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(54) **MODULAR INNER-CLIMATE INFLUENCING APPLIANCE**

(57) Modular inner-climate influencing appliance (1) comprising a housing module (10) which comprises a fan (2) for obtaining an airflow from an inlet (3) to an outlet (4), a suction chamber (14) upstream the fan (2) and a pressure chamber (15) downstream the fan (2) and separated from each other by a separating wall (16). The separating wall (16) comprises a first opening (17) to which an inlet cone (2a) of the fan (2) is attached, and a sidewall (12b) of the suction chamber (14) comprises the inlet (3). The inner-climate influencing appliance (1) further comprises a climate module (20) connectable to the

housing module (10) and comprising at least one climate influencing device (21) and the outlet (4). The separating wall (16) comprises a center portion (16c) which comprises the first opening (17), at least two end portions (16a, 16b) each fixedly connected to a respective opposite sidewall (12a, 12b) of the housing module (10), and at least two connecting portions (16ca, 16cb) connected to the center portion (16c) on opposite sides of the opening (17) and extending towards the respective two end portions (16a, 16b) and connected to the respective end portions (16a, 16b) of the separating wall (16).

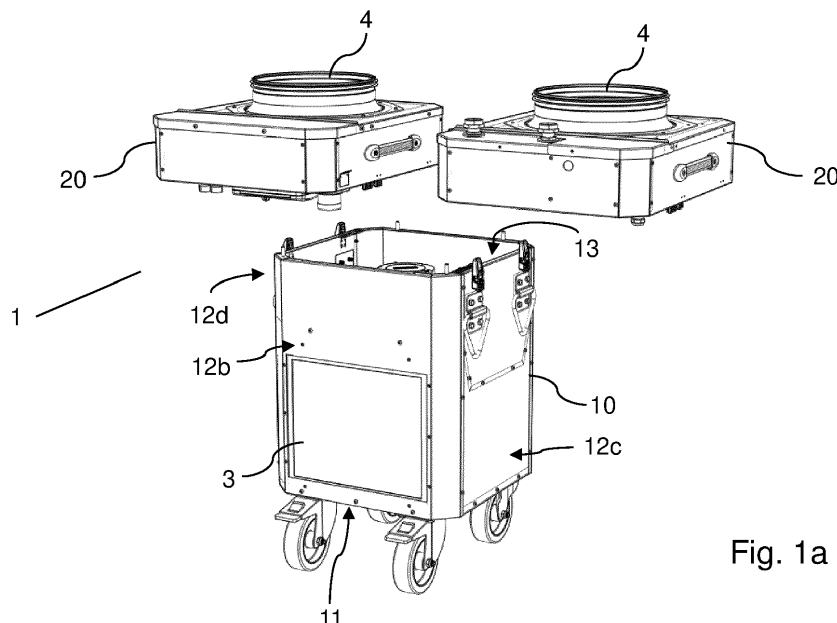


Fig. 1a

Description

Technical field

[0001] The present invention relates generally to a modular inner-climate influencing appliance which normally is used in connection with a temporary set up for influencing the inner-climate of a building site during construction of a building.

Background art

[0002] When a building is under construction there is a need of affecting and controlling the inner-climate at the building site for different reasons. One reason is to dry concrete or other building materials in the construction which main reason is to shorten the time before the building can be put into use. It is also of importance to provide an optimal climate for controlling for example the drying time of concrete, for maximum strength of the material. Another reason is to provide good working conditions for the construction workers on site. Typical climate influencing actions may be heating, cooling, dehumidifying, filtration of air, etc. The inner-climate influencing appliances have different sizes from small units to large units. The smallest units may be hand-held units or easily moved small units which are easy to carry for one person. Medium units may for example comprise wheels used for the relocation and may be relocated/moved by one or two construction workers. Large units are units which has to be moved by some machine like a crane or a forklift or the like.

[0003] The most common type of an inner-climate influencing appliance is probably the so-called fan heater, which may be a small or medium sized unit which more or less comprises a fan and a heater, where an electrical heater probably is the most common. The fan causes an airflow through the fan heater which air flow is heated by the electrical heater before the air flow leaves the appliance. Medium sized unit may for example be fan heaters with an electrical heater or a water coil, like a heating coil or cooling coil combined with a fan. The fan heater is of course electrically connected to an electricity supply network for the operation of the fan and the electrical heater and if applicable controls which controls the fan heater. If the inner-climate influencing appliance comprises both a fan and a water coil, the inner-climate influencing appliance is also connected to some supply of tempered water/fluid, like a district heating network or the like.

[0004] Prior art solutions normally are designed as one unit with integrated fan and heater (or cooler or the like) in one single unit, which means that one unit is specially designed for a single purpose. Since a lot of inner-climate influencing appliances are available to the market through rental companies, the rental companies need a lot of different types of machines to cover the needs of a building site and to cover the need of many building sites.

[0005] Another problem concern that especially the in-

ner-climate influencing appliances of medium and large size are bulky and produces noise, the latter is of course opposite the purpose of improvement of the inner-climate at the building site.

[0006] To summarize, there is a need of an inner-climate influencing appliance with a modular design which may reduce the need of different specialized appliances, each designed for one purpose. Other needs are the need of a less bulky and less noisy inner-climate influencing appliance.

Summary of invention

[0007] An object of the present invention is to provide solutions to the above described problems. These objects of are met by an inner-climate influencing appliance according to claim 1.

[0008] According to an aspect, a modular inner-climate influencing appliance arranged for temporary influencing an inner-climate of a building site, is disclosed. The inner-climate influencing appliance comprises a fan, arranged for obtaining an airflow through the inner-climate influencing appliance from an inlet to an outlet of the inner-climate influencing appliance. The fan comprises an impeller and a motor, and an inlet cone is arrangeable at an inlet center of the impeller. Further, the inner-climate influencing appliance comprises a housing module which comprises a bottom, sidewalls and an open top. The housing module further comprises a suction chamber and a pressure chamber, wherein the fan is arranged (physically) in the pressure chamber. The suction chamber is arranged upstream the fan and a pressure chamber is arranged downstream the fan seen in the airflow direction (which means that the air leaving the fan impeller in the radial direction enters the pressure chamber). The suction chamber is separated from the pressure chamber by a separating wall, wherein the separating wall comprises a first opening to which the inlet cone of the fan is attached. The suction chamber comprises the inlet (or inlets) of the inner-climate influencing appliance, which inlet is arranged in at least one sidewall of the sidewalls, and the pressure chamber comprises the open top downstream the fan for outflow of air from the pressure chamber of the housing module. The inner-climate influencing appliance further comprises a climate module to be arranged downstream the pressure chamber of the housing module and which is connectable to the housing module. The climate module comprises an inflow opening for inflow of the airflow to the climate module, which inflow opening faces the open top of the housing module when the climate module is connected to the housing module. The climate module further comprises at least one climate influencing device downstream the inflow opening, and the climate module further comprises the outlet of the inner-climate influencing appliance, wherein the outlet is arranged downstream the climate influencing device. The separating wall of the housing module further comprises a first wall portion/center portion which com-

prises the first opening, at least two second wall portions/end portions, each fixedly connected to at least a respective opposite sidewall of the housing module, and at least two third wall portions/connecting portions, connected to the center portion on opposite sides of the opening and extending towards the respective two end portions, and which further are connected to the respective end portions of the separating wall.

[0009] The separating wall is preferably made of steel sheet metal and may be one single wall/sheet or may be several walls/sheets which are connected to one separating wall. The separating wall may be flat or bent to a preferred design.

[0010] The type of fan which here is preferred, and which may be called a centrifugal fan, normally comprises a motor arranged directly to the fan/fan impeller and normally, this type of fan comprises a specially designed inlet cone, which follows the fan. The inlet cone is not physically connected to the impeller but arranged really close to the center of the impeller for providing a controlled inflow of air at the center of the fan. The air then leaves the impeller in the radial direction (centrifugally). This type of fan is as told preferred, but it is not necessary to use this specific type of fan. Other names for the preferred type of fan (centrifugal fan) may be plug-fan, chamber fan etc.

[0011] Such an inner-climate influencing appliance provides a modular design where the housing module comprises inlet, fan, suction chamber, pressure chamber etc. while a climate module of any kind may be connected, disconnected to the housing module, to provide an inner-climate influencing appliance of the kind needed for a special function. By that, one single housing may be used to provide several appliances with different functions such as heating, cooling, filtration, dehumidification (drying), humidification, or combinations thereof. This saves money and also space at the building site, since the same housing may be used for different functions during different states of the building process. No prior art provides such a flexible solution. Another advantage is the positioning of the fan relative the inlet. Since the inlet is arranged at a sidewall of the housing and the fan is arranged at the separating wall which extends between two opposite sidewalls of the housing, the inlet of the fan is not directed towards the inlet of the housing as in prior art solutions, which lowers the direct sound (noise) from the fan to outside the housing (i.e. noise via the inlet). It is also positive from sound aspect to relink the airflow as in the invention, from the airflow direction through the inlet to the main airflow direction through the fan, wherein the latter is the main airflow direction of the inner-climate influencing appliance.

[0012] According to an embodiment, the at least two connecting portions of the separating wall extends a distance in the airflow direction towards the respective two end portions of the separating wall and are connected to the respective two end portions, such as the center portion is arranged at a first level in the airflow direction and

the two end portions are arranged at a second level in the airflow direction. This means that the fan, which inlet cone is connected to the separating wall and arranged at the opening of center portion of the wall, is recessed - so to speak - in the separating wall. The separating wall is as mentioned above, preferably a steel sheet which in this embodiment is bent like a "U-form", which means that the center portion of the wall, with the opening and the inlet cone, is at the "bottom" of the U-form, while the end portions of the wall, which are connected to the sidewalls of the housing, are at the top of the shanks of the U-form and finally, the connecting portions connects the "bottom" with the "top" of the "U". By that, the fan is recessed into the separating wall, since the inlet cone is arranged in close connection to the inlet center of the fan impeller. By such a solution, the inner-climate influencing appliance is less bulky, since the total height/length of the housing module is reduced due to the recessed positioning of the fan in the separating wall. If looking at a section view from the side and compared to a flat separating wall, the separating wall "protrudes" a distance in direction from the pressure chamber "into" the suction chamber. This design also reduces noise, since a linking of the airflow occurs, when air is sucked through the inlet arranged in at least one sidewall and is sucked by the fan through the inlet cone arranged at the opening of the separating wall. The linking is more or less a right angle linking since the sidewall preferably is arranged in a right angle compared to the separating wall and the fan, which means that a main airflow direction from the inlet and through the fan is linked 90 degrees, which is positive concerning noise reduction. The noise is also reduced since the inlet of the fan (inlet cone) is not directed towards the inlet. The reduction of noise due to the inventive design also means that less or no noise dampening insulation is needed which means a less bulky and lighter inner-climate influencing appliance compared to prior art.

[0013] According to an embodiment, the climate module comprises a protruding part, which protrudes outside at least one of the sidewalls of the housing module, wherein the protruding part comprises controls and connections arranged for operating the inner-climate influencing appliance. The controls may be arranged for controlling the fan and the climate module, as well as controls for communication with cloud-based functions, main-control units, or other superior systems. The connections may be for example electrical power, connections to water systems like pipe connectors etc. By having a protruding part of the climate module, which comprises controls and connections, a larger area of the climate influencing device of the climate module is exposed for the airflow through the inner-climate influencing appliance, which is positive for many aspects. Firstly, the total height/length of the inner-climate influencing appliance may be lowered since a larger exposed airflow area means lower air speed and better heat transfer if heating or cooling, which in turn means less installed electric power (if electric heating is used) or lower temperature dif-

ference (if water based heating or cooling). This ends up in a lower height/thickness in the airflow direction of the climate module both due to heat transfer and due to that the available area is not occupied by the controls as in prior art solutions. Further, lower air speed also means lower pressure drop which is positive if a filter unit is the climate module and also may utilize shorter filters. Secondly, by having the connections at a protruding part, the connections may be positioned on the underside of the protruding part and by that a weather protection is achieved. Another positive aspect compared to prior art solutions is that because of the large area of the climate module, which is exposed for air flow, for example at electrical heaters, less electrical power is needed. This means lower temperature of the electrical heater which means that less or no heating insulation is needed in the climate module, which also means a less bulky climate module.

[0014] According to an embodiment, the climate module comprises an air duct arranged along at least one side of the inflow opening of the climate module, wherein the air duct comprises at least one first duct opening facing the pressure chamber of the housing module, when the climate module is connected to the housing module. The air duct is connected to the protruding part of the climate module and arranged to guide a cooling airflow from the pressure chamber via the first duct opening towards at least the controls arranged in the protruding part, such as the cooling airflow passes the controls. The climate module further comprises at least one outflow opening arranged for letting out said cooling airflow from the climate module. By having an air duct with an opening which faces, and thereby is connected to, the pressure chamber of the housing module, when the climate module is connected to the housing, and that the air duct is connected (open to) the interior of the protruding part, a simple and cost efficient solution for cooling the controls and electrical connections of the climate module is achieved. This means that a controlled amount of air (due to the size of the inflow opening) is guided from the pressure chamber to the air duct and further towards the outflow opening such as the airflow passes and cools the controls. The outlet opening may be a dedicated opening or may be an outflow through leakage in positions such as the airflow passes the controls. For example, the housing may comprise a lid arranged for access of the controls and connections and the leakage may be through or around the lid. Prior art solutions do not provide such simple and cost efficient solutions for cooling of the controls.

[0015] According to an embodiment, the suction chamber is arranged below the pressure chamber in a using position of the inner-climate influencing appliance, which using position is a position of the inner-climate influencing appliance on a substrate such as a floor or the like at a building site. This embodiment thereby discloses an upright standing inner-climate influencing appliance. Such a solution may comprise wheels arranged at the bottom

of the housing module.

[0016] According to an embodiment, the climate module is connectable to the housing module by locking means with a first locking part arranged at the climate module and a corresponding second part arranged at the housing module. The modular system where the climate module is to be connected to the housing module comprises the locking means for safety reasons and for practical reasons - to get a single unit when connected to each other. The locking means may for example be four locking means with first locking parts arranged on the sidewalls near the open top of the housing module and with corresponding second locking parts arranged around the sidewalls near the inflow opening of the climate module. It is preferred that electrical connectors are arranged at the respective modules such as power supply and control signals may be transferred between the modules when connected to each other.

[0017] According to an embodiment, an upper edge of the inlet of the inner-climate influencing appliance is arranged in the at least one sidewall at a third level between the first level and the second level seen in the airflow direction. This means that the inlet has an extension "above" the center portion with the opening where the inlet of airflow to the fan is arranged, and the upper edge of the inlet is thus positioned in the sidewall at a level, seen in the main airflow direction through appliance, between the level of the center portion and the level of the end portions of the separating wall. This is positive especially for the medium and large inner-climate influencing appliances, since large airflow is handled which needs larger inlet/inlets but it is also positive due to noise reduction since a better linking of the airflow is achieved.

[0018] According to an embodiment, the upper edge of the inlet comprises an inlet wall part which protrudes from the at least one sidewall in direction towards the nearest connecting portion, wherein the inlet wall part and the connecting portion together with the sidewall forms a protection area of the suction chamber, in which at least one climate sensor is arranged. This enables a protected positioning of climate sensors, for example humidity sensor, temperature sensor, pressure sensor etc., wherein they are protected from dust, water, physical impact (demolition) which might occur during filter exchange or cleaning of the suction chamber. The positioning of a pressure sensor also enables the use of short pressure hoses, to measure pressure drop over the filter as well as the pressure difference between suction chamber and pressure chamber. The positioning of a pressure sensor in the protection area is also positive due to low disturbance from airflow, since the protection area is more or less free from turbulence.

[0019] According to an embodiment, the at least one climate influencing device of the climate module is a coil. By a coil is normally meant a "water coil" or a coil where a fluid of some kind is circulating for heating or cooling the airflow on passage through the inner-climate influencing appliance. For example, the climate influencing

device may be a cooling coil and in that case the climate module may need one or several drainage outlet for condensation water, which may be arranged at the protruding part of the climate module and/or in the bottom of the housing as well as at the bottom of the separating wall. The cooling coil may be connected to some kind of superior cooling system. The climate influencing device may also be a heating coil, which in that case is connected to a superior heating system like a district heating system or an internal building site heating system connected to a district heating system or the like.

[0020] According to an embodiment, the at least one climate influencing device of the climate module is an electrical heater. The electrical heater may be in the form of one or several heated, flanged or not flanged, electrically coupled rod or the like, which is a common solution on the market. It is preferred to use a special kind of flanged electrical heater with a large heat transferring surface and with a special fin structure to lower the power consumption and surface temperature of the electric heater, which also means less or no need of heating insulation.

[0021] According to an embodiment, the at least one climate influencing device of the climate module is an air cleaning device. The air cleaning device is climate influencing to the inner climate of a building site and may be in the form of a filter unit, an ozone air purifier or the like.

[0022] According to an embodiment, the at least one climate influencing device of the climate module is a dehumidifier. By arranging a dehumidifier as the climate module an airflow may be driven through the inner-climate influencing appliance by means of the fan, which airflow is dehumidified. For example, this may be used for drying construction materials as concrete. One other option could be a humidifier as the climate influencing device.

[0023] According to an embodiment, the climate module comprises two or more climate modules arranged in the airflow direction after each other. By such a solution, a number of different functions may be connected to the same housing module which gives a possibility to control the inner-climate regarding more parameters than just one single function. The modular inventive concept is also applicable to this solution by for example that all modules are connectable to each other with the same inventive concept as described above.

[0024] According to an embodiment, the housing and the climate module each comprises electrical connection means which are connectable to each other for providing electrical power and/or control signals between the modules. By using a standardized set of connection means all modules may be connected to the housing modules and the operation of the modules are facilitated through the connections.

[0025] According to an embodiment, an inlet grille is arranged at the center portion of the separating wall on a side facing the suction chamber of the housing, wherein the inlet grille is arranged to cover the first opening. When

the airflow passes the inlet grille and further via the inlet cone to the fan, the noise is reduced by the characteristics of the inlet grille. The redirection/linking of airflow together with the functionality of the inlet grille and the positioning of the fan/the separating wall in relation to the inlet of the housing, provide a far better noise reduction which is very positive for the inner-climate at the building site.

[0026] According to an embodiment, the suction chamber comprises at least two inlets, arranged at opposite sidewalls of the housing module. As mentioned above, larger airflows may need a great inlet area which means that at least two inlets are arranged at opposite sidewalls of the housing suction chamber. Of course three or four inlets may also be applicable.

Brief description of drawings

[0027] The invention is now described, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 a shows an isometric view of a modular inner-climate influencing appliance according to the invention, with a housing and two types of climate modules connectable to the housing.

Fig. 1b shows the modular inner-climate influencing appliance of Fig. 1a with a first type of climate module attached to the housing, which first type of climate module comprises an electrical heater arranged for heating of an airflow.

Fig. 1c shows the modular inner-climate influencing appliance of Fig. 1a with a second type of climate module attached to the housing, which second type of climate module comprises a water coil, arranged for heating or cooling an airflow.

Fig. 2 shows a section view of the modular inner-climate influencing appliance of Fig. 2b.

Fig. 3a shows a side view of the modular inner-climate influencing appliance of Fig. 2b.

Fig. 3b shows an isometric view of the first and the second type of climate modules of the modular inner-climate influencing appliance.

Fig. 3c shows an isometric view of the housing of the modular inner-climate influencing appliance.

Fig. 4a shows a view of the underside of the first type of climate module.

Fig. 4b shows a section view of the first type of climate module.

Description of embodiments

[0028] In the following, a detailed description of a modular inner-climate influencing appliance 1 according to the invention is disclosed in detail in respect of embodiments and in reference to the accompanying drawings. All examples herein should be seen as part of general description and therefore possible to combine in any way in general terms.

[0029] Fig. 1 shows an isometric view of the modular inner-climate influencing appliance 1, which comprises a housing 10 and two types of climate modules 20 connectable to the housing 10. The climate module 20 is detachably connectable to the housing 10 to provide a modular concept of changing climate modules 20 such as the same housing 10 may be used for different functions such as for example heating, cooling, humidification, dehumidification, filtration etc. The housing module 10 comprises a bottom 11, sidewalls 12a-d and an open top 13, and further a fan 2 (not directly visible). At least one of the sidewalls 12b comprises an inlet 3, which is arranged to allow an airstream to enter the housing module 10 upon operation of the fan 2. The open top 13 is arranged downstream the fan 2 for outflow of air the housing module 10 and is more or less complete open in direction towards the climate module 20. The climate module 20 is connectable to the housing 10 with an inflow side which faces the open top 13 of the housing module 10, when the climate module 20 is connected to the housing module 10, and the climate module 20 comprises an outlet 4 arranged for outflow of air from the climate module.

[0030] Fig. 1b shows the modular inner-climate influencing appliance 1 arranged with a first type of climate module 20 attached to the housing 10, which first type of climate module 10 comprises an electrical heater arranged for heating of an airflow. The electrical heater is not visible but will be explained further below. On the same side as the front side 12b of the housing 10, which is the same side where the inlet 3 also is arranged at the housing, a lid 29 is arranged along the front side of the top of the climate module 20, which lid 29 is arranged for access to controls and connections inside the climate module 20 of course for protection of the same.

[0031] Fig. 1c shows the modular inner-climate influencing appliance 1 arranged with a second type of climate module 20 attached to the housing 10, which second type of climate module 20 comprises a water coil, arranged for heating or cooling an airflow. Also this climate module 20 comprises the lid 29 for access to controls etc. Separated from the electrical equipment is a number of connections 6 arranged, which in this particular case are pipe connectors arranged for connecting the water coil to a central heating or cooling system.

[0032] Fig. 2 shows a section view of the modular inner-climate influencing appliance 1, which comprises two main modules, the housing module 10 and the climate module 20. In this figure, the inner-climate influencing

appliance 1 is of the type called "fan heater", arranged for heating of an air stream which is obtained by the operation of the fan 2. The main function of the appliance 1 is that an airflow is obtained from an inlet to an outlet (see symbolic arrows), where the airflow is conditioned somehow, in this case heated, during the airflow through the appliance 1. A main airflow direction z through the inner-climate influencing appliance 1 is achieved upon operating the fan 2, that is more or less an upwardly directed airflow in the preferred embodiment. The fan 2 is as mentioned arranged for obtaining an airflow through the inner-climate influencing appliance 1 from the inlet 3 to an outlet 4 of the inner-climate influencing appliance 1. The fan 2 comprises an impeller 2a, a motor 2b, and an preferred inlet cone 2c, which inlet cone 2c is arrangeable at an inlet center of the impeller 2a. This preferred type of fan 2 is called a centrifugal fan and comprises the specially designed inlet cone 2c, which so to speak "follows the fan". The inlet cone 2c is not physically connected to the impeller 2a but arranged really close to the center of the impeller 2a for providing a controlled inflow of air at the center of the fan 2. The air then leaves the fan 2 via the impeller 2a in the radial direction (centrifugally outwards, see symbolic arrows). Other names than centrifugal fan may be plug-fan, chamber fan etc. The fan 2 may of course be another type of fan, also a type without an inlet cone 2c.

[0033] The housing module 10 comprises as mentioned above the bottom 11, the sidewalls 12a-d and the open top 13. The housing module 10 is divided into a suction chamber 14 and a pressure chamber 15 wherein the suction chamber 14 is separated from the pressure chamber 15 by a separating wall 16 and the suction chamber 14 is arranged upstream the fan 2 and the pressure chamber 15 is arranged downstream the fan 2 seen in the main airflow direction z. The fan 2 is physically arranged in the pressure chamber 15 which means that the air which leaves the impeller 2a centrifugally enters the pressure chamber 15 when leaving the fan blade. The fan 2 is arranged at a bracket 2d which is attached to the separating wall 16, wherein the fan 2 is arranged with its inlet opening of the impeller center close to inlet cone 2c. The separating wall 16 comprises a center portion 16c which comprises a first opening 17 and at least two end portions 16a, 16b, each fixedly connected to at least respective opposite sidewalls 12a, 12b of the housing module 10. Two connecting portions 16ca, 16cb are connected to the center portion 16c on opposite sides of the opening 17 and extending towards the respective two end portions 16a, 16b and are connected to the respective end portions 16a, 16b. The inlet cone 2c is arranged at the opening 17 of the separating wall 16 to facilitate a smooth and controlled airflow from the suction chamber 14 to the inlet center of the fan impeller 2a. The inlet 3 of the housing module 10 is arranged at the suction chamber 14, in at least one sidewall 12b of the sidewalls 12a-d. In Fig. 2, the inner-climate influencing appliance 1 is of medium size and the airflow to be handled by the inner-

climate influencing appliance 1 is relatively great, why two inlets 3 are needed. The inlet 3 may comprise a filter of some kind, which may be a "simple" air filter or a more advanced filter like a HEPA-filter. The outlet from the housing 10 is the same as the open top 13, which is arranged in the pressure chamber 15 downstream the fan 2.

[0034] Depending on the size of the inner-climate influencing appliance 1, the separating wall 16 may have different designs. For small airflows, the separating wall 16 may be flat, and for larger airflows (i.e. medium to large appliances) the separating wall 16 has the form like in Fig. 2, that is with an extension of the wall 16 in the airflow direction z. In this case the two connecting portions 16ca, 16cb extends in direction towards the respective two end portions 16a, 16b of the separating wall 16, wherein the center portion 16c is arranged at a first level z_1 in the airflow direction z and the two end portions 16a, 16b are arranged at a second level z_2 in the airflow direction z. At least for medium or large inner-climate influencing appliances 1 the center portion 16c of the separating wall 16 is arranged below an upper edge 3b of the inlet 3 seen in the using position of the inner-climate influencing appliance 1, i.e. when positioned on a floor in an upright position like in Fig. 2. Thus, the upper edge 3b of the inlet 3 is arranged in the at least one sidewall 12b at a third level z_3 between the first level z_1 and the second level z_2 seen in the main airflow direction z of the inner-climate influencing appliance 1. Further, the upper edge 3b of the inlet 3 comprises an inlet wall part 3b which protrudes from the at least one sidewall 12b in direction towards the nearest connecting portion 16cb, wherein the inlet wall part 3b and the connecting portion 16cb together with the sidewall 12b forms a protection area p of the suction chamber 14, in which at least one climate sensor is arranged (not visible). The protection area p enables a protected positioning of the climate sensors, which for example may be a humidity sensor, a temperature sensor, a pressure sensor etc. As may be seen in Fig. 2, the protection area p provides an area/volume in which the sensors are protected from for example dust and water. They are also protected from physical impact which might occur during for example filter exchange or cleaning of the suction chamber. The protection area p is not a closed area but provides a "calm" volume of the suction chamber 14, which despite the contact with the suction chamber 14 provides an air volume more or less free from turbulence which is positive for the accuracy of measurements of for example a pressure sensor. The positioning of a pressure sensor also enables the use of short pressure hoses, to measure pressure drop over the filter as well as the pressure difference between suction chamber and pressure chamber.

[0035] The climate module 20 is to be arranged downstream the pressure chamber 15 of the housing module 10 and is connectable to the housing module 10. The climate module 20 comprises an inflow opening 22 (see Fig. 4a-b) for inflow of the airflow to the climate module

20 and which inflow opening 22 faces the open top 13 of the housing module 10 when the climate module 20 is connected to the housing module 10. The climate module 20 further comprises at least one climate influencing device 21 downstream the inflow opening 22 and the climate module 20 further comprises the outlet 4 of the inner-climate influencing appliance 1. The outlet 4 is arranged downstream the climate influencing device 21. The climate influencing device 21 may for example be a coil, like a "water coil" or a coil where a fluid of some kind is circulating for heating or cooling the airflow on passage through the inner-climate influencing appliance 1. For example, the climate influencing device 21 may be a cooling coil and in that case the climate module 20 may need a drainage outlet for condensation water. The cooling coil may be connected to a superior cooling system. The climate influencing device 21 may also be a heating coil, which in that case is connected to a superior heating system like a district heating system or an internal building site heating system, connected to a district heating system or the like. In Fig. 2, the at least one climate influencing device 21 is an electrical heater in the form of a cluster of heating rods or heated threads with or without flanges. It is preferred to use a special kind of flanged electrical heater with a large heat transferring surface and with a special fin structure to lower the power consumption and surface temperature of the electric heater, which also means less or no need of heating insulation in the climate module 20.

[0036] The climate module 20 comprises a protruding part 23, which protrudes outside at least one of the sidewalls 12b of the housing module 10 when the climate module 20 is connected to the housing module 10. The protruding part 23 comprises controls 5 and connections 6 arranged for operating the inner-climate influencing appliance 1. The connections 6 may be for example electrical power connections and the controls 5 may be comprise controls for example the fan 2, the electrical heater 21, sensors and communication equipment etc., to be able to measure, evaluate, and control the indoor-climate at the building site in best possible way. This, to keep for example the time schedule of the building process and in operating the inner-climate influencing appliance 1 in the most environmentally friendly way. Especially the controls 5 but sometimes also the connections 6 have to be cooled down to not be overheated and for obtaining a longer lifetime. This is taken care of by that the climate module 20 comprises an air duct 25 along at least one side 20d, through which air is drawn from the pressure chamber 15 and which air upon its way out to the free (outside the heating module) passes the controls 5 and preferably the connections 6. This is further explained in connection to Fig. 4a-b.

[0037] An inlet grille 19 is arranged at the center portion 16c of the separating wall 16 on a side facing the suction chamber 14 of the housing 10. The inlet grille 19 "covers" the first opening 17, such as the airflow passes the inlet grille 19 on its way from the suction chamber 14, via the

fan 2 to the pressure chamber 15. Looking to Fig. 2, air is drawn from the room in a horizontal direction into the suction chamber 14. The air is then changing direction vertically upwards (to the airflow direction z), and flows up through the inlet grille 19, via the opening 17 and is guided by the inlet cone 2c and flows further into the center of the fan impeller 2a. The fan 2 throws the air radially outwards to the pressure chamber 15, wherefrom the air enters the climate module 20 in a vertical direction z and then leaves to the free via the outlet 4. The redirection of airflow together with the functionality of the inlet grille 19 and the positioning of the fan 2 at the center portion 16c of the separating wall 16, in relation to the inlet 3 of the housing 10, provide a good noise reduction which is very positive for the inner-climate at the building site.

[0038] Fig. 3a shows a side view of the modular inner-climate influencing appliance 1, Fig. 3b shows an isometric view of the first and the second type of climate modules 20 and Fig. 3c shows an isometric view of the housing module 10. Most preferred is to use the inner-climate influencing appliance 1 in an upright using position like in Fig. 3a, where the housing 10 is arranged below the climate module 20. It is clear from the figure that the protruding part 23, which protrudes a distance relative the front wall 12b of the housing when the climate module 20 is connected to the housing 20, enables a protection of the connections 6, both like a weather protection and a physical protection due to the protected location. The climate module 20 may be fixedly connected to the housing module 10 by locking means 30, with a first locking part 30a arranged at the climate module 20 and a corresponding second part 30b arranged at the housing module 10. It is preferred that the climate module 20 comprises the outlet 4, but of course, it is possible to have the outlet 4 as a connectable "lid-part" including the outlet 4, which then may be connected to the housing portion. Especially, if a number of climate modules 20 are arranged after (on top of) each other, to provide an inner-climate influencing appliance 1 with more than one function, like heating and filtration or the like. To access the controls 5, the climate module comprises a lid 29, which preferably is attached to the top cover in an articulated manner. The "dotted" arrow at the top left corner of Fig. 3a and in Fig. 3b symbolically shows how the small "cooling airflow", which is led via the air duct 25 (see Fig. 4b) for cooling of the controls 5, flows out via leakage, which is a designed way of letting the cooling air out. Of course, a separate outlet may be used for the same purpose. The housing module 10 may also comprise lifting loops 65 and wheels 70 to facilitate and easy moving of the inner-climate influencing appliance 1 and the climate module 20 may comprise handles 60.

[0039] In Fig. 3b, the left climate module 20 is provided with an electrical heater why the lid 29 covers the whole top of the protruding part 23 and the controls 5 and connections 6 are accessible under the lid 29 and some of them from the underside. The right climate module 20 is

provided with a water coil, why the water connections 6 like pipe couplings may be arranged at one side of the protruding part 23 (for connection upwards) and the electrical controls and connections 6 at the other side of the protruding part 23. Another modular design feature is that the climate module 20 and the housing module 10 each comprises electrical connection means 40, which are connectable to each other for providing electrical power and/or control signals to and between the modules 10, 20. This is also a safety feature since the power supply to the fan motor 2b is switched off when disconnection the climate module 20 from the housing module 10. The fan motor 2b and the pressure chamber 15 is as seen in Fig. 3c accessible from the open top 13 of the housing module 10. The suction chamber 14 is accessible via the inlet 3 by removing a filter module or inlet grid from the inlet 3.

[0040] Fig. 4a shows a view of the underside of the first type of climate module 20 including an electrical heater and Fig. 4b shows a section view of the first type of the same. As seen in the figures, the inflow opening 22 is large wherein a large area is accessible for the airflow through the climate module 20 which is positive. For example when the climate influencing device 21 is an electrical heater, like in Fig. 4a-b, the large area means an effective heat transfer which, enables the use of an electrical heater with less power which in turn leads to lower or no need of heating insulation of the climate module 20. One problem with known fan heaters with electrical heaters is that the inflow area is quite small, why a high power electrical heater is needed which leads to the use of heating insulation and thereby the fan heater gets bulky.

[0041] The climate module 20 comprises as mentioned before an air duct 25, which is arranged along at least one side 20d of the inflow opening 22 of the climate module 20. In Fig. 4b, it may be seen that the air duct 25 is arranged along three sides of the climate module 20 like an air duct 25 surrounding the inflow opening 22 where walls separates the air duct 25 from the inflow opening 22. The air duct is connected to/open towards the protruding part 23 of the climate module 20 and is arranged to guide a cooling airflow from the pressure chamber 15 via a first duct opening 26 towards at least the controls 5 arranged in the protruding part 23. By that the climate module 20 further comprises at least one outflow opening arranged for letting out said cooling airflow from the climate module 20 to the free, the cooling airflow passes the controls 5 and thereby cools down the controls. The duct opening 26 may be a hole with a tested size to provide a wanted volume of air to the air duct 25. The outflow opening may be a dedicated outflow hole or as mentioned above, leakages for example around the lid 29. The electrical connection means 40 for a modularized electrical connection between the climate module 20 and the housing module 10 may also be seen in Fig. 4a-b.

[0042] Although the description above contains a plurality of specificities, these should not be construed as

limiting the scope of the concept described herein but as merely providing illustrations of some exemplifying embodiments of the described concept. It will be appreciated that the scope of the presently described concept fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the presently described concept is accordingly not to be limited. Reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more."

Claims

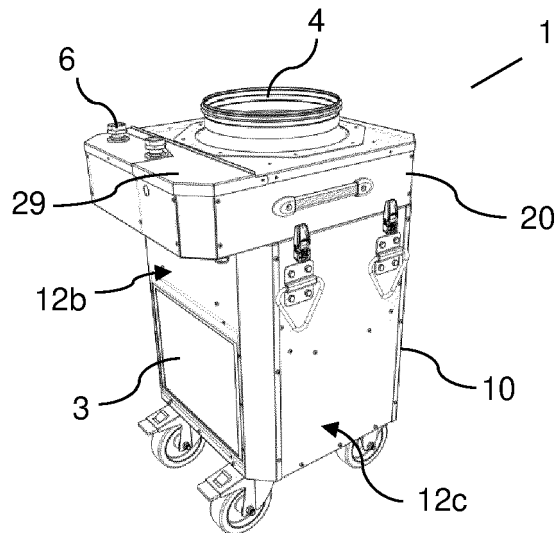
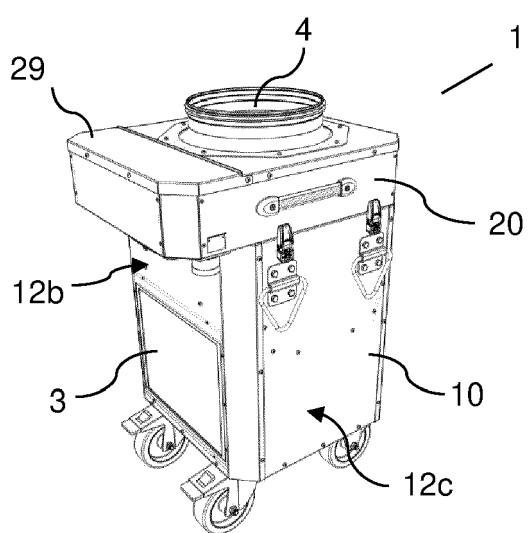
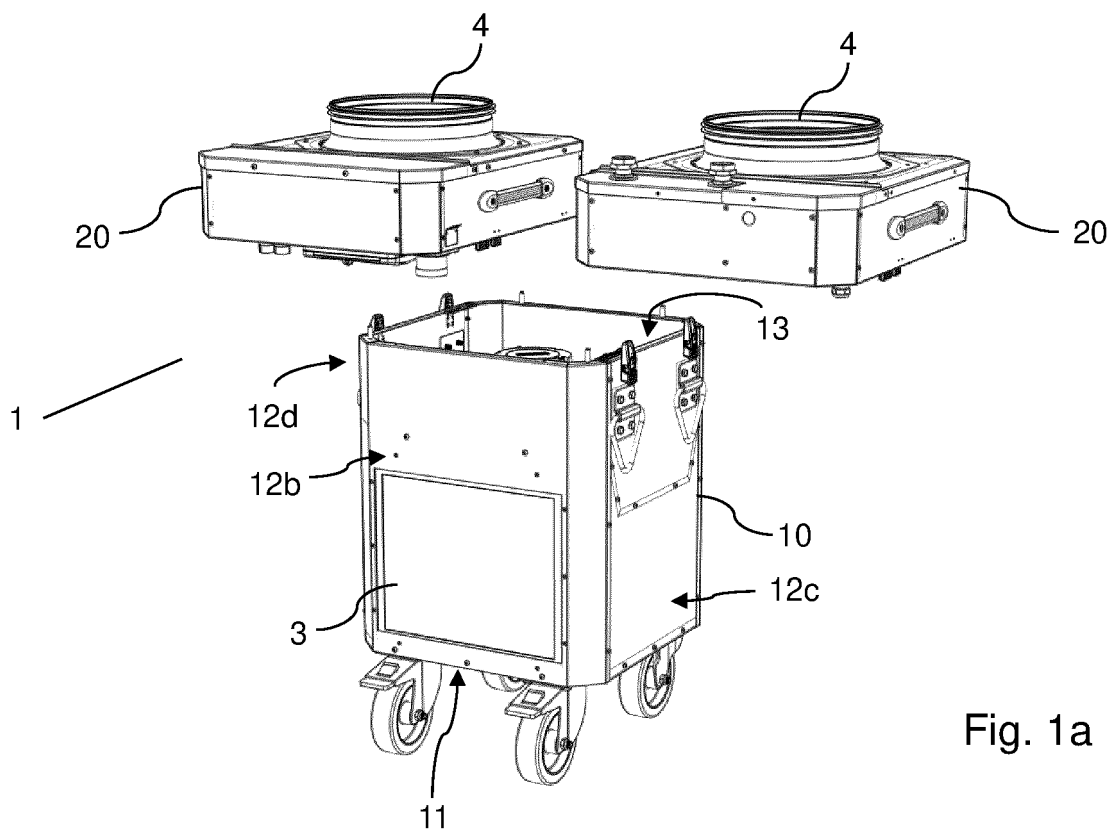
1. A modular inner-climate influencing appliance (1) arranged for temporary influencing an inner-climate of a building site, the inner-climate influencing appliance (1) comprising:
 - a fan (2), arranged for obtaining an airflow through the inner-climate influencing appliance (1) from an inlet (3) to an outlet (4) of the inner-climate influencing appliance (1), the fan (2) comprises an impeller (2a) a motor (2b), and an inlet cone (2c) is arrangeable at an inlet center of the impeller (2a),
 - a housing module (10) comprising a bottom (11), sidewalls (12a-d) and an open top (13), the housing module (10) further comprises a suction chamber (14) and a pressure chamber (15), wherein the fan (2) is arranged in the pressure chamber (15), and the suction chamber (14) is arranged upstream the fan (2) and a pressure chamber (15) is arranged downstream the fan (2) seen in the airflow direction, wherein the suction chamber (14) is separated from the pressure chamber (15) by a separating wall (16), wherein the separating wall (16) comprises a first opening (17) to which the inlet cone (2a) of the fan (2) is attached, and the suction chamber (14) comprises the inlet (3) of the inner-climate influencing appliance (1) which inlet (3) is arranged in at least one sidewall (12b) of the sidewalls (12a-d), and the pressure chamber (15) comprises the open top (13) downstream the fan (2) for outflow of air from the pressure chamber (15) of the housing module (10),
 - a climate module (20) to be arranged downstream the pressure chamber (15) of the housing module (10) and connectable to the housing module (10), wherein the climate module (20) comprises an inflow opening (22) for inflow of the airflow to the climate module (20), which inflow opening (22) faces the open top (13) of the housing module (10) when the climate module (20) is connected to the housing module (10), and the climate module (20) further comprises at least one climate influencing device (21) downstream the inflow opening (22) and the climate module (20) further comprises the outlet (4) of the inner-climate influencing appliance (1), wherein the outlet (4) is arranged downstream the climate influencing device (21), wherein the separating wall (16) of the housing module (10) further comprises:
 - a center portion (16c) which comprises the first opening (17),
 - at least two end portions (16a, 16b) each fixedly connected to at least a respective opposite sidewall (12a, 12b) of the housing module (10),
 - at least two connecting portions (16ca, 16cb) connected to the center portion (16c) on opposite sides of the opening (17) and extending towards the respective two end portions (16a, 16b) and connected to the respective end portions (16a, 16b) of the separating wall (16).
2. Modular inner-climate influencing appliance (1) according to claim 1, wherein the at least two connecting portions (16ca, 16cb) of the separating wall (16) extends a distance in the airflow direction (z) towards the respective two end portions (16a, 16b) of the separating wall (16) and are connected to the respective two end portions (16a, 16b), such as the center portion (16c) is arranged at a first level (z₁) in the airflow direction (z) and the two end portions (16a, 16b) are arranged at a second level (z₂) in the airflow direction (z).
3. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the climate module (20) comprises a protruding part (23) which protrudes outside at least one of the sidewalls (12b) of the housing module (10), wherein the protruding part (23) comprises controls (5) and connections (6) arranged for operating the inner-climate influencing appliance (1).
4. Modular inner-climate influencing appliance (1) according to claim 3, wherein the climate module (20) comprises an air duct (25) arranged along at least one side (20d) of the inflow opening (22) of the climate module (20), wherein the air duct (25) comprises at least one first duct opening (26) facing the pressure chamber (15) of the housing module (10) when the climate module (20) is connected to the housing module (10), and the air duct (25) is connected to the protruding part (23) of the climate module (20) and arranged to guide a cooling airflow from the pressure chamber (15) via the first duct opening (26) towards at least the controls (5) arranged in the protruding part (23), such as the cooling airflow passes the controls (5), wherein the climate module (20) fur-

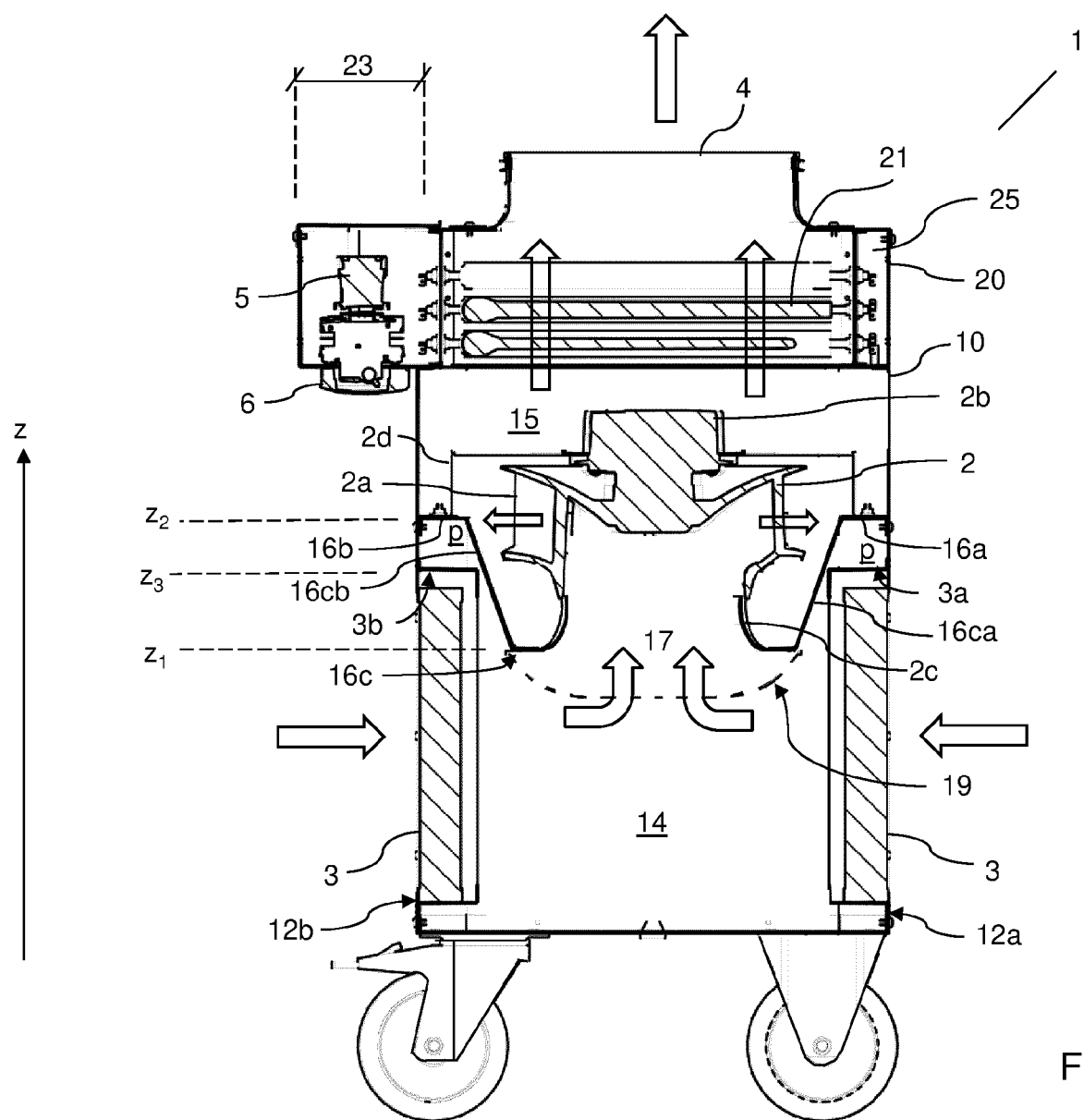
ther comprises at least one outflow opening arranged for letting out said cooling airflow from the climate module (20).

5. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the suction chamber (14) is arranged below the pressure chamber (15) in a using position of the inner-climate influencing appliance (1), which using position is a position of the inner-climate influencing appliance (1) on a substrate such as a floor or the like at a building site. 5
6. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the climate module (20) is connectable to the housing module (10) by locking means (30) with a first locking part (30a) arranged at the climate module (20) and a corresponding second part (30b) arranged at the housing module (10). 10
7. Modular inner-climate influencing appliance (1) according to any of claims 2 - 6, wherein an upper edge (3b) of the inlet (3) of the inner-climate influencing appliance (1) is arranged in the at least one sidewall (12b) at a third level (z_3) between the first level (z_1) and the second level (z_2) seen in the airflow direction (z). 15
8. Modular inner-climate influencing appliance (1) according to claim 7, wherein the upper edge (3b) of the inlet (3) comprises an inlet wall part (3b) which protrudes from the at least one sidewall (12b) in direction towards the nearest connecting portion (16cb), wherein the inlet wall part (3b) and the connecting portion (16cb) together with the sidewall (12b) forms a protection area (p) of the suction chamber (14), in which at least one climate sensor is arranged. 20
9. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the at least one climate influencing device (21) of the climate module (20) is a coil. 25
10. Modular inner-climate influencing appliance (1) according to any of claims 1 - 8, wherein the at least one climate influencing device (21) of the climate module (20) is an electrical heater. 30
11. Modular inner-climate influencing appliance (1) according to any of claims 1 - 8, wherein the at least one climate influencing device (21) of the climate module (20) is an air cleaning device. 35
12. Modular inner-climate influencing appliance (1) according to any of claims 1 - 8, wherein the at least one climate influencing device (21) of the climate module (20) is a dehumidifier. 40

module (20) is a dehumidifier.

13. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the climate module (20) comprises two or more climate modules (20) arranged in the airflow direction after each other. 45
14. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein the housing (10) and the climate module (20) each comprises electrical connection means (40) which are connectable to each other for providing electrical power and/or control signals between the modules (10, 20). 50
15. Modular inner-climate influencing appliance (1) according to any of the preceding claims, wherein an inlet grille (19) is arranged at the center portion (16c) of the separating wall (16) on a side facing the suction chamber (14) of the housing (10), wherein the inlet grille (19) is arranged to cover the first opening (17). 55





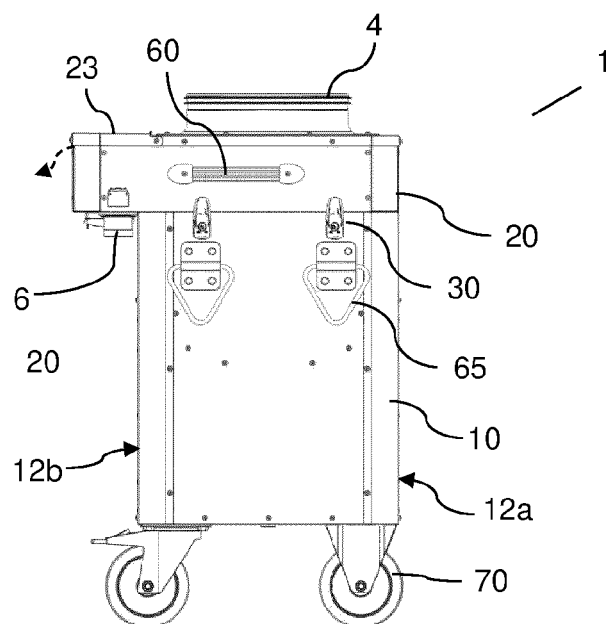


Fig. 3a

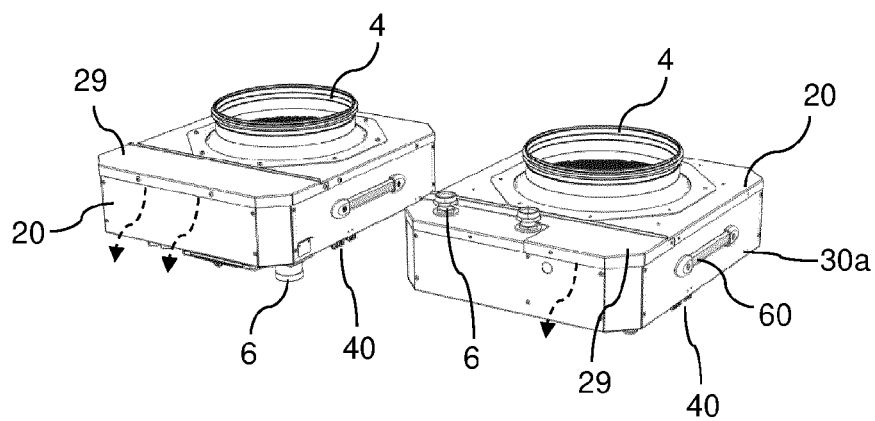


Fig. 3b

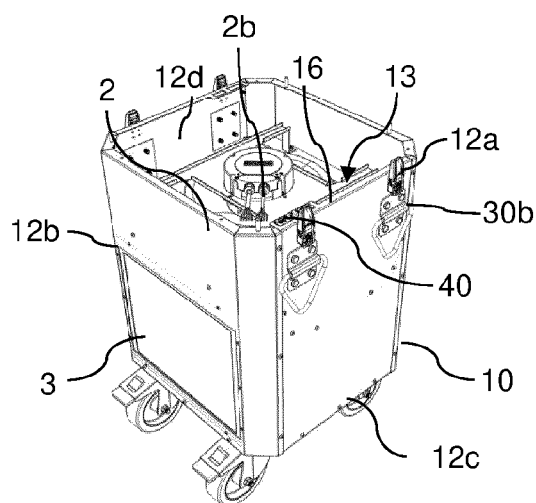


Fig. 3c

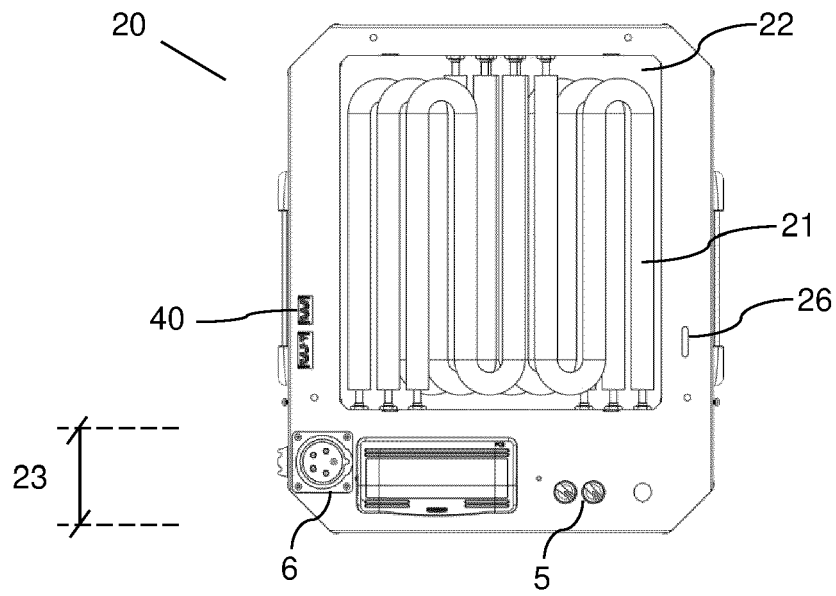


Fig. 4a

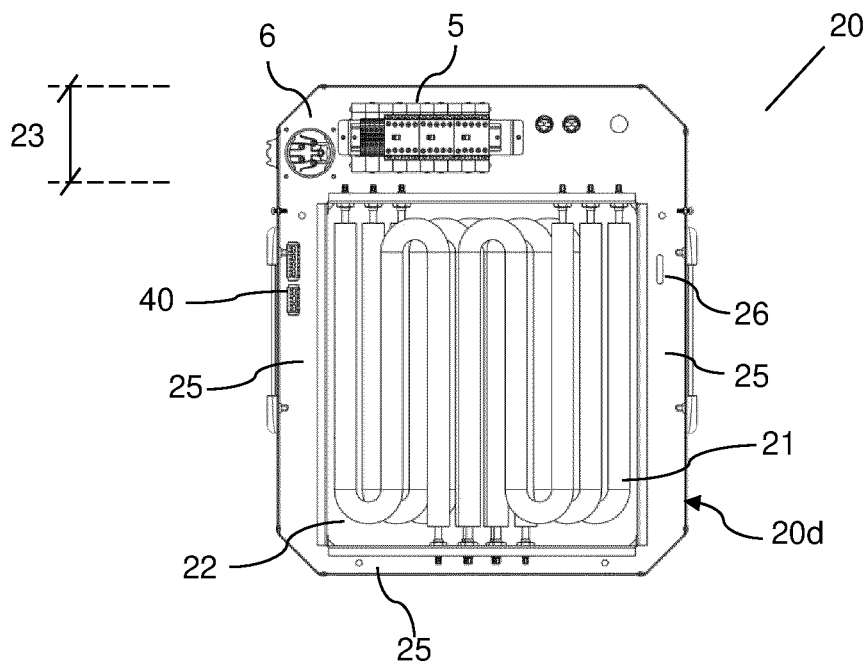


Fig. 4b



EUROPEAN SEARCH REPORT

 Application Number
 EP 20 16 4560

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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)
Y A	DE 26 39 627 A1 (RAMPE RESEARCH) 10 March 1977 (1977-03-10) * pages 6, 7 * * pages 10-12 * * pages 14, 15; figures 1, 3 *	1-3,5,6, 9-15 4,7,8	INV. F24H3/04 F24H9/00 F24H9/18 F24H9/20 F24F5/00
Y	US 5 997 619 A (KNUTH RUSSELL P [US] ET AL) 7 December 1999 (1999-12-07) * pages 7-9; figures 1-4 *	1,2,5,6, 9-13,15	
Y	EP 3 460 355 A1 (PRIOLO MORENO [IT]) 27 March 2019 (2019-03-27) * paragraph [0019]; figures 1, 2 *	3	
Y	EP 2 226 574 A2 (LICHTBLICK ZUHAUSEKRAFTWERK GM [DE]) 8 September 2010 (2010-09-08) * paragraph [0009] *	14	
A	CN 110 145 865 A (LEXY ELECTRIC GREEN ENERGY TECH SUZHOU CO LTD) 20 August 2019 (2019-08-20) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC) F24H F24F
A	US 2015/267931 A1 (AI HSU-FAN [TW] ET AL) 24 September 2015 (2015-09-24) * the whole document *	1-15	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 August 2020	Examiner Schwaiger, Bernd
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			

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 EPO FORM 1503 03.82 (P04C01)

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

EP 20 16 4560

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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21-08-2020

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 2639627 A1	10-03-1977	CA 1050806 A DE 2639627 A1	20-03-1979 10-03-1977
US 5997619 A	07-12-1999	NONE	
EP 3460355 A1	27-03-2019	NONE	
EP 2226574 A2	08-09-2010	DE 102009011475 A1 EP 2226574 A2 US 2010224689 A1	09-12-2010 08-09-2010 09-09-2010
CN 110145865 A	20-08-2019	NONE	
US 2015267931 A1	24-09-2015	TW 201537116 A US 2015267931 A1	01-10-2015 24-09-2015