adjusted.

[0028] In an embodiment of the invention, said sections may be rotatably adjustable in relation to each other, which is advantageous in that the orientation of the suspension members may be adjusted. This in turn means that that the rotational position of a suspended ceiling tile may be adjusted.

[0029] In an embodiment of the invention, said body unit may be arranged for sliding attachment of said body unit to said ceiling by means of a profile element, which is advantageous in that a simple attachment to a structural ceiling may be achieved by providing a profile element on the structural ceiling.

[0030] According to a preferred embodiment of the invention, said ceiling tile may comprise mineral wool, glass wool and/or rock wool, which is advantageous in that sound absorbing ceiling tiles may be provided in a cost effective manner using well known manufacturing processes.

[0031] According to a preferred embodiment of the invention, said string like suspension members may be attachable to said attachment points by means of a hook element, which is advantageous in that simple and reliable attachment may be achieved.

[0032] According to a preferred embodiment of the invention, said length adjustment device may be integrated in said hook element, which is advantageous in that an easy to install solution comprising a reduced number of loose parts may be achieved in a cost effective manner.

[0033] According to another aspect of the invention, there is provided a method for providing a suspended ceiling in a room having a structural ceiling, said method comprising: providing at least two string like suspension members, such as a wire, a line, a cable, a cord, a thread, providing a body unit, which body unit for each of said at least two string like suspension members defines a suspension member receiving path for reception thereof, providing a ceiling tile, attaching said body unit to said structural ceiling, attaching each one of said string like suspension members to said ceiling tile at two attachment points, receiving each one of said string like suspension members in said suspension member receiving paths, suspending said ceiling tile in said body unit by means of said at least two string like suspension members. In general, features of this aspect of the invention provide similar advantages as discussed above in relation to the previous aspect of the invention.

[0034] According to one embodiment of the invention, said method may further comprise: adjusting a length of said string like suspension member extending between said two attachment points associated thereto.

[0035] Further features of, and advantages with, the present invention will become apparent when studying the appended claims and the following description. The skilled person will realize that different features of the present invention may be combined to create embodiments other than those described in the following, without departing from the scope of the present invention.

Brief description of the drawings

[0036] The aspects of the invention, including its particular features and advantages, will be readily understood from the following detailed description and the accompanying drawings, in which:

Fig. 1 conceptually illustrates a suspended ceiling system according to an embodiment of the invention;
Fig. 2a-c conceptually illustrates different body units according to currently preferred embodiments of the invention;
Fig. 3 is a detail view of a body unit, conceptually illustrating the locking of a string like suspension member in form of a wire within a channel of the body unit;
Fig. 4 is a detail view of an attachment point of a ceiling tile, where a suspension member is attached to the ceiling tile by means of a hook element;
Fig. 5 conceptually illustrates a suspended ceiling system according to an embodiment of the invention in which a profile element is used;
Fig. 6a-c conceptually illustrates different body units according to currently preferred embodiments of the invention, in which the body units are attached to profile elements of different shapes.

Detailed Description

[0037] The present invention will now be described more fully hereinafter with reference to the accompanying drawings, in which preferred embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein; rather, these embodiments are provided for thoroughness and completeness, and fully convey the scope of the invention to the skilled person. Like reference numerals refer to like elements throughout the description.

[0038] Referring now to the drawings and to Fig. 1 in particular, there is conceptually depicted a suspended ceiling system 100 according to an embodiment of the invention. For reasons of simplicity there are five planar objects in form of ceiling tiles 102a-e illustrated in Fig. 1. It is however to be understood that any number of ceiling tiles may be used according to the present invention.

[0039] Fig 1. Illustrates how the five ceiling tiles 102a-e, forming a suspended ceiling, are suspended from a structural ceiling of a building, not shown.

[0040] Each ceiling tile 102a-e is suspended by means of string like suspension members 104a-e in form of wires. The wires are attached to the ceiling tiles in number of attachment points 106a-e. The wires are then attached to body units 108a-108e, each shown as a single body, which in turn are attached to a structural ceiling of a building, not shown. It is to be noted that each of the body units 108a-e used to suspend the ceiling tiles 102a-e is attached to the structural ceiling in a single attachment

point. Hence, the number of attachment points in the structural ceiling equals the number of ceiling tiles 102a-e being suspended from the structural ceiling.

[0041] Each of the ceiling tiles 102a-c and 102e are suspended using two wires which extends through the body units 108a-c and 108e and are attached to the ceiling tiles 102a-c and 102e at two attachment points 106a-c and 106e each, meaning that the ceiling tiles 102a-c and 102e are suspended at four attachment points 106a-c and 106e. Ceiling tile 102d on the other hand is suspended using four wires which extends through the body unit 108a and are attached to the ceiling tile 102d at two attachment points each, meaning that the ceiling tile 102d is suspended at eight attachment points 106d.

[0042] The body units 108a-e are provided with receiving paths, not shown for receiving the wires 104a-e. This feature will be discussed in more detail below in conjunction with Fig. 2a-c.

[0043] As can be seen in Fig. 1, the ceiling tiles 102a-e are of different sizes and different shapes. Commonly, the ceiling tiles 102a-e, are made of glass wool but other materials such as mineral wool or rock wool are also conceivable without departing from the scope of the invention. Ceiling tiles comprising the exemplified materials are known to exhibit sound absorbing properties.

[0044] Ceiling tiles 102a-c are all of a square shape and are of the same size. Ceiling tile 102d on the other hand is larger compared to ceiling tiles 102a-c. Also ceiling tile 102d is in the form of a square. Ceiling tile 102e on the other hand is exhibiting a circular shape. As is evident, the size of and shape of the ceiling tiles 102a-e may be altered into any size and shape without departing from the scope of the invention. Also the arrangement in term of how the respective ceiling tiles 102a-e are suspended with respect to each other and the room in which they are present may be altered to suit the needs. For instance, the ceiling tiles may be arranged at different levels and/or be inclined relative each other.

[0045] In Fig. 1 the ceiling tiles 102a-e are illustrated as being free hanging, meaning that the respective ceiling tiles 102a-e are not in contact with each other. It is however possible to arrange the ceiling tiles 102a-e such that the respective ceiling tiles 102a-e are in contact with neighboring ceiling tiles or some of the neighboring ceiling tiles.

[0046] Further, the ceiling tiles 102a-e may be provided with a layer, not shown, on the side facing the interior of the room in which the ceiling tiles 102a-e are suspended. The layer may in turn be provided with decorative elements such a paint, a print, a sticker or similar. In other words, the appearance of the ceiling tiles 102a-e may be altered to suit the needs of a particular installation.

[0047] As discussed above each ceiling tile 102a-e is provided with a number of attachment points 106a-e in which wires 104a-e are attached to the ceiling tiles 102a-e. Now referring to ceiling tile 102a, here two wires 104a.1 and 104a.2 are used to suspend the ceiling tile 102a. The first wire 104a.1 is attached to the ceiling tile at two diagonally disposed attachment points 106a.1 along a first diagonal direction. In the same way, the second wire 104a.2 is attached to the ceiling tile at two diagonally disposed attachment points 106a.2 along a second diagonal direction. This means that the wires 104a.1 and 104a.2 are crossing the body unit 108a diagonally along their respective diagonals. The arrangement of the wires 104a-e at the body units 108a-e will be discussed in more detail below.

[0048] The wires 104a-e may be attached to the ceiling tiles 102a-e using different techniques. For instance, the wires 104a-e may be attached using a hook element as will be discussed in more detail below in conjunction with Fig. 4. However, any suitable adjustment technique may be used without departing from the scope of the invention.

[0049] Now referring to Fig. 2a, a body unit 208a according to an embodiment of the present invention is depicted. The body unit 208a is attachable to the structural ceiling of a building by means of a centrally located screw 203a. By inserting the screw 203a into a hole in the structural ceiling and tightening the screw 203a, the body unit 208a becomes attached to the structural ceiling. Further, the body unit 208a is provided with paths in form of through channels 205a for receiving string like suspension members 204a e.g. in form of wires 204a. The channels 205a are provided in the body unit 208a such that they cross each other at 90 degree angle. By providing the channels 205a at a 90 degree angle with respect to each other, the openings of the channels 205a will become evenly distributed along the periphery of the body unit 208a. An even distribution of the channels 205a helps in counteracting any unwanted rotation of a ceiling tile being suspended by means of the body unit 208a.

[0050] Further, the channels 205a are arranged on different heights with respect to a longitudinal direction of the body unit 208a. By arranging the channels 205a at different heights, the channels 205a do not influence each other as would be the case if the channels 205a were provided at the same height. The fact that the channels 205a do no influence each other facilitates the insertion of the wires 204a through the respective channels 205a.

[0051] Now referring to Fig. 2b, a body unit 208b according to an embodiment of the present invention is depicted. The body unit 208b comprises two sections 208b.1 and 208b.2 which are adjustable in relation to each other. Section 208b.1 of the body unit 208b is provided with a screw 203b. The screw 203b may be used to attach the section 208b.1 to the structural ceiling of a building in a manner similar to what has been described above.

[0052] Section 208b.2 is in turn provided on section 208b.1. The two sections 208b.1 and 208b.2 are adjustable with respect to each other, meaning that the orientation of the two sections 208b.1 and 208b.2 with respect to each other may be altered, i.e. section 208b.2 may be rotated with respect to section 208b.1 about a central axis thereof. By rotating the section 208b.2 the orientation of a ceiling tile being suspended by mans of the body

unit 208b may be adjusted.

[0053] Further, the body unit 208b, is on a side facing away from the structural ceiling, provided with a marking 212b in form of a groove. The marking 212b is used for facilitating laser alignment of the body unit 208b. The alignment may be performed by passing laser light through the groove in order to determine the correct alignment of the body unit 208b. In other words, a body unit 208b may be correctly aligned with respect to a laser beam by adjusting the position of the body unit 208b such that the laser beam passes through the groove. The marking 212b may for instance also be formed as a hole through which laser light may be passed.

[0054] It is of course possible to provide any type of body unit with a marking 212b or several markings for facilitating the alignment of the body unit in question. Further, the marking 212b may extend in any suitable direction on the body unit 208b, which allows for that the alignment direction with respect to the channels 205b may be adapted.

[0055] Just like in the body unit 208a of Fig 2a, the section 208b.2 of the body unit 208b is provided with paths in form of through channels 205b for receiving string like suspension members 204b e.g. in form of wires 204b. The channels 205b are arranged in accordance to what has been described above.

[0056] The two sections 208b.1 and 208b.2 may be attached to each other using any suitable technique. For instance a forced fit may be utilized to realize an attachment wherein the respective sections 208b.1 and 208b. 2 may be rotated with respect to each other. Similarly, a screw joint may be used to realize the above described adjustable attachment.

[0057] According to some embodiments, the attachment of the two sections 208b.1 and 208b.2 are designed such that not only the rotation may be adjusted but also the location of the section 208b.2 in relation to the section 208b.1. Such an attachment may be realized using any suitable attachment technique. By being able to adjust also the position of the section 208b.1 in relation to the section 208b.2, a position of a ceiling tile being suspended by the body unit 208b may be adjusted. The possibility to adjust the position of the ceiling tile brings about that it is possible to counteract misalignments or misplacements of the body unit 208b to the structural ceiling of a building.

[0058] Further, is possible to provide the channels 205a, b with e.g. a radius in connection to the openings of the channels 205a, b such that any wire present in the channels 205a, b is subject to less bending. Further, to counteract bending of any wires exiting the channels 205a, b the channels 205a, b may widened towards the openings of the channels to reduce the bending the wires are subjected to.

[0059] Now referring to Fig. 2c, a body unit 208c according to an embodiment of the present invention is depicted. The body unit 208c may be fixed to the structural ceiling of a building by means of a screw 203c, similarly to what has been described above.

[0060] Also in this case, the body unit 208c is provided with paths 205c for receiving string like suspension members e.g. in form of wires 204c. However, in this case the paths 205c are formed as grooves. The grooves are formed by areas surrounded by elevated portions 210c. The elevated portions 210c are provided such that the wires 204c may be placed on an inside of the respective elevated portions 210c. The wires 204c are counteracted from falling off or loosing from the body unit 208c by means of the elevated portions 210c.

[0061] As may be seen in Fig. 2c, the paths 205c, formed by the grooves are arranged parallel to each other and not in a diagonal manner as have been discussed above in conjunction to Figs. 2a and b. This arrangement of the grooves brings about that the wires 204c preferably are to be arranged differently on a ceiling tile that is to be suspended by means of the body unit 208c.

[0062] As may be understood from the parallel arrangement of the paths 205c the respective wires 204c should preferably attached along a side of the ceiling tile that is to be suspended and not in a diagonal manner as have been discussed above. Further, the wires 204c may be attached to the body unit 208c after having been attached at both ends to a ceiling tile. This is not possible when using a body unit according to Figs. 2a or b where the wires are passed through the channels of the body units.

[0063] Further, it is of course possible to provide paths in form of channels in a parallel manner on any type of body unit. In other words, the body unit may be provided with channels extending in a parallel manner through the body unit in question. This brings about that the wires used in this case also preferably are to be attached along a side of the ceiling tile and not in a diagonal manner. Moreover, the body unit may be provided with paths in form of channels extending in any direction through the body unit, meaning that the wires may be crossing each other in the body unit or not.

[0064] Furthermore, it is of course also possible to provide grooves or similar on a body unit such that wires may be arranged in a diagonal manner, a parallel manner or in any other suitable direction where the wires are crossing each other at the body unit or not.

[0065] The skilled person realizes that other solutions than channels and grooves may be used to realize the receiving paths for the string like suspension members or wires. For instance, the body unit may be provided with partly open channels or hooks. The paths may be formed in the material of the body unit, but the wires used my be provided indirectly in the paths e.g. by means of an insert or similar. In other words, the wires may rest on some kind of insert used to e.g. increase the friction between the body unit ant the wires used.

[0066] Now referring to Fig. 3, here is depicted a detail view of a body unit 308 according to a currently preferred embodiment of the invention. The body unit 308 is provided with receiving paths in form of through channels

305. The through channel 305 is of the type which has been discussed above in conjunction with Figs. 2a and b.

[0067] A string like suspension member in form of a wire 304 is provided in the channel 305. Further, the body unit 308 is provided with a locking element 303 for locking the wire 304 within the channel 305. The locking element is according to the illustrated embodiment a locking screw 303 provided in a threaded opening which opens towards the channel 305 and an outside of the body unit 308. Hence, it is possible to lock the wire 304 within the channel 305 by tightening the locking screw 303 such that the locking screw 303 pushes the wire 304 towards an interior wall of the channel 305.

[0068] By being able to lock a suspension member or wire 304 in respect to the body unit 308, the position of the wire 304 with respect to the body unit 308 may be fixed. This in turn brings about that a ceiling tile being suspended by means of the locked wire 304 may be locked and prevented from tilting as the lengths of the respective wires used to suspend the ceiling tile are fixed with respect to the body unit 308.

[0069] The above described locking screw 303 may advantageously be used in the body units 208a and b of Figs. 2a and b respectively. It is of course also possible to use locking elements of different designs to lock the suspension members used in relation to the body unit used. Any suitable locking means may be used without departing from the scope of the invention. For instance, a spring loaded pin pushing on the suspension member may advantageously be used.

[0070] It is of course also possible to provide body units of different designs with locking elements. For instance the body unit 208c of Fig. 2c may be provided with a locking screw in the elevated portions 210c pushing the wires 204c towards a central portion of the body unit 208c.

[0071] Now referring to Fig. 4, here is depicted a detail view of an attachment point where a string like suspension member in form of a wire 404 is attached to a ceiling tile 402 by means of a hook element 407.

[0072] The ceiling tile 402 is provided with a an attachment element 406 for providing an attachment point. The attachment element 406 is formed with a threaded portion which is being screwed into the ceiling tile 402. Further, the attachment element 406 is provided with an eye into which a hook may be inserted.

[0073] The on the wire 404 provided hook element 407 may be provided with a hook which may be inserted in the eye of the attachment element 406. As may be seen in Fig. 4, the wire 404 extends through the hook element 407 and ends first after the hook element 407. By means of this arrangement it is possible to adjust the length of the wire 404 without cutting the wire 404, as the length of wire 404 may be adjusted in a sliding manner with respect to the hook element 407.

[0074] The hook element 407 is provided with an adjustment device in form of a wedge 407a provided within the hook element 404. Further, the interior of the hook element 407 tapers towards the upper opening thereof, meaning that the wedge 407a will push on the wire 404 when the wire 404 is being pulled upwards. More specifically, when pulling the wire 404 upwards, the wire 404 will entrain the wedge 407a which will then push the wire towards an interior surface of the hook element 407, such that the wire 404 becomes locked with respect to the hook element 407. In order to release the wire 404, the wire 404 is pulled backwards towards the hook or the wedge 407a is pushed backwards towards the hook. It is thus possible to adjust the length of the wire 404 by adjusting the position of the wire 404 within the hook element 407 and consequently looking the position of the wire 404 by means of the wedge 407a.

[0075] By adjusting the length of a wire 404 used to suspend a ceiling tile, the distance between the ceiling tile and a body unit used to suspend the ceiling tile may be adjusted. Further, by adjusting the length of a wire 404, the force distribution between the respective attachment points may be adjusted.

[0076] It is to be understood that any suitable length adjustment device may be used without departing from the scope of the invention. For instance an adjustment screw may advantageously be used as length adjustment device. Further, the length adjusting device and the hook element may be formed as separate components and not integrated in a single hook element 407 as described above.

[0077] Further, the attachment element 406 may be provided with a hook and the hook element 407 with an eye. It is to be understood that any suitable element may be used to attach the wire 404 to the ceiling tile 402. Hence, the attachment device 406 may be omitted or of different design.

[0078] Now referring to Fig. 5, here is depicted a suspended ceiling system 500 similar to what is depicted in Fig 1. Just like the system 100 depicted in Fig. 1, a number of ceiling tiles 502a-c are suspended by wires 504a-c. The wires are attached to body units 508a-c used to suspend the ceiling tiles 502a-c. The body units are in turn attached to a profile element 509 by means of a sliding attachment, i.e. the body units 508a-c may slid into the profile element 509 such that the body units 508a-c are attached the profile element 509 in the sense that the body units 508a-c are only movable along the profile element 509. The profile element 509 may in turn be attached to the structural ceiling of a room not shown.

[0079] It is thus possible to adjust the positions of the body units 508a-c along the profile element 509 by simply sliding the body units 508a-c. By adjusting the positions of the body units 508a-c with respect to the profile element 509, also the positions of the ceiling tiles 502a-c will be adjusted. It is thus possible to adjust the position of any ceiling tile being suspended, indirectly by means of the profile element 509, in a direction along the profile element 509.

[0080] Further, the body units 508a-c may be employed with a locking element, not shown for locking the

body units in relation to the profile element 509. For instance, a locking screw provided in the body units 508a-c may be used to force the body units 508a-c towards a surface of the profile element 509, such that the body units 508a-c are locked in relation to the profile element. Any suitable locking element may of course be used.

[0081] Further, the profile element 509 may be attached in a sliding manner on other profile elements, not shown, extending in a traverse direction of the profile element 509. By arranging the profile element 509 in a sliding manner on profile elements extending in a traverse direction, the position of the profile element 509 may be adjusted. By attaching the profile elements, extending in a traverse direction to the profile element 509, to the structural ceiling of a building, the position of the profile element 509 may be adjusted in relation to the structural ceiling of the building. It is thus possible to adjust the position of any ceiling tile 502a-c being suspended by means of the body units 508a-c and the profile element 509. By this arrangement the position may be adjusted in two substantially perpendicular directions along the surface of the structural ceiling of the building.

[0082] Now referring to Fig. 6a, here is depicted an embodiment in which a body unit 608a is attached to a profile element 609a by being slid into and substantially encased by the profile element 609a. It is to be noted that the openings of the paths 605a into which the wires 604a are inserted are provided on un underside of the body unit 608a to facilitate the sliding arrangement into the profile element 609a.

[0083] Fig.6b illustrates a body unit 608b provided with peripheral groves 601 b used to slide the body unit 608b onto a profile element 609b having a U shaped cross section. By providing the body unit 608b with peripheral groves 601 b, wires 604b may still exit on the peripheral surface of the body unit 608b as is shown.

[0084] Fig. 6c illustrates a body unit 608c provided with an internal grove 601 c used to slide the body unit 608c onto a profile element 609c having an I shaped cross section. Also in this arrangement wires 604c may exit the peripheral surface of the body unit 608c as is shown.

[0085] A method for providing a suspended ceiling will be described in detail hereinafter. The method will for reasons of simplicity be described when using a suspended ceiling system 100 as depicted in Fig. 1. As will be substantiated below, a plurality of the method steps may be performed in a random order. The order of the steps in which they occur in the claims and in the below description is by no means limiting.

[0086] In order to be able to mount the suspended ceiling system 100 of Fig. 1 the material needed will be provided. The material needed, e.g. the body units 108a-c, the wires 104a-c and the ceiling tiles 102a-e may be provided at different points of time or at the same time.

[0087] According to the choice of the personnel mounting the suspended ceiling system 100, the work may start with different steps or working moments. One way to start is to conduct measurement related to determining the position of the body units 108a-c which are to be attached to the structural ceiling. The determination may be conducted with any suitable measurement technique including laser assisted measurements. When the correct positions for attachment of the body units 108a-c to the structural ceiling has been determined, holes may be drilled for attaching the body units 108a-c to the structural ceiling. It is however of course possible to use other suitable attachment techniques including adhesives, nails or similar.

[0088] If not already pre-attached to the ceiling tiles 102a-e, attachment elements 406 may be provided by being screwed into the ceiling tiles 102a-e. The so attached attachment elements 406 will provide attachment points 106a-e. The ceiling tiles 102a-e are thus prepared for being suspended by means of the attachment elements 406.

[0089] Sting like suspension members 104a-e in form of wires 104a-e may then be prepared. The wires 104a-e may be provided in suitable predetermined lengths or may be provided on a roll, bobbin or similar and then cut into suitable lengths.

[0090] The wires 104a-e may then be provided with hook elements 407 in one of their free ends. In the following, the wires 104a-e may then be passed through the channels 205a-b of the bodies 107a-e, such that a single wire is passed through each of the channels 205a-b. Following this a hook element 407 may also be provided in the remaining free end of the wires 104a-e. By providing hook elements 407 in both ends of the respective wires 104a-e, the wires may no longer loose from the body units 108a-e, as the hook elements 407 will not fit through the channels 205a-b. It is however still possible to move the wires 104a-e within the respective channels 205a-b. Further, it may be advantageous to roughly adjust the length of the respective wires 104a-e by means of the locking element 407a provided in each hook element 407. The wires 104a-e may then be looked in their respective channels 205a-b using a locking screw 303. By tightening the locking screw 303 the wires 104a-e becomes locked with respect to the body units 104a-e.

[0091] It is to be understood that it is sufficient to provide a single locking element 407a per wire 204a-e in order to be able to adjust the length of the wire 204a-e. This arrangement do however bring about that the overall length of the wires 104a-e preferably need to be adjusted before the locking screw 303 is tightened.

[0092] One hook element 407 of each wire may then be attached to their intended attachment points 106a-e on the ceiling tiles 102a-e. The ceiling tiles 102a-e are thus hanging in a substantially vertical direction. It is now possible to make further adjustments of the lengths of the respective wires 104a-d. Following this the remaining hook elements 407 may be attached to their respective intended attachment points 106a-e.

[0093] The ceiling tiles 102a-e are thus suspended in a manner substantially parallel to the structural ceiling as illustrated in Fig. 1. Further adjustments may then be

carried out if needed. For instance, the lengths of the wires 104a-e may be further adjusted such that the weight of the ceiling tiles 102a-e are evenly distributed. Also the rotation of the ceiling tiles may be adjusted. This may e. g. be performed by rotating the body units 108a-e or by rotating the section 208b.2 when using a body unit of the type illustrated in Fig 2b.

[0094] The above sequence of providing a suspended ceiling 100 is described for illustrative purposes. The skilled parson realizes that the above presented working moments may be carried out in virtually any order and still achieving the same result. In fact, when using a body unit 208c of the type illustrated in Fig. 2c any working moment may be carried out in any order once having access to the required material. It is also to be understood that the respective working moments may be carried out by different personnel at different times. Also, two or more working moments may be performed concurrently or with partial concurrence. All the above variations are within the scope of the disclosure.

[0095] Additionally, even though the invention has been described with reference to specific exemplifying embodiments thereof, many different alterations, modifications and the like will become apparent for those skilled in the art. For example, the body unit which in the shown embodiments has been illustrated as a single body may be formed as separate bodies, having at least one suspension member receiving path each.

[0096] Thus, variations to the disclosed embodiments may be understood and effected by the skilled addressee in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims. Furthermore, in the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality.

Claims

1. Suspended ceiling system (100, 500) for a room having a structural ceiling, said system (100, 500) comprising:

   a body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c) attachable to said structural ceiling,
   at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c), such as a wire, a line, a cable, a cord, a thread, and
   a ceiling tile (1 02a-e, 402, 502a-c) with sound absorbing properties,

   wherein each string like suspension member (1 04a-e, 204a-c, 304, 404, 504a-c, 604a-c) is attachable to said ceiling tile (1 02a-e, 402, 502a-c) at two attachment points (106a-e, 406),
   wherein said ceiling tile (102a-e, 402, 502a-c) is suspendable in said body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c) by means of said at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c), and
   wherein said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) for each of said at least two string like suspension members (1 04a-e, 204a-c, 304, 404, 504a-c, 604a-c) defines a suspension member receiving path (205a-c, 305) for reception thereof.

2. System (100, 500) according to claim 1, wherein each string like suspension member (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) comprises a length adjustment device (407, 407a) for adjusting a length of said string like suspension member (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) extending between said two attachment points (1 06a-e, 406) associated thereto.

3. System according (100, 500) to claim 1 or 2, wherein each of said suspension member receiving paths (205a-c, 305) defines two entries, wherein said entries of said suspension member receiving paths (205a-c, 305) are circumferentially distributed.

4. System (100, 500) according to claim 3, wherein said entries are evenly circumferentially distributed.

5. System (100, 500) according to any one of claims 1-4, wherein said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) comprises a locking element (303) for locking of said string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) in said receiving paths (205a-c, 305).

6. System (100, 500) according to any one of claims 1-5, wherein each one of said receiving paths (205a-c, 305) is a through channel extending through said body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c).

7. System (100, 500) according to any one of claims 1-6, wherein said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) comprises a marking 212b for laser alignment of said body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c).

8. System (100, 500) according to any one of claims 1-7, wherein said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) comprises two sections (208b.1, 208b.2) which are adjustable in relation to each other.

9. System (100, 500) according to claim 8, wherein said sections (208b.1, 208b.2) are rotatably adjustable in relation to each other.

10. System (100, 500) according to any one of claims 1-9, wherein said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) being arranged for sliding attachment of said body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c) to said ceiling by means of profile a element (509, 609a-c).

11. System (100, 500) according to any one of claims 1-10, wherein said ceiling tile (102a-e, 402, 502a-c) comprises mineral wool, glass wool and/or rock wool.

12. System (100, 500) according to any one of claims 1-11, wherein said string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) are attachable to said attachment points (1 06a-d, 406) by means of a hook element (407).

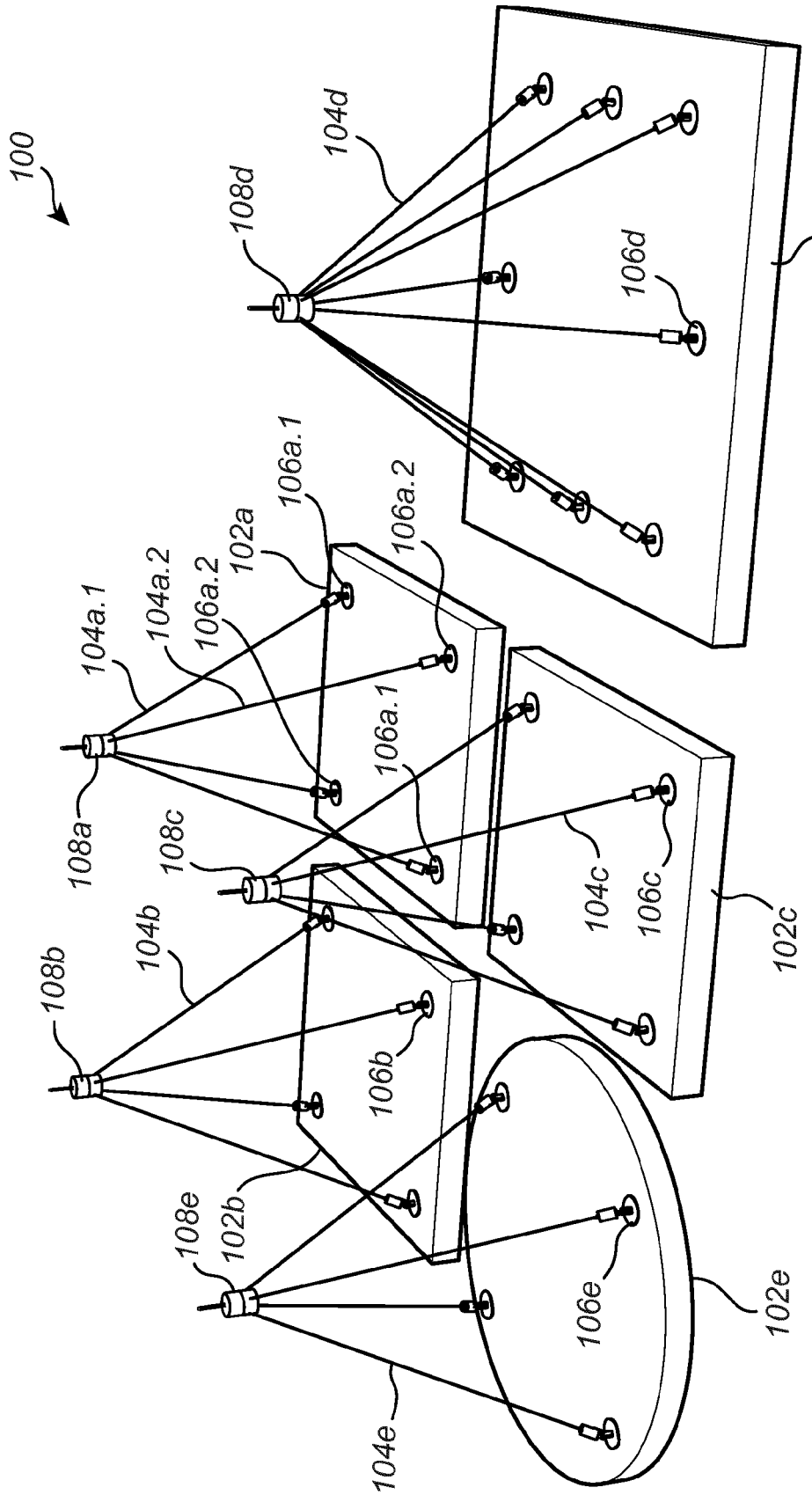
13. System (100, 500) according to claim 12 when referring to claim 2, wherein said length adjustment device (407, 407a) is integrated in said hook element (407).

14. Method for providing a suspended ceiling in a room having a structural ceiling, said method comprising:

providing at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c), such as a wire, a line, a cable, a cord, a thread,
providing a body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c), which body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c) for each of said at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) defines a suspension member receiving path (205a-c, 305) for reception thereof,
providing a ceiling tile (1 02a-e, 402, 502a-c),
attaching said body unit (1 08a-e, 208a-c, 308, 508a-c, 608 a-c) to said structural ceiling,
attaching each one of said string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) to said ceiling tile (102a-e, 402, 502a-c) at two attachment points (1 06a-e, 406),
receiving each one of said string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c) in said suspension member receiving paths (205a-c, 305),
suspending said ceiling tile (102a-e, 402, 502a-c) in said body unit (108a-e, 208a-c, 308, 508a-c, 608 a-c) by means of said at least two string like suspension members (104a-e, 204a-c, 304, 404, 504a-c, 604a-c).

15. Method according to claim 14, said method further comprising:

adjusting a length of said string like suspension member (1 04a-e, 204a-c, 304, 404, 504a-c, 604a-c) extending between said two attachment points (106a-e, 406) associated thereto.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104d
106d
102d
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106a.2
102a
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106b
108e
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102e
104e

Fig. 1

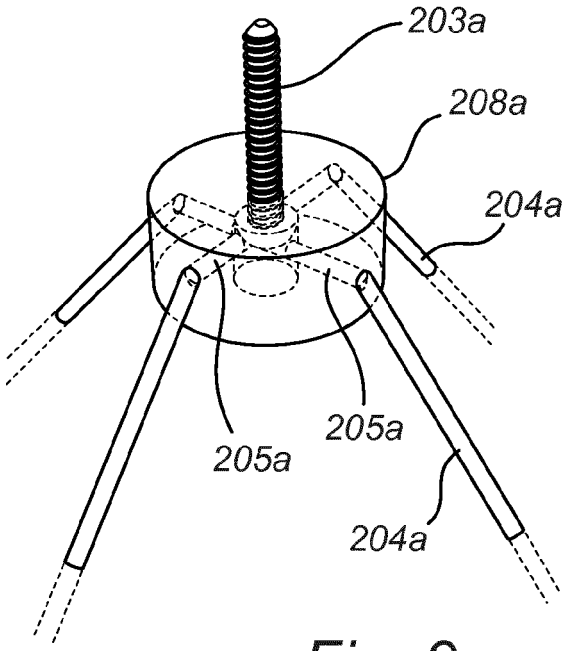


Fig. 2a

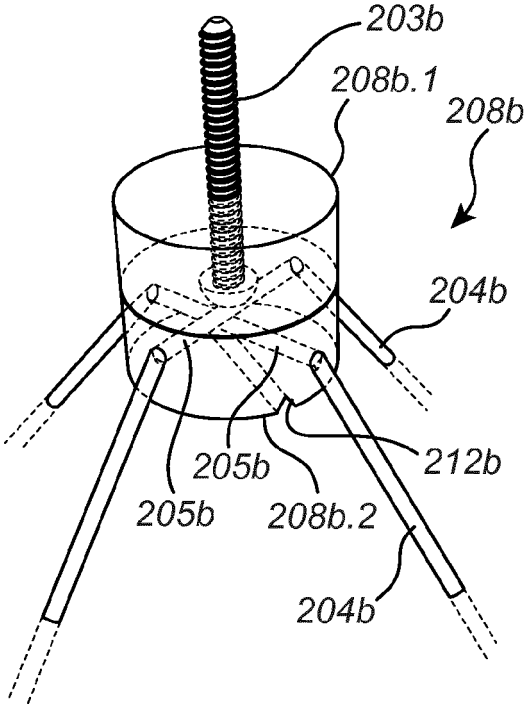


Fig. 2b

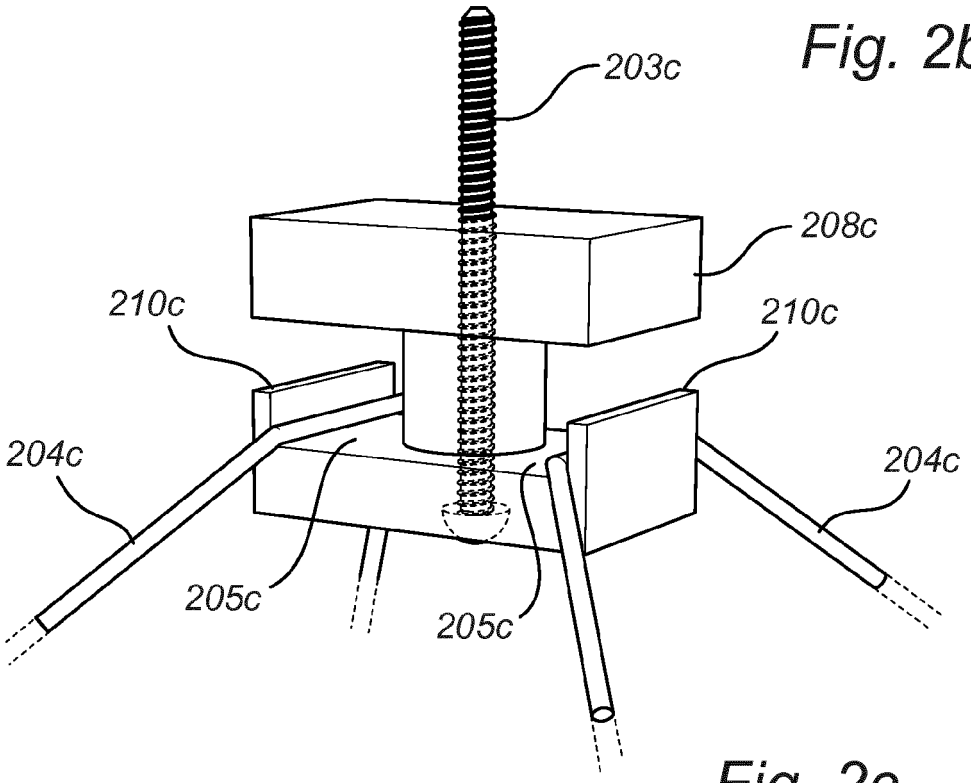
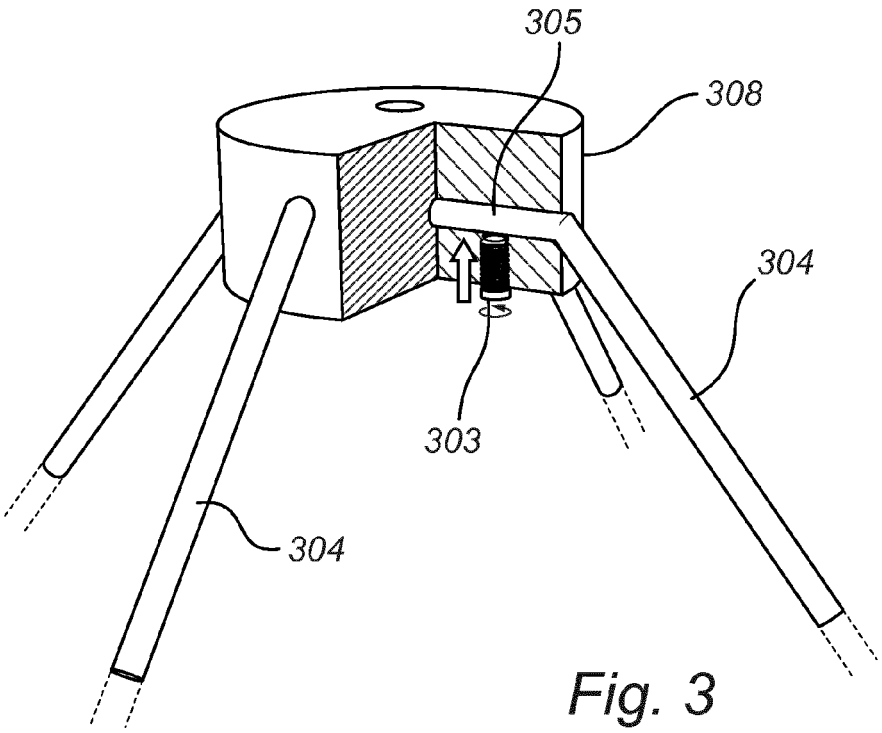


Fig. 2c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308
304
303
304

Fig. 3

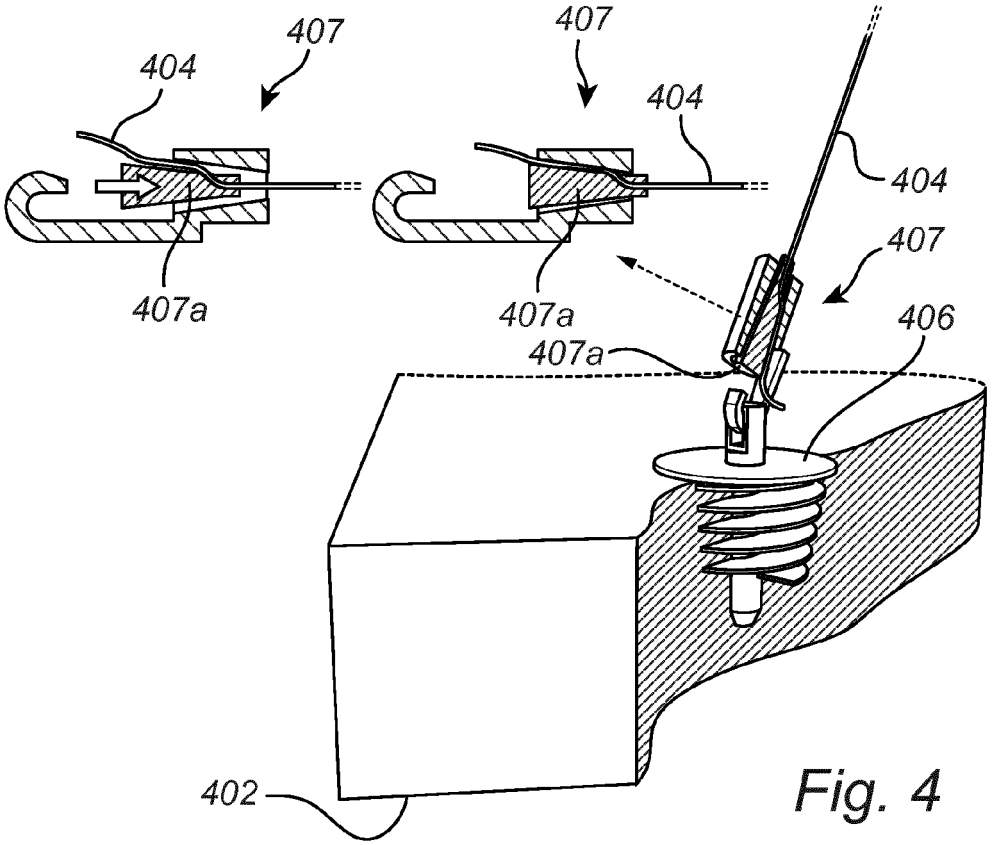
407
404
407
404
404
407
407a
407a
406
407a
402

Fig. 4

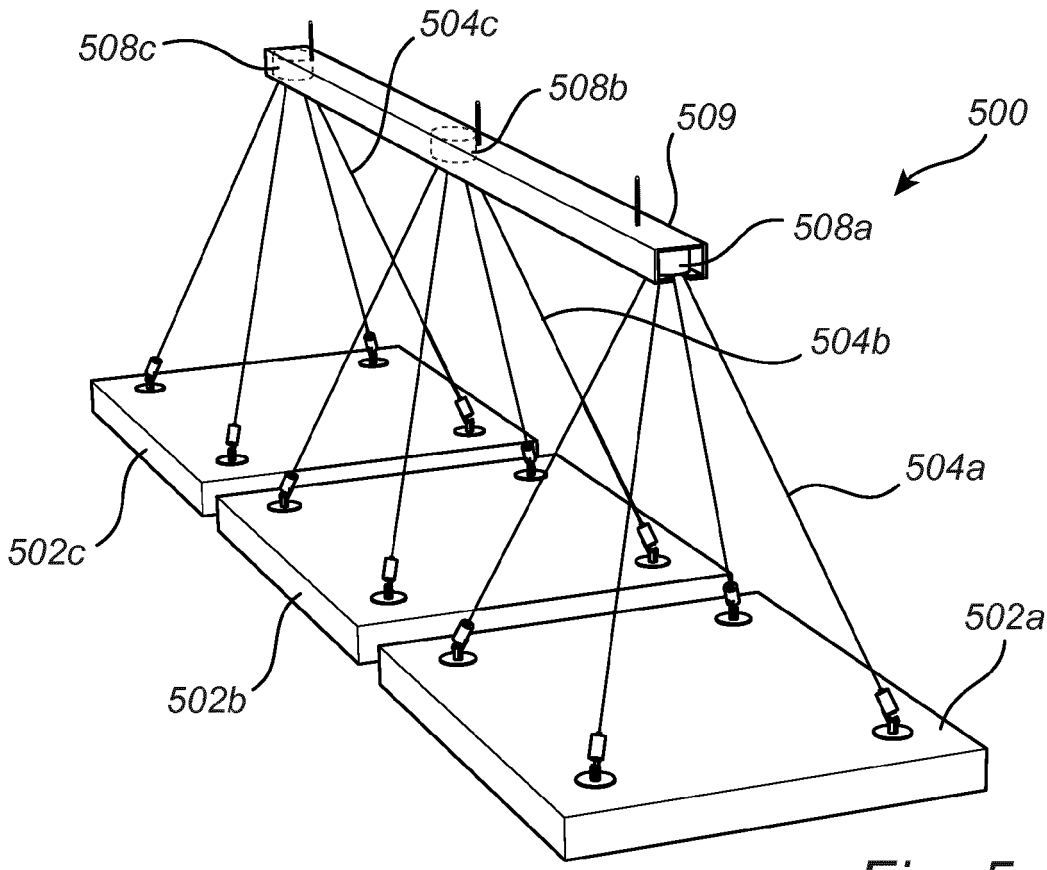

Fig. 5

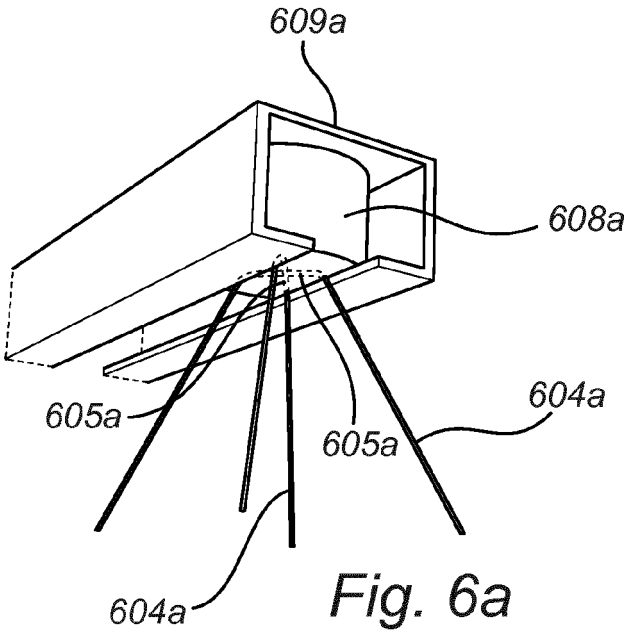

Fig. 6a

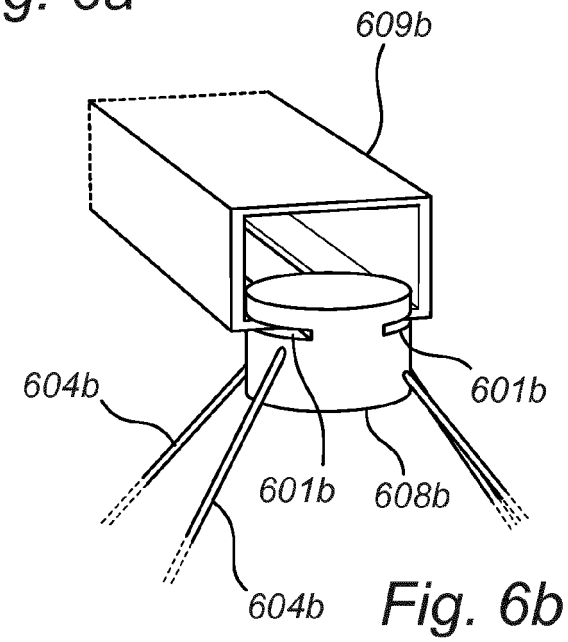

Fig. 6b

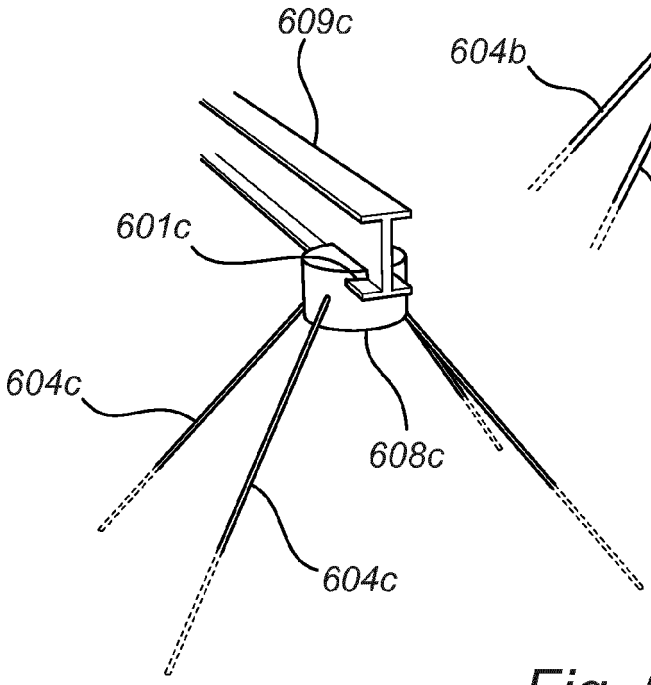

Fig. 6c

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EUROPEAN SEARCH REPORT

Application Number
EP 13 19 7127

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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A	DE 32 43 242 A1 (REITZ HERBERT WILHELM [DE]) 24 May 1984 (1984-05-24) * figure 1 * * page 6, paragraph 2 * * page 7, paragraph 2 *	1-3,6, 12,14,15	
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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
The Hague	13 May 2014	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

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13-05-2014

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