



- (51) **International Patent Classification:**
F24D 3/16 (2006.01)
- (21) **International Application Number:**
PCT/EP2011/054480
- (22) **International Filing Date:**
23 March 2011 (23.03.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (71) **Applicant** (for all designated States except US): **ENERGY PRODUCTS GROUP NV** [BE/BE]; Legen Heirweg 77, B-9890 Asper (BE).
- (72) **Inventor; and**
- (75) **Inventor/Applicant** (for US only): **DE GRAEVE, Wim** [BE/BE]; Motte 22, B-7880 Vloesberg (BE).
- (74) **Agent:** **PRONOVEM-OFFICE VAN MALDEREN**; Ave Josse Goffin 158, B-1082 Brussels (BE).
- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) **Designated States** (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (54) **Title:** MODULAR UTILITY SYSTEM FOR THE INTERIOR OF A ROOM

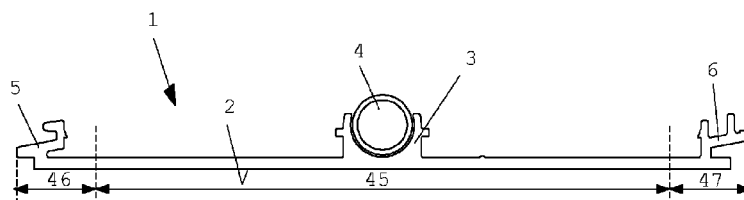


FIG. 1

- (57) **Abstract:** The invention is related to modular utility system for the interior of a room, said system comprising a plurality of modules extending in a longitudinal direction, configured to be mounted adjacent to each other, wherein each module comprises a central utility-providing portion (45), and a first and second side portion (46,47) on opposing sides of the central portion, the central and two side portions extending in said longitudinal direction, said first and second side portion comprising a first and second interconnection profile (5, 6), the first interconnection profile (5) of a module being configured to be attached to the second interconnection profile (6) of an adjacent module, so as to form a module assembly.

5

MODULAR UTILITY SYSTEM FOR THE INTERIOR OF A ROOM10 **Field of the Invention**

[0001] The present invention is related to a utility system, for distributing a variety of utilities such as heating/cooling, lighting or telecommunication to the interior of a room.

15

State of the art.

[0002] Modular heating and/or cooling systems are known in the art. For example, document WO2009059811 describes a system involving heat exchange elements combined with non-heat exchange elements arranged against a wall. Another example is shown in EP0524085, where a plurality of heat exchange elements are arranged in a vertical or horizontal plane, to form a large radiator. All existing systems are composed of heating elements with a high degree of complexity, and their flexibility in terms of the ease with which the functionality and composition of a radiator unit can be changed is quite limited. Furthermore, a limited number of functionalities are available in the presently existing modular systems.

30

Aims of the invention

[0003] The present invention aims to provide a modular utility system, with the capability of incorporating a wide range of functionalities, which is

easy to install and modify, and which comprises lightweight and technically straightforward basic modules.

Summary of the invention

5 **[0004]** The invention is related to a system as disclosed in the appended claims. The invention is thus related to a modular utility system for the interior of a room, said system comprising a plurality of modules extending in a longitudinal direction, configured to be
10 mounted adjacent to each other, wherein each module comprises a central utility-providing portion, and a first and second side portion on opposing sides of the central portion, the central and two side portions extending in said longitudinal direction, said first and second side
15 portion comprising respectively a first and second interconnection profile, the first interconnection profile of a module being configured to be attached to the second interconnection profile of an adjacent module, so as to form a module assembly.

20 **[0005]** According to a preferred embodiment, the system comprises two end profiles, configured to interconnect with the lateral modules of the assembly, and further configured to form support elements by which the assembly may be mounted on or connected to an external
25 structure.

[0006] The system may further comprise two heat-insulating profiles configured to interconnect with said end profiles.

[0007] According to a preferred embodiment, each of
30 said modules itself or at least the central utility-providing portion consists of or comprises a profile extending in said longitudinal direction.

[0008] Said interconnection profiles may be configured in such a way that the shape of the front

surface of any assembly of a first and second module is continuous in the transition area between the first and second module.

[0009] According to an embodiment, the first and
5 second profile comprise an essentially flat elongate portion which portions are slanted with respect to the front surface of the modules, and wherein said slanting portions are arranged so that the slanting portions engage in mutual contact when two modules are moved towards each
10 other along the plane of their front surface.

[0010] According to an embodiment, the system comprises a plurality of clamps configured to secure the connection between the first profile of a module and the second profile of an adjacent module

15 [0011] According to another embodiment, the system comprises one or more strips or plates, attached at the back of the module assembly, and spanning over the entire width of the module assembly, wherein these strips or plates are provided with gripping means at their lateral
20 ends, which are configured to interlock with suitable interlock means on the end profiles.

[0012] According to a preferred embodiment, said modules comprise at least one heating module, wherein the central utility-providing portion comprises a plate having
25 a front surface and a back surface, the back surface being provided with a means for heating the plate, the front surface being suitable for producing heat by infra red radiation.

[0013] Said means for heating may comprise a means
30 for holding a duct in heat-exchanging contact with the back surface of said plate, said duct being configured to contain a heated fluid flowing through said duct.

[0014] Said modules may comprise at least one lighting module. According to a preferred embodiment, said lighting module comprises one or more LEDs.

[0015] Said modules may comprise at least one
5 cooling module. Said cooling module may comprise a pipe configured to contain a cooling fluid, at least one ventilator, an air inlet opening at the back of the module and an air outlet opening at the front of the module.

[0016] According to another embodiment, said cooling
10 module comprises an air duct at the back of the module and an opening at the front of the module.

[0017] According to another embodiment, said cooling
module comprises a pipe configured to contain a cooling
fluid, at least one ventilator, at least one inlet opening
15 and at least one outlet opening, both said inlet and outlet openings being located at the front side of the module.

[0018] Said modules may comprise at least one
sprinkler module. According to an embodiment, said
sprinkler module comprises a pressurized water pipe, a
20 sprinkler and a lead meltaway mounted between said water pipe and said sprinkler.

[0019] According to another embodiment, said
sprinkler module is connected to a duct for containing
heating or cooling water, said duct being arranged in
25 connection with another module of said system, so as to use said heating or cooling water for sprinkling.

[0020] In a system according to the invention, the
lateral modules of said assembly may be provided with a
protruding rim. When said system is provided with end
30 profiles, and possibly with heat insulation profiles, said end profiles and said heat insulation profiles may equally be provided with a protruding rim.

[0021] According to an embodiment, at least one
module comprises one or more sensors suitable for

detecting the presence of a person, and a means configured to provide a utility to a location where said person is detected by said sensor(s).

[0022] According to an embodiment, the system
5 comprises at least one module provided with a means for guiding cables and/or a means for mounting electronic devices.

[0023] According to an embodiment, the the system
comprises at least one heating module provided with one or
10 more fins attached to the emitting surface of the heating module, said fins being configured to form a heat barrier for hot air when the module is placed at an angle.

[0024] According to another embodiment, at least one
interruption profile is provided between two adjacent
15 modules, the interruption profile being configured to be attached to the first interconnection profile of one of said adjacent modules and to the second interconnection profile of the other of said adjacent modules.

20 **Brief description of the figures**

[0025] Figure 1 shows a module suitable for use in a system according to the invention.

[0026] Figure 2 shows two connection profiles of adjacent modules suitable for use in a system according to
25 the invention.

[0027] Figure 3a shows an example of a system according to the invention comprising two modules. Figure 3b shows detailed views of the end profiles used at the lateral ends of a module assembly.

30 [0028] Figure 4a and 4b shows examples of modules interconnected without the help of an additional securing element.

[0029] Figure 5 shows alternative ways of attaching the end profiles to a ceiling.

[0030] Figure 6 shows alternative shapes of the end profiles.

[0031] Figure 7 shows alternative shapes of the lateral insulation profiles.

5 [0032] Figure 8 shows alternative securing means applicable in a module assembly according to the invention.

[0033] Figure 9 shows alternative suspension means for mounting a system according to the invention.

10 [0034] Figure 10 shows a lighting module applicable in a system according to the invention.

[0035] Figures 11a and 11b show examples of cooling modules applicable in a system according to the invention.

[0036] Figure 12 shows a ventilation module applicable in a system according to the invention.

15 [0037] Figure 13 shows a module equipped with a movement detection sensor and quartz tube, and a module equipped with an additional layer of active IR producing material.

20 [0038] Figures 14a and 14b shows sprinkler modules applicable in a system according to the invention.

[0039] Figure 15 shows a module equipped with a laterally protruding edge.

[0040] Figure 16 shows a heating module comprising an undulating panel.

25 [0041] Figure 17 shows a heating module placed at an angle and provided with fins for forming a hot air barrier.

[0042] Figure 18 shows a heat-insulating interruption profile mounted between two adjacent modules.

30 **Detailed description of the invention**

[0043] Figure 1 shows a heating module 1 applicable in a system according to the invention. The element is shaped in the form of a rectangular panel, with a flat (though not necessarily flat) outer surface 2 on one side

of the module, and on the other side a cradle 3 for attaching a duct 4. The panel preferably has an elongate shape, with a width of for example 15 cm and a length adapted to span the width of a room. Several panels can be
5 connected side-by-side, preferably against the ceiling of a room. The outer surface 2 is configured to produce infrared heat radiation. It may be a metal outer surface, or a metal or other surface provided with a layer of high infrared emissivity (as known in the art), i.e. a material
10 or surface material which produces high natural IR-radiation when heated (such as metal oxides, leather, minerals, polymers, ...). Any other material or surface material suitable for producing a significant amount of IR heat radiation may be applied.

15 **[0044]** The duct attachment means in the form of the cradle 3 is configured to receive a duct 4 carrying a heated circulating fluid, and to conduct heat from said fluid to the emitting surface 2. One or more of such cradles 3 may be provided on each module. The duct 4 may
20 for example be a copper duct. The system may also comprise modules heated by other means than by a heated duct, for example by an electrical resistor. The ducts 4 attached to one or more modules are preferably interconnected and may form part of a central heating system as known in the art.

25 **[0045]** The module 1 is partitioned in a central portion 45, and two side portions 46 and 47 on opposite sides of the central portion, all three portions extending in the longitudinal direction of the module. This is a common feature of any module applicable in a system of the
30 invention. The central portion 45 comprises a means for providing a utility to the interior of a room where the system is installed. In the case of figure 1, this utility is providing heating to the the room. The side portions 46 and 47 each comprise interconnection profiles 5,6 along the

straight edges of the side portions. The interconnection profiles are uniform for all the modules, i.e. the interconnection profile 5 on the left-hand side of a module is the same for each module, and the interconnection profile 6 on the right-hand side is equally the same for each module (though the interconnection profiles 5/6 in one module may be different as in the embodiment shown). The first profile 5 of a module is configured to be attached to the second profile 6 of an adjacent module, to thereby form a module assembly. The reference numerals 46 and 47 will not be repeated in all other drawings, but it is clear from the description of other module types that any module according to the invention comprises said three portions. In most preferred embodiments, the module itself or at least the central utility-providing portion 45 consists of or comprises a profile, formed of a single elongate plate, flat or deformed in the direction perpendicular to the plane of the plate, for example bent to form a hollow interior enclosure where LEDs are installed (fig. 10). However, it can be imagined also that the central portion is a separate piece attached by welding or other techniques to separate side portions 46/47. The general advantage of the invention is that it allows the assembly of lightweight modules (e.g. formed of a single plate) against the ceiling of a room (although mounting against a wall is also possible), thereby covering a large surface of said ceiling. The partitioning of the modules into a central portion 45 with a function and shape that can change from module to module, but with side portions 46/47 which can be interconnected regardless of the function of the module leads to a very flexible system that can incorporate a multitude of utilities, as will be described further.

[0046] A plurality of heating modules as shown in figure 1 may be assembled together, to form a large

emitting surface. Preferably, the interconnection profiles 5 and 6 are integral with the body of the module. The first profile 5 of a module can be assembled together with the second profile 6 of an adjacent module by moving
5 the modules horizontally towards each other until the profiles are in mutual contact, see figures 2a+2b. According to the preferred embodiment of figure 2, the portions 45/46 are formed so that in the module assembly, and the outer surfaces 2 of the modules form a continuous
10 outer surface. In the preferred embodiment shown in figure 2a, the first profile comprises a slanting portion 10 set back with respect to the outer surface 2 of the module over a distance a. At the end of the slanting portion, a hook-shaped portion 11 is formed. The second profile 6
15 comprises a second slanting portion 12 set back with respect to the front surface 2 of the module over a distance b which is larger than the distance a, so that the first and second slanting portions of two adjoining modules can be brought together in mutual contact, with the front
20 surfaces of the modules forming a continuous surface in the transition area between the two modules (see figure 2b). The hook 11 of the first profile fits around the end 13 of the second slanting portion 12. The slanting portions 10 and 12 are in contact over their entire length and over a
25 width w, thereby defining a significant heat transfer path between neighbouring modules.

[0047] In the embodiment shown, the second profile 6 is provided with a first and second upstanding portion 14 and 15, pointing away from the outer surface 2 of the
30 module, the first upstanding portion 14 being placed near the base of the slanting portion 12, the second upstanding portion 15 being placed near the middle of the slanting portion 12. The second upstanding portion 15 is configured to support the middle of one or more clamps 17 which may

be placed over the assembled first and second profiles, so as to lock the neighbouring modules together, see figure 3. The first upstanding portion 14 of the second profile 6 and the side of the hook-shaped portion 11 of the first profile 5 are provided in this embodiment with retention strips 16, behind which the lateral ends of the clamp 17 can be secured.

[0048] Figure 3 shows an assembly of two heating modules secured in this way. The assembly hangs from a ceiling 20 by resting on lateral supports 21 attached to the ceiling. The lateral attachment will now be looked at in more detail. The module assembly of figure 3 is provided with first and second end profiles 22 and 23, which are configured to be connected to heat-insulating support profiles 24, 24'. First and second end profiles 22/23 are shown in more detail in figure 3b. The first end profile 22 has a module attachment part 25 which is identical to the second profile 6 of a module. In this way, the first end profile 22 can be assembled together with the lateral module to one side of an assembly in the same way in which two modules are assembled together. The second end profile 23 has a module attachment part 26 which is identical to the first profile 5 of each module. In this way, the second end profile 23 can be assembled together with the lateral module to the opposite side of an assembly in the same way in which two modules are assembled together. The end profiles 22 and 23 are furthermore provided with an outer attachment part 27 and 28 respectively. In the embodiment shown, this is an extension in the shape of an 'H'. The heat-insulating support profiles 24, 24' have an inner profile which can glide over the 'H' profile or be clipped over the H-profiles so as to be fixed to the end profiles 22/23. Alternatively, the end profiles 22/23 may be configured to

be directly mounted on or connected to an external support structure, without the rubber profiles intervening in the actual mounting or connecting (see for example embodiments in figure 5).

5 **[0049]** The heat-insulating profiles 24/24' can be rubber profiles, or any other heat insulating material. They have a flat underside 29/29' with which the module assembly rests on the lateral ceiling supports 21.

10 **[0050]** The heat-insulating support profiles 24/24' also have a rectangular portion 30/30' extending towards the centre of the assembly, and resting on the back of the clamps 17 which are holding together the end profiles 22/23 and the lateral modules. Extension ribs 31 may be present, to retain a layer of isolation material (glass
15 wool or rock wool, which may be applied at the backside of the modules, not shown in the drawings).

20 **[0051]** The heat-insulating profiles 24/24' allow to isolate the module assembly from the surrounding environment, so that heat loss by convection and or conduction is minimized.

25 **[0052]** According to an embodiment, the first and second profiles 5 and 6 are configured to interlock without the help of an additional securing means, see figure 4a. This may be established by producing the slanting portions
30 10 and 12 to fit tightly together so as to obtain an interlocking through friction. In addition to this, the hook-shaped portion 11 may be produced to fit tightly around the end 13 of the second slanting portion 12. The end 13 is preferably provided with a conical shape, which may be fitted into the interior of the hook-shaped portion
30 11. In another embodiment, shown in figure 4b, the profiles have a different shape : the cross section of the left-hand profile 6' has the shape of an L-shaped lip with the short side 34 attached to the back of the module, and

12

long side 35 extending towards the edge of the module, while the cross-section of the right-hand profile 5' has the shape of a lip 36 extending from the back of the module and configured to fit into the space formed by the L-shaped lip 34/35 and the back of the first module. A retention hook 37 is formed at the top of the left-hand profile 6', and a retention obstruction 38 is formed on top of the right-hand profile 5', so as to establish an interlock by engaging the retention hook 37 with the obstruction 38. In this way, the securing of two modules is obtained without separate securing means. Here also, the profiles are formed so as to obtain a continuous front surface of the assembled modules.

[0053] Other ways of installing a module assembly according to the invention are shown in figure 5. In figure 5a, the end profiles (only the second one 23 is shown), are provided with a side portion 40 which can be inserted into the suitably shaped edge 41 of a ceiling plate 42. Alternatively (fig. 5b), the end profile has a flat extension 43 configured to rest on the edge of a ceiling plate 44. As can be seen in the embodiments of figure 6a and 6b, the position of the module attachment parts 25/26 (only 26 is shown) with respect to the 'H' profile 28/28' can be adapted to the particular dimensions needed. Also, the shape of the heat-insulating support profiles 24/24' can differ according to the specific dimensional circumstances, as illustrated by the embodiments of figure 7a-7b.

[0054] Figure 8 shows alternatives for securing neighbouring modules and for securing the lateral modules to the end profiles 22/23. In the embodiment of figure 8a, the securing is established by bolts 50 inserted through holes provided in the interconnection profiles 5/6. In the embodiment of figure 8b, the securing is established by one

or more strips or plates 51, attached at the back of the module assembly, and spanning over the entire width of the module assembly. These strips or plates are provided with gripping means 52 at their lateral ends, which are
5 configured to interlock with suitable interlock means on the end profiles 22/23, e.g. with the retention strips 16 (see fig. 2b).

[0055] Figures 9a and 9b show two alternatives of how a module assembly may be attached to a ceiling : by
10 hanging from the ceiling through the use of cables 60 attached to the clamps 17 or by brackets 61 attached to the modules themselves.

[0056] A system of the invention may be equipped with modules of various functionality. While the main
15 application is heating, the above described heating modules may be replaced by and preferably used in combination with cooling modules, lighting modules, sprinkler or purification modules, etc. Figure 10 shows a heating module 1 combined with a lighting module 101. The lighting
20 module is equipped with a number of LEDs 70 and possibly a suitable power unit 71 (which may equally be mounted outside of the module). The lighting module shown comprises a recessed portion 72 wherein the LEDs are mounted, but other types of lighting and shape of the
25 module may be applied. The lighting module is provided with the same interconnection profiles 5 and 6 as the heating module, so as to form a continuous front surface in the transition area between the modules. The shape of the profiles 5 and 6 of the embodiment shown is particularly
30 advantageous when the LED module is formed of a heat-conductive (preferably metal) plate : the heat of the LEDs heats up the LED-module plate, and said heat is transmitted through the large contact area of the profiles 5 and 6, to the neighbouring heating module. In this way, a portion of

the energy consumed by the LEDs is recuperated as radiation energy.

[0057] Figures 11a and 11b show examples of a heating module combined with a cooling module. In the embodiment of figure 11a, the cooling module 102 comprises an enclosure 80 with a front surface that is flush with the surface of the heating module. Part of said front surface is formed by an opening 81 provided with a grating. The enclosure furthermore comprises one or more ventilators 82, and a pipe 83 configured to contain a cold fluid, preferably cold fluid circulating in a cooling cycle. The pipe 83 may be provided with fins 84 to maximize the heat exchange surface. At the back of the enclosure another opening 85 provided with a grating is present. The ventilator causes a flow of air through the opening 85 at the back, over the pipe 83, and through the front opening 81, to thereby provide cooled air into the room. In the cooling module 102' shown in figure 11b, an air duct 86 is attached to the enclosure 87. Through the air duct 86, cold air may be provided to cool the air in the enclosure. A opening 88 provided with a grating is provided at the front to allow cooled air to flow from the enclosure to the room. In stead of a cooling pipe 83, a air purification filter may be installed, thereby creating a purification module.

[0058] In stead of air flowing from the back to the front of the cooling module, the in -and outlet may both be present at the front of the module, as shown in figure 12. This module 103 comprises an enclosure divided in two parts, each part comprising an inlet opening 90 provided with a grating at the front of the module, one or more ventilators 91, a cooling pipe 92, and an outlet port 93 towards the room. In the embodiment of figure 12 and of figure 11a, a plurality of ventilators may be placed at

regular distances along the length of the module. These ventilators may be operated separately to provide cooling in specific areas of the room, or they may be operated in a predefined sequence.

5 **[0059]** Figure 13 shows an embodiment wherein one of the heating modules 104 comprises a movement sensor 200 and quartz tube 201, configured to produce a locally increased IR radiation. The heating panel 100 comprises an extra layer 202 of high IR emissivity material attached to the front of the panel. The quartz tube may be activated when a movement is detected by the sensor 200, e.g. when a person is present underneath the module 104. The high emissivity material and the quartz tube are examples of the system of the invention providing a hybrid heating, i.e. a targeted heating to specific areas within a room. The provision of such additional heating can be controlled on the basis of a detection by a sensor (in the case of the quartz tube controlled by the response of the movement sensor 200), or it can be continuous additional localized heating (in the case of the extra layer of IR active material). In stead of a movement sensor 200, any other type of sensor suitable for detecting a person may be applied in one or more modules in a system of the invention, in combination with means arranged to provide local heating or another utility on the basis of the detection output of these sensors. In this way, a 'follow me' operation may be obtained, whereby utilities such as heating, cooling or lighting may be provided locally and automatically to a person depending on the location of the person in a room.

[0060] Figures 14a and 14b show examples of sprinkler modules 105 and 106. In the module 105, a pressurized water pipe 209 is installed inside the enclosure 210. The pipe is connected to a sprinkler 211

via a lead meltaway 212, configured to activate the sprinkler when a fire takes place. Sprinkler water is supplied through the grating 213.

[0061] In the module 106, a connection 220 is made to the heating duct 4 of the neighbouring heating module. Via a heat sensor 221 and an electrovalve 222, the sprinkler 223 may be activated, supplied by water from the heating duct 4, via the connection 220. Possibly the hot water can be replaced by cold water before the sprinkling is started. In stead of to a duct 4 of a heating module, the sprinkler unit could also be connected to the cooling pipe (83) of a cooling unit 102 (fig. 11a).

[0062] Figure 15 shows an embodiment of a heating module provided with a side edge 230 which protrudes forward (i.e. into the heated room) from the emitting surface 2. This module may be used as the lateral module of a module assembly, wherein a similar side edge is preferably used in the lateral module on the other side of the assembly. These protruding edges diminish heat loss through convection. In the preferred case shown, also the end profile and the heat-insulating profile are provided with a protruding edge 231 and 232 respectively.

[0063] Figure 16 shows a heating module 107 with an undulating front surface. Other shapes of the panel are possible. Figure 17 shows a system comprising four heating modules placed at an angle, for example placed parallel to the slanting side of a roof. The lower module is provided with 4 parallel fins 240 which are placed at an angle with respect to the surface 2 of the module. In the embodiment shown, said angle is substantially the same as the angle of the modules themselves, so that the fins are oriented substantially vertically (but this is not a necessary limitation). The fins represent barriers for hot air rising towards the top of the roof. The fins thereby

reduce heat losses through convection. In stead of only one heating module, several heating modules may be provided with such fins 240. The fins 240 may have any suitable cross-section, shape or orientation compatible with the
5 above-described function of forming a hot air barrier.

[0064] Besides the modules described above, other utilities, not necessarily related to the conditioning (heating, cooling, lighting, purifying,...) of the interior of a room may be provided by a system of the invention.
10 For example, a module may be provided which comprises attachment means for electric or glass fibre cables or other types of cable connections. A module may be provided similar to the heating module of figure 1, but without the cradle 4. In stead, a suitable guiding and attachment
15 means such as cable gutter may be provided on the top surface of the module. Modules may be provided that have dedicated attachment means for installing modems for wireless telecommunication, position sensors for alarm systems, or other utility devices.

20 **[0065]** According to an embodiment, the clamps 17 or equivalent securing means may be provided with a vertical plate with a hole in it or with means equivalent thereto, for receiving a support bar inserted through said holes and spanning the width of the module assembly. This feature is
25 aimed at preventing a curvature perpendicular to the plane of the assembly, in the case of a horizontally placed module assembly supported only by two laterally placed end profiles 22/23 (or by insulation profiles 24/24' attached thereto).

30 **[0066]** According to an embodiment, an interruption profile 300 may be provided between two modules, as shown in figure 18. This interruption profile is shaped so as to fit together with two interconnection profiles 6 and 5 of two adjacent modules. The interruption profile is made of

a heat-insulating material, e.g. rubber, to form a heat barrier between adjacent modules. This is useful in particular between a heating module and a cooling module in order to separate these two functions.

CLAIMS

1. A modular utility system for the interior of a room, said system comprising a plurality of modules extending in a longitudinal direction, configured to be mounted adjacent to each other, wherein each module comprises a central utility-providing portion (45), and a first and second side portion (46,47) on opposing sides of the central portion, the central and two side portions extending in said longitudinal direction, said first and second side portion comprising respectively a first and second interconnection profile (5,6), the first interconnection profile (5) of a module being configured to be attached to the second interconnection profile (6) of an adjacent module, so as to form a module assembly.

2. System according to claim 1, comprising two end profiles (22,23), configured to interconnect with the lateral modules of the assembly, and further configured to form support elements by which the assembly may be mounted on or connected to an external structure.

3. System according to claim 2, comprising two heat-insulating profiles (24,24') configured to interconnect with said end profiles (22,23).

4. System according to any one of claims 1 to 3, wherein each of said modules itself or at least the central utility-providing portion (45) consists of or comprises a profile extending in said longitudinal direction.

5. System according to any one of claims 1 to 4, wherein said interconnection profiles (5,6) are configured in such a way that the shape of the front surface of any assembly of a first and second module is continuous in the transition area between the first and second module.

6. System according to any one of claims 1 to 5, wherein the first and second profile (5,6) comprise an essentially flat elongate portion (10,12) which portions are slanted with respect to the front surface (2) of the modules, and wherein said slanting portions are arranged so that the slanting portions (10,12) engage in mutual contact when two modules are moved towards each other along the plane of their front surface (2).

7. System according to any one of claims 1 to 6, comprising a plurality of clamps (17) configured to secure the connection between the first profile (5) of a module and the second profile of an adjacent module (6).

8. System according to any one of claims 2 to 6, comprising one or more strips or plates (51), attached at the back of the module assembly, and spanning over the entire width of the module assembly, wherein these strips or plates are provided with gripping means (52) at their lateral ends, which are configured to interlock with suitable interlock means on the end profiles (22,23).

9. System according to any one of claims 1 to 6, wherein said modules comprise at least one heating module (100), wherein the central utility-providing portion (45) comprises a plate having a front surface (2) and a back surface, the back surface being provided with a means (3) for heating the plate, the front surface (2) being suitable for producing heat by infra red radiation.

10. System according to claim 9, wherein said means for heating comprise a means (3) for holding a duct (4) in heat-exchanging contact with the back surface of said plate, said duct being configured to contain a heated fluid flowing through said duct.

11. System according to any one of claims 1 to 10, wherein said modules comprise at least one lighting module (101).

21

12. System according to claim 11, wherein said module comprises one or more LEDS (70).

13. System according to any one of claims 1 to 12, wherein said modules comprise at least one cooling
5 module (102,103).

14. System according to claim 13, wherein said cooling module (102) comprises a pipe (83) configured to contain a cooling fluid, at least one ventilator (82), an air inlet opening (85) at the back of the module and an
10 air outlet opening (81) at the front of the module.

15. System according to claim 13, wherein said cooling module (103) comprises an air duct (86) at the back of the module and an opening (88) at the front of the module.

16. System according to claim 13, wherein said cooling module comprises a pipe (92) configured to contain a cooling fluid, at least one ventilator (91), at least one inlet opening (90) and at least one outlet opening (93), both said inlet and outlet openings being
20 located at the front side of the module.

17. System according to any one of claims 1 to 16, wherein said modules comprise at least one sprinkler module (105,106).

18. System according to claim 17, wherein
25 said sprinkler module (105) comprises a pressurized water pipe (209), a sprinkler (211) and a lead meltaway (212) mounted between said water pipe and said sprinkler.

19. System according to claim 14, wherein said sprinkler module (106) is connected to a duct (4,83)
30 for containing heating or cooling water, said duct being arranged in connection with another module of said system, so as to use said heating or cooling water for sprinkling.

22

20. System according to any one of the preceding claims, wherein the lateral modules of said assembly are provided with a protruding rim (230).

21. System according to claim 20, provided
5 with end profiles (22,23), and possibly with heat insulation profiles (24,24'), wherein said end profiles and said heat insulation profiles are equally provided with a protruding rim (231,232).

22. System according to any one of the
10 preceding claims, comprising at least one module (104) which comprises one or more sensors (200) suitable for detecting the presence of a person, and a means (201) configured to provide a utility to a location where said person is detected by said sensor(s).

23. System according to any one of the
15 preceding claims, comprising at least one module provided with a means for guiding cables and/or a means for mounting electronic devices.

24. System according to claim 9 or 10,
20 comprising at least one heating module provided with one or more fins (240) attached to the emitting surface (2) of the heating module, said fins (240) being configured to form a heat barrier for hot air when the module is placed at an angle.

25. System according to any one of the preceding claims, wherein at least one interruption profile (300) is provided between two adjacent modules, the interruption profile being configured to be attached to the first interconnection profile (5) of one of said adjacent
30 modules and to the second interconnection profile (6) of the other of said adjacent modules.

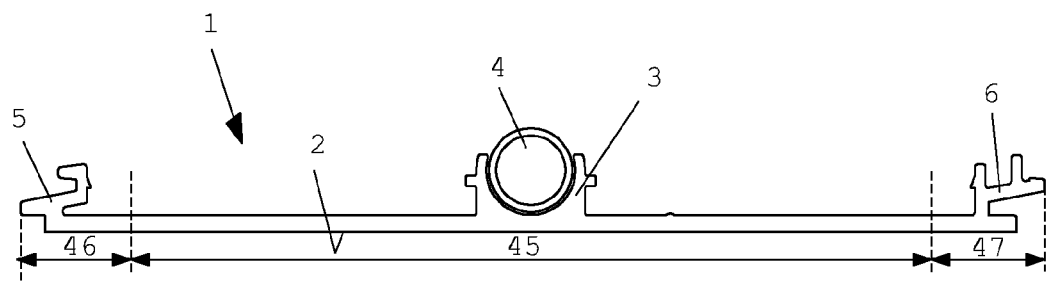


FIG. 1

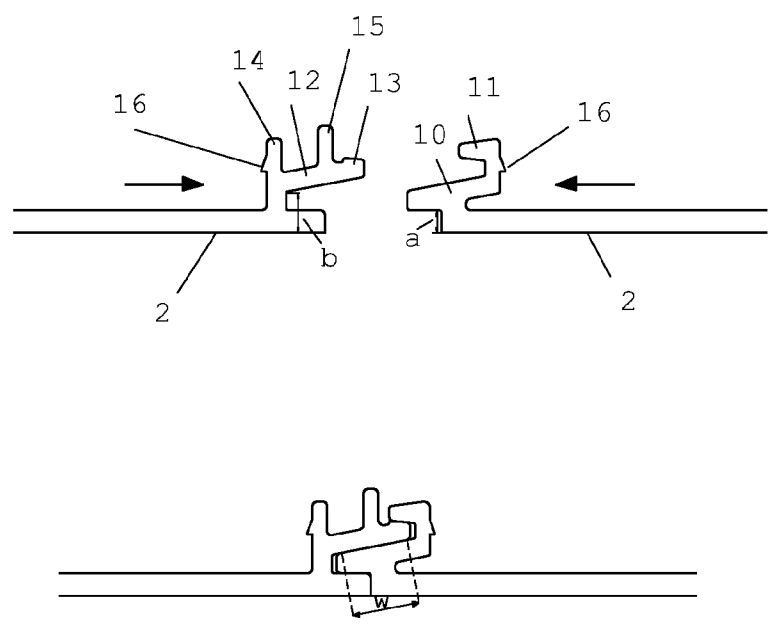


FIG. 2

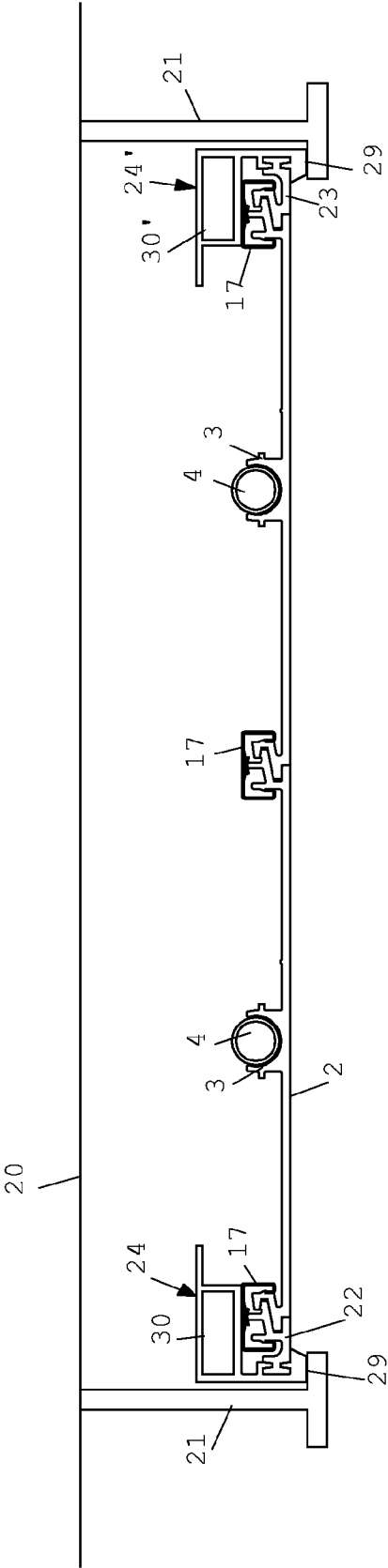


FIG. 3a

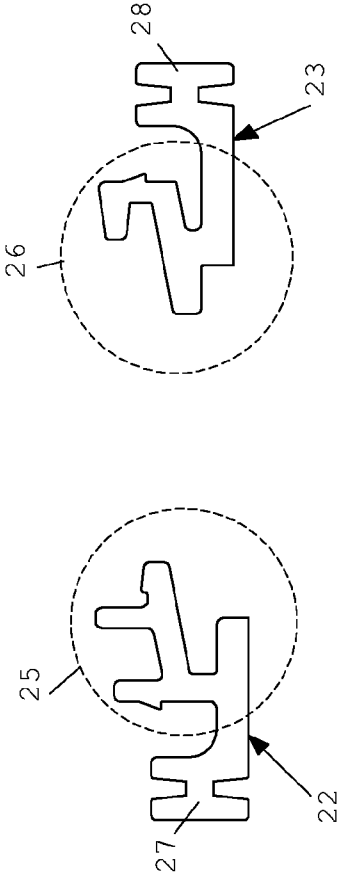


FIG. 3b

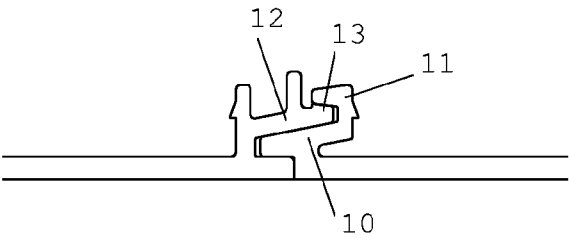


FIG. 4a

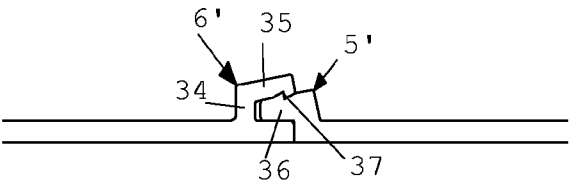


FIG. 4b

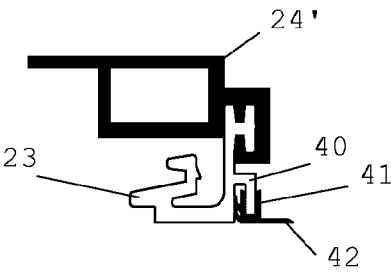


FIG. 5a

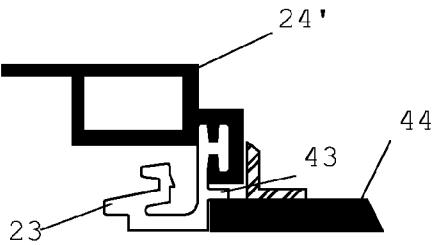


FIG. 5b

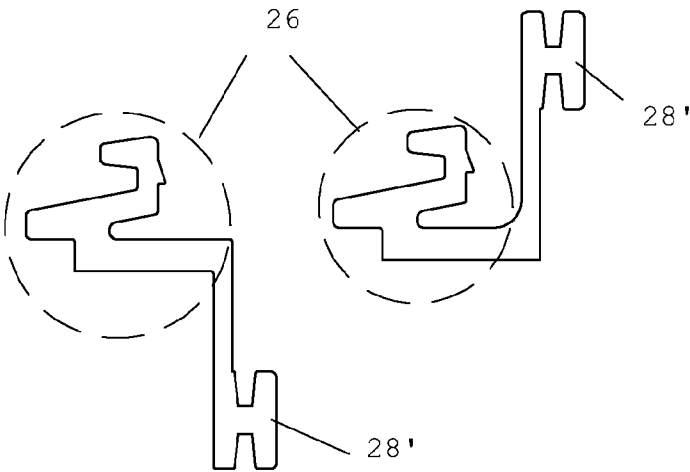


FIG. 6a

FIG. 6b

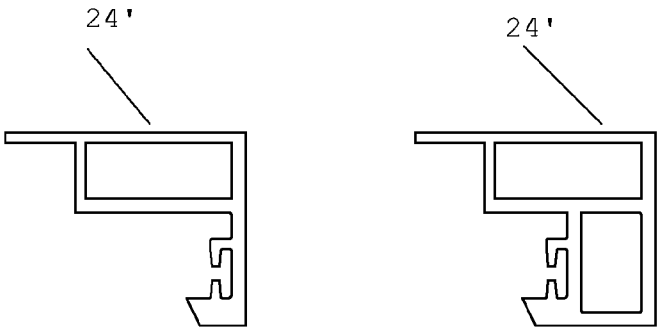
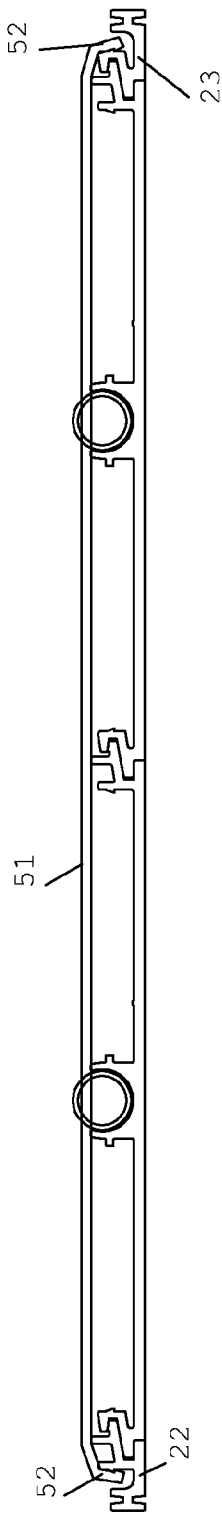
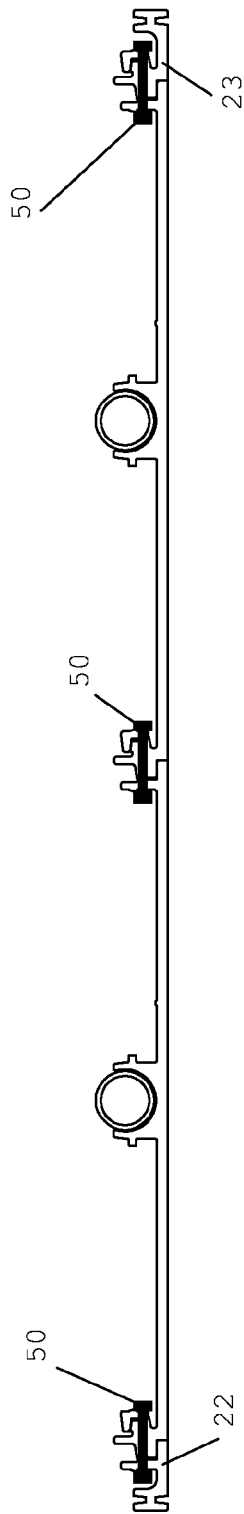


FIG. 7a

FIG. 7b



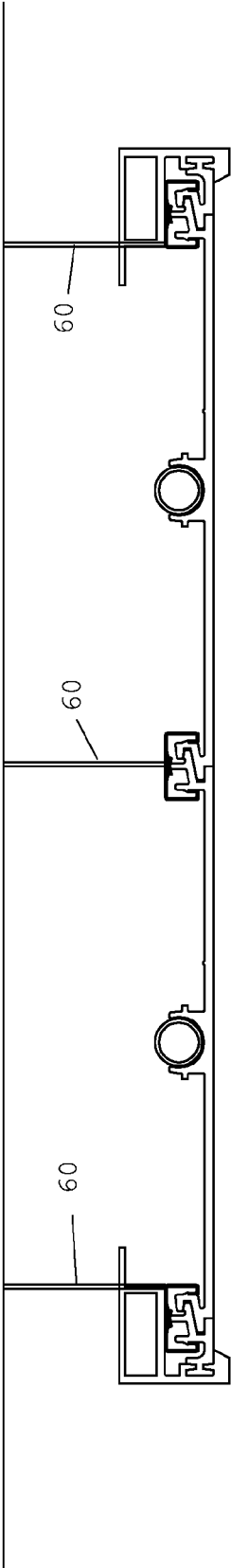


FIG. 9a

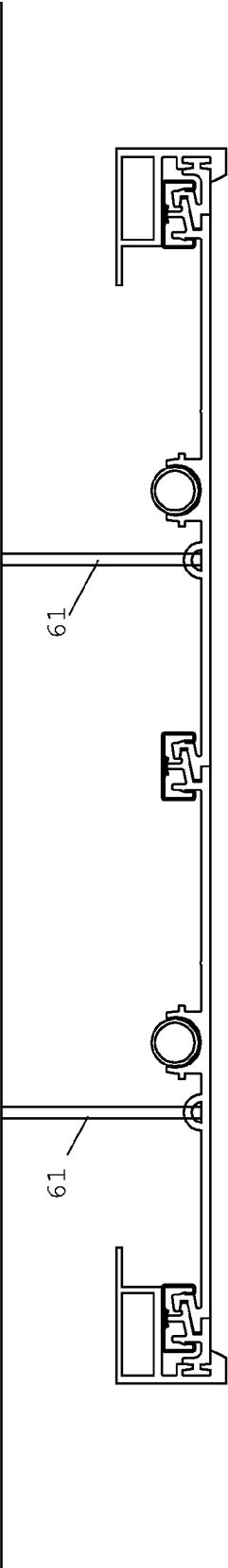


FIG. 9b

7/12

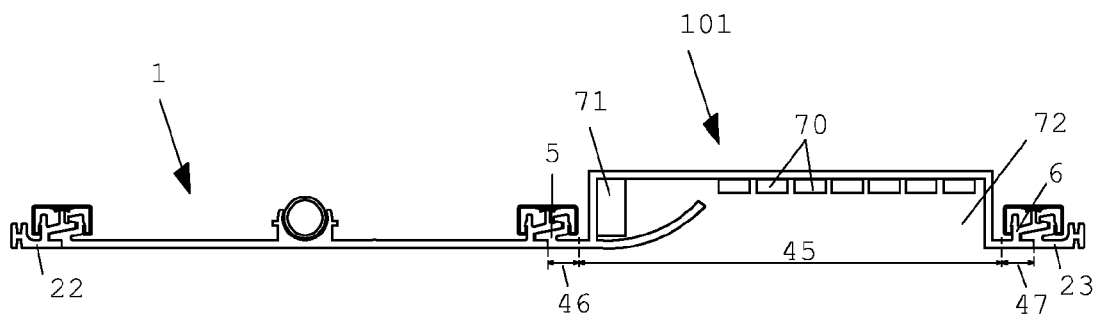


FIG. 10

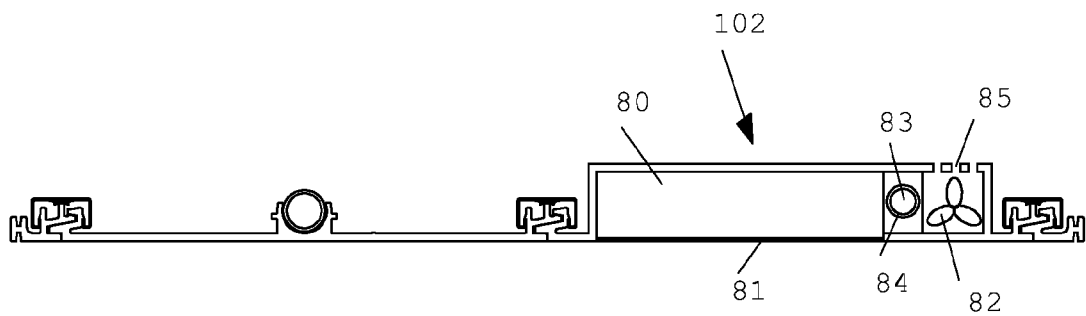


FIG. 11a

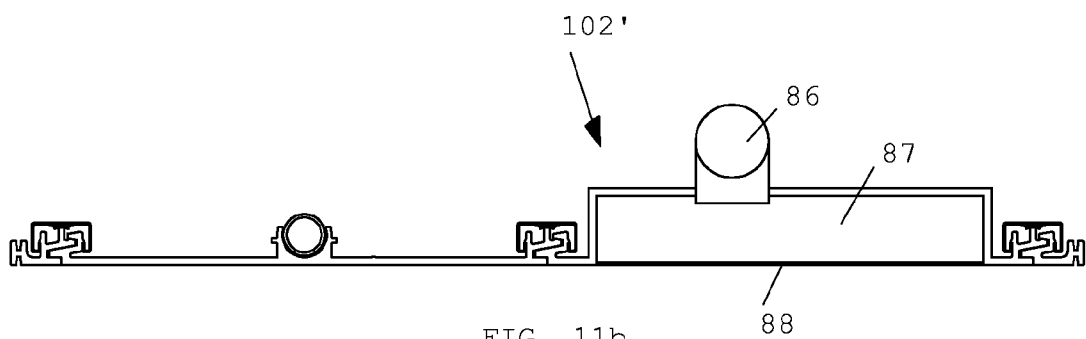


FIG. 11b

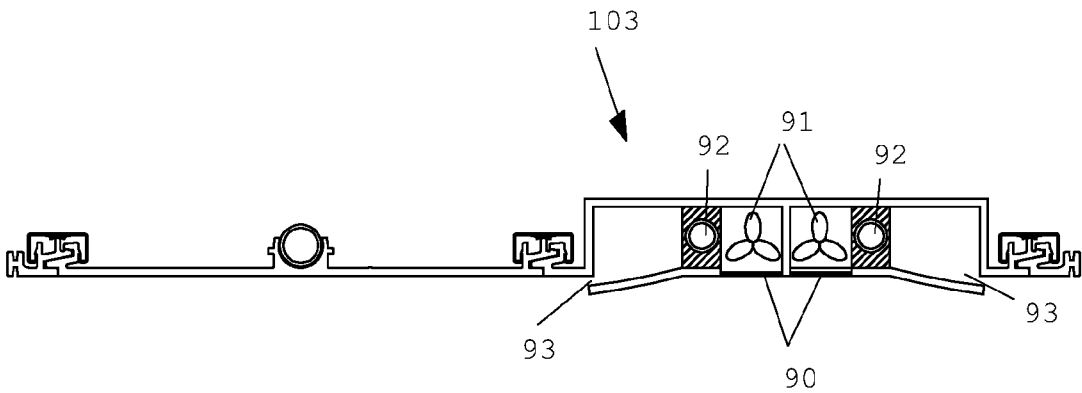


FIG. 12

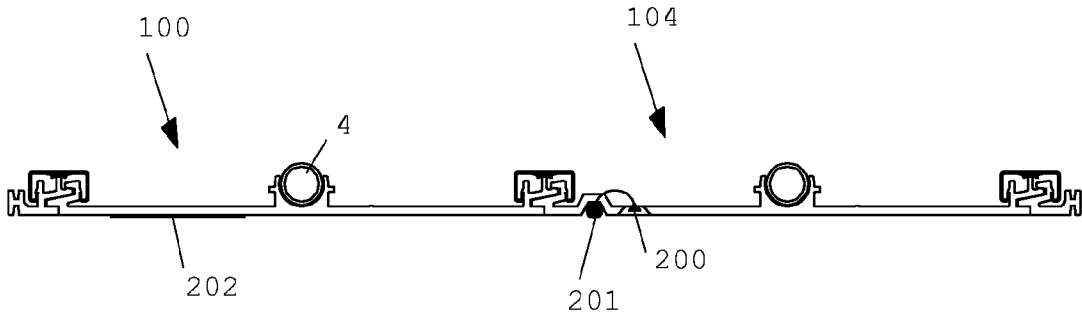


FIG. 13

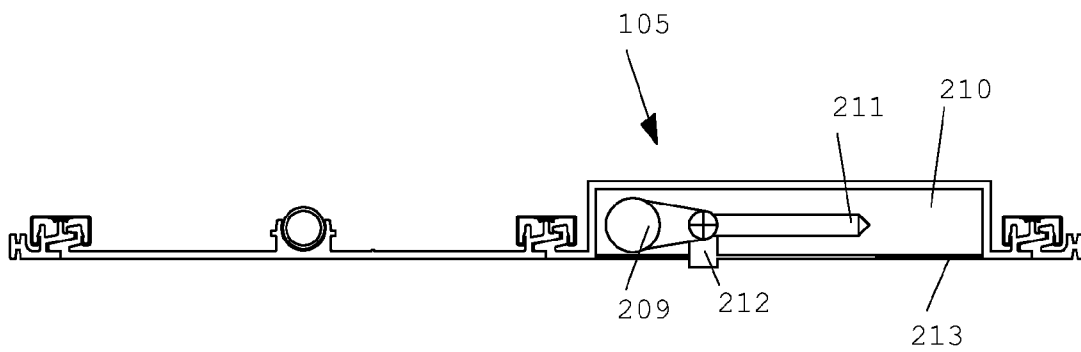


FIG. 14a

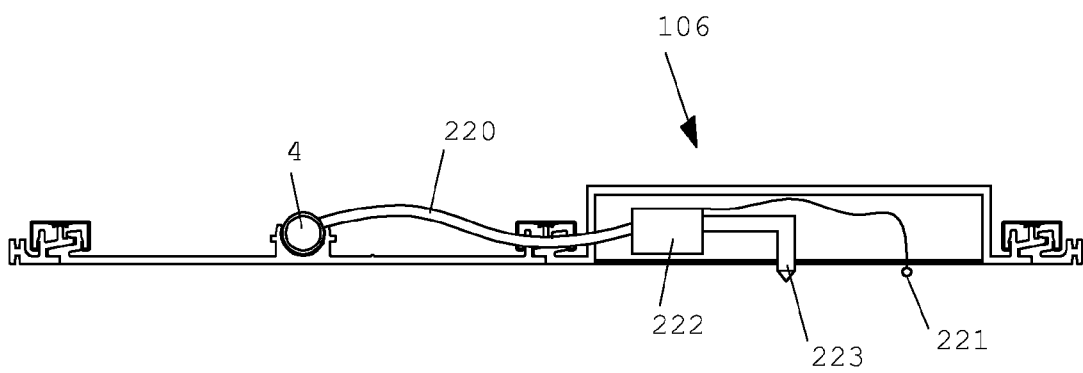


FIG. 14b

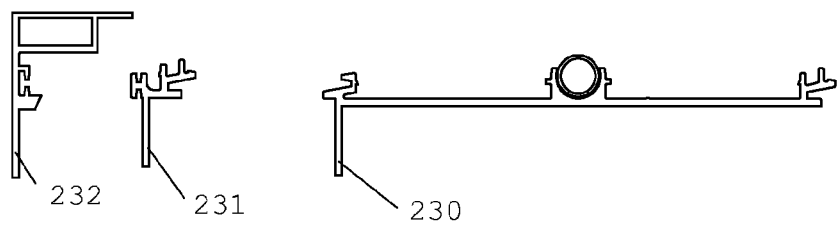


FIG. 15

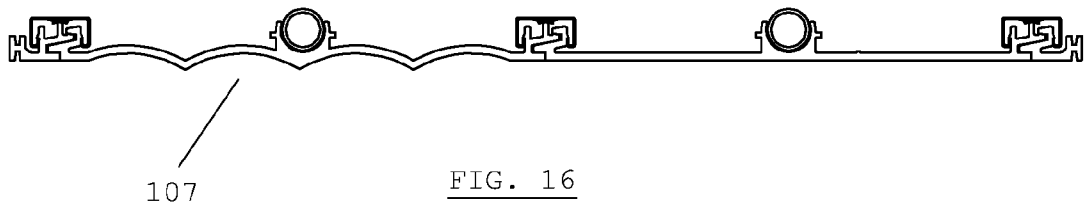


FIG. 16

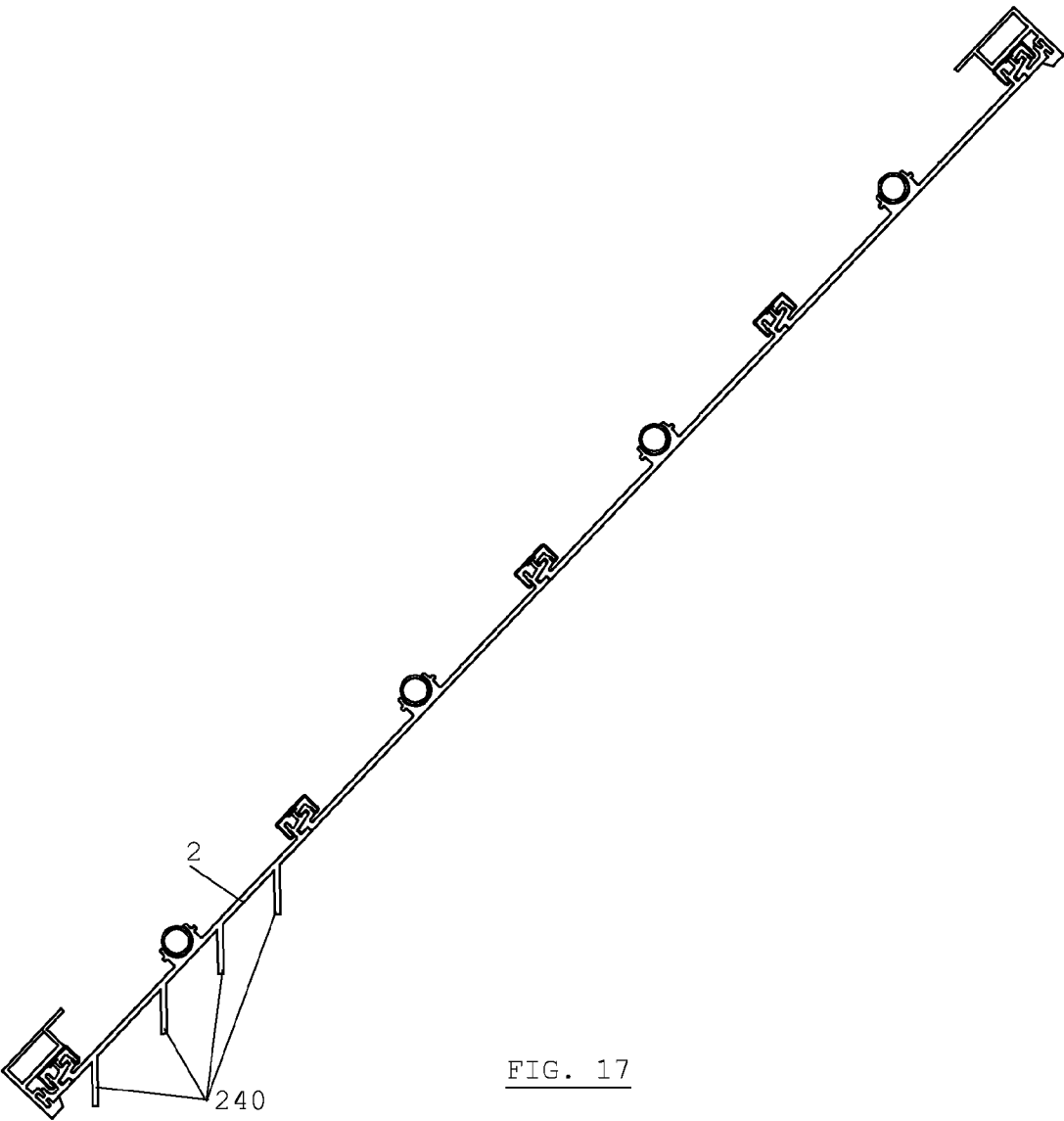


FIG. 17

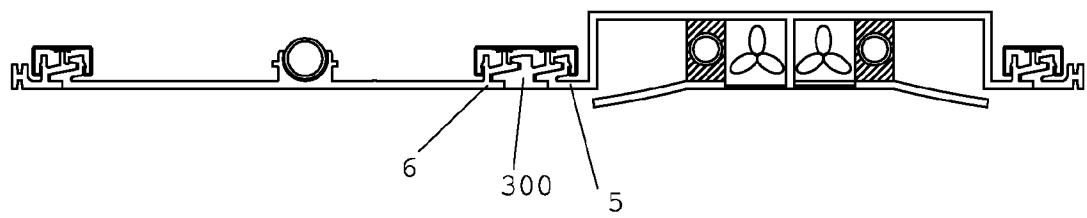


FIG. 18

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2011/054480

A. CLASSIFICATION OF SUBJECT MATTER
INV. F24D3/16
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F24D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US 4 080 703 A (BECK JR EDWARD G) 28 March 1978 (1978-03-28) the whole document	1,4,5,7, 9 3,6,8, 10-25
X Y	----- US 2007/272295 A1 (RUBIN LEONID B [CA] ET AL) 29 November 2007 (2007-11-29) abstract; figures	1,4,5,9 3,6, 10-25
X Y	----- GB 2 376 431 A (SECO ALUMINIUM LTD [GB]) 18 December 2002 (2002-12-18) abstract; figures	1,2,5 10-25
X Y	----- WO 2010/099758 A1 (CHEN HONGCHUN [CN]) 10 September 2010 (2010-09-10) abstract; figures	1 10-25
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

23 November 2011

Date of mailing of the international search report

05/12/2011

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Vedoato, Luca

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2011/054480

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 972 683 C (FRENGER GUNNAR DIPL-ING) 3 September 1959 (1959-09-03) figures	1-25

Y	US 2010/313504 A1 (LI XINFANG [CN]) 16 December 2010 (2010-12-16) abstract; figures	1-25

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2011/054480

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4080703	A	28-03-1978	NONE
US 2007272295	A1	29-11-2007	CA 2653293 A1 06-12-2007 EP 2021702 A1 11-02-2009 JP 2009538520 A 05-11-2009 TW 200810135 A 16-02-2008 US 2007272295 A1 29-11-2007 WO 2007137407 A1 06-12-2007
GB 2376431	A	18-12-2002	GB 2376431 A 18-12-2002 WO 02103272 A1 27-12-2002
WO 2010099758	A1	10-09-2010	CN 101492955 A 29-07-2009 WO 2010099758 A1 10-09-2010
DE 972683	C	03-09-1959	NONE
US 2010313504	A1	16-12-2010	CN 201411875 Y 24-02-2010 US 2010313504 A1 16-12-2010