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(54) **Air Conditioning Unit**

(57) The air conditioning unit comprises a casing (2) housing in its interior an air treatment unit. The casing presents first apertures (11) for air entry into its interior, second apertures (14) for cold air expulsion positioned in a bottom region thereof, and third apertures (16) for hot air expulsion positioned in its top. The interior of the casing houses, for treating a refrigerant fluid, a compressor (20) connected to a condenser (23) positioned at said third apertures, the condenser being connected to a throttling means (22) which is connected to an evaporator (21) positioned at the second apertures. The interior of the casing also houses fans (25,26) arranged to force the air entering from said first apertures towards the second and third apertures.

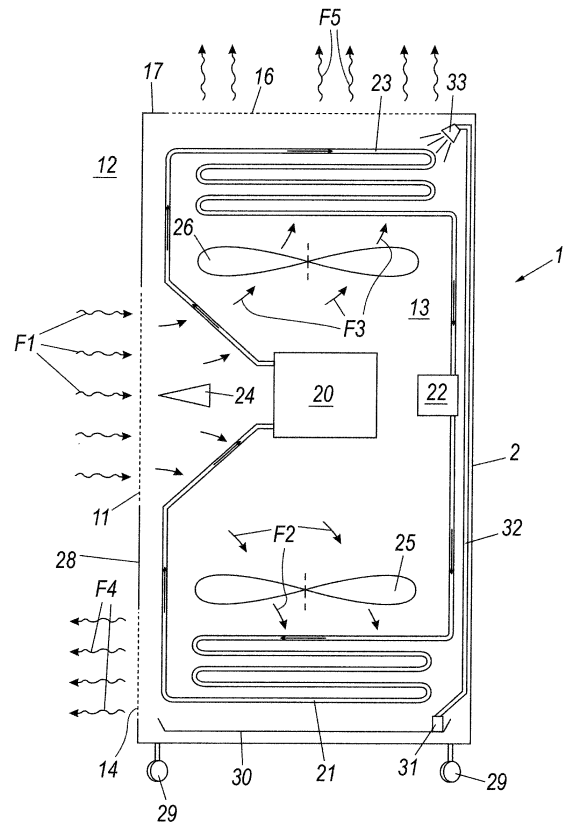


Fig. 1

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Description

[0001] The present invention relates to an air conditioning unit.

[0002] Hereinafter reference will be made in particular to air conditioning units usable in non-closed environments, i.e. outside buildings.

[0003] To condition air outside buildings rudimentary fans are currently used which, by moving the air by a blade create a pleasant refreshing effect for those persons exposed to the moving air flow.

[0004] However, when the air temperature is very high, the mere refreshing effect caused by the air movement is insufficient to ensure a pleasant sensation to those persons located in an outside environment who are struck by the moving air; in fact the hot air could generate an unpleasant sensation and hence the presence of the fan could be counterproductive.

[0005] To obviate this drawback, devices have been developed provided with a fan for moving the air and in addition one or more nozzles which spray water droplets into the air, to create clouds of air droplets which provide a very pleasant refreshing sensation when they strike the user.

[0006] It is however evident that these devices also present certain drawbacks, including the fact that the person struck by the flow of air and water droplets is inevitably wetted.

[0007] This is naturally unpleasant and is to be avoided.

[0008] In addition, the fact of generating clouds of water droplets could create dangerous situations, for example if the user is in the presence of electrical machines.

[0009] The technical aim of the present invention is therefore to provide an air conditioning unit by which the stated technical drawbacks of the known art are eliminated.

[0010] Within the scope of this technical aim, an object of the invention is to provide an air conditioning unit which is able to refresh a region within an external environment even when the external air temperature is very high, without the risk of generating unpleasant sensations for the user.

[0011] Another object of the invention is to provide an air conditioning unit which does not wet the user.

[0012] A further object of the invention is to provide an air conditioning unit which is safe and which, in particular, does not generate dangerous situations for the user when in use.

[0013] The technical aim, together with these and other objects, are attained according to the present invention by an air conditioning unit in accordance with claim 1.

[0014] Other characteristics of the invention are defined in the subsequent claims.

[0015] Further characteristics and advantages of the invention will be more apparent from the description of a preferred but non-exclusive embodiment of the air conditioning unit according to the invention, illustrated by way

of non-limiting in the accompanying drawings, in which:

Figure 1 is a schematic view of a unit according to the present invention;

Figures 2 and 3 show two different views of the unit of the invention.

[0016] With reference to said figures, these show an air conditioning unit indicated overall by the reference numeral 1.

[0017] The unit 1 comprises a casing 2 housing in its interior an air treatment unit.

[0018] The casing 2 presents first apertures 11 for air entry into its interior 13 from the outside 12, these being positioned in an intermediate region of a substantially vertical wall thereof.

[0019] The casing 2 also presents, for cold air expulsion, second apertures 14 positioned in a bottom region thereof; the second apertures 14 are also preferably provided in a substantially vertical wall of the casing.

[0020] Finally, the casing 2 presents, for hot air expulsion, third apertures 16 positioned in an upper portion of the casing, preferably in a substantially horizontal wall 17 (as in the illustrated example), but not in a substantially vertical wall.

[0021] The interior of the casing 2 houses a compressor 20 to treat a refrigerant fluid; the compressor 20 is connected to an evaporator 21 positioned at the second apertures 14.

[0022] The evaporator 21 is connected to a throttling means 22 (typically a throttling valve), this latter being connected to a condenser 23 positioned at the third apertures 16.

[0023] The interior of the casing 2 also houses at least one fan for forcing the air entering from the first apertures 11 towards the second and third apertures 14, 16.

[0024] In the illustrated example a first fan 25 is arranged to feed air onto the evaporator 21, a second fan 26 feeding air onto the condenser 23.

[0025] Advantageously a baffle 24 is also provided to divide the air flow entering from the first apertures 11.

[0026] Alternatively a single fan can be provided, for example housed inside the casing 2 at the first apertures 11, or the number of fans can be greater than 2, for example in addition to the fans shown in Figure 1 a third fan can be provided positioned at the first apertures 11.

[0027] The third apertures 16 are preferably located in the top wall 17 of the casing 2.

[0028] As shown in the accompanying figures, the casing 2 presents a cylindrical body with a polygonal base (square in the illustrated example), with the first and second apertures 11, 14 provided in at least one lateral wall of the cylindrical body (i.e. the first and second apertures 11, 14 can be provided in one lateral wall, in two or even in more lateral walls).

[0029] In particular the first and second apertures 11, 14 are provided in the same substantially vertical lateral walls 28 of the cylindrical body.

[0030] Advantageously the air conditioning unit 1 of the invention presents wheels 29 to facilitate its movement.

[0031] The air conditioning unit 1 also comprises a tray 30 positioned in a bottom portion thereof to collect the condensation water.

[0032] A pump 31 dipping into the tray 30 is connected to a pipe 32 terminating with an injector nozzle 33 arranged to spray the water accumulating in the tray 30 onto the condenser 23.

[0033] This enables the heat and moisture to be removed from the unit 1 by concentrating them in a region (above the unit 1) far from the user.

[0034] Advantageously, the unit 1 also comprises a movable wall 35 which can be associated with the casing 2 in such a manner as to maintain the cold air delivered by the second apertures 14 localized.

[0035] In practice the movable wall 35 defines a closed enclosure within which the casing 1 is positioned.

[0036] In this manner the cold air delivered in proximity to the floor by the second apertures 14 remains concentrated as it is retained by the movable wall 35; this is because the cold air tends to remain in proximity to the floor and is unable to straddle the movable wall 35.

[0037] The operation of the unit of the invention is apparent from that described and illustrated, and is substantially the following.

[0038] Air enters the unit 1 through the first apertures 11 (arrow F1).

[0039] A part F2 of the entering air flow is directed onto the evaporator 21 by the baffle 24 and by the fan 25, while a second part F3 of the air flow is fed onto the condenser 23 by the baffle 24 and by the other fan 26.

[0040] Simultaneously the compressor 20 pressurizes the refrigerant fluid which yields heat to the air flow F3 in the condenser 23; the refrigerant fluid hence yields heat and changes state by passing from vapour to liquid, while the air flow F3 is heated.

[0041] The refrigerant fluid (liquid) then undergoes sudden pressure drop through the throttle valve 22.

[0042] Finally, in the evaporator 21 the refrigerant fluid (liquid) absorbs heat from the air flow F2; hence the refrigerant fluid absorbs heat and changes state (from liquid to vapour) while the air flow F2 cools.

[0043] Finally, the refrigerant fluid vapour returns to the compressor 20 and the cycle recommences.

[0044] During operation, cold air F4 is expelled from the second apertures 14, while hot air F5 is expelled from the third apertures 16.

[0045] The tray 30 accumulates condensate water together with those droplets delivered by the nozzle 33 which are not removed.

[0046] The water which accumulates in the tray 30 is sprayed onto the condenser 23 by the pump 31 and the injector nozzle 33.

[0047] This enables the cooling of the refrigerant fluid to be intensified as the water absorbs heat by subtracting it from the refrigerant fluid circulating through the evaporator 23.

orator 23.

[0048] This also enables the moisture to be removed as the sprayed water partly evaporates and partly remains in the form of liquid droplets, but in both cases is mostly entrained by the air flow F3 and removed through the third apertures 16.

[0049] Finally, by placing the casing within the movable wall 35 (which defines a preferably but not necessarily closed enclosure), the cold air which stratifies at the floor is able to be retained, being unable to pass over the movable wall, to create outdoors a cold region in an averagely hot environment.

[0050] It has been found in practice that the cooling unit of the invention forms a self-sufficient combination which requires only electric power and is particularly suitable for use in open environments (for example in a garden) as it delivers cold air from the bottom and expels hot air (with vapour) from the top.

[0051] The air conditioning unit conceived in this manner is susceptible to numerous modifications and variants, all falling within the scope of the inventive concept; moreover all details can be replaced by technically equivalent elements.

[0052] In practice the materials used and the dimensions can be chosen at will in accordance with requirements and the state of the art.

Claims

1. An air conditioning unit (1) comprising a casing (2) housing in its interior an air treatment unit, **characterised in that** the casing (2) presents first apertures (11) for air entry into its interior (13) from the outside (12), second apertures (14) for cold air expulsion positioned in a bottom region thereof, and third apertures (16) for hot air expulsion positioned in its top, the interior of said casing (2) housing, for treating a refrigerant fluid, a compressor (20) connected to a condenser (23) positioned at said third apertures (16), said condenser (23) being connected to a throttling means (22) which is connected to an evaporator (21) positioned at said second apertures (14), the interior of said casing (2) also housing at least one fan (25, 26) arranged to force the air entering from said first apertures (11) towards said second and third apertures (14, 16).
2. A conditioning unit (1) as claimed in claim 1, **characterised in that** said first apertures (11) are positioned in an intermediate region of a substantially vertical wall (28) of said casing (2).
3. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised in that** said third apertures (16) are positioned in the top wall of said casing (2).

4. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised in that** said top wall is substantially horizontal.
5. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised by** presenting two fans (25, 26), a first fan (25) being arranged to feed air onto said evaporator (21) and a second fan (26) being arranged to feed air onto said condenser (23). 5
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6. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised in that** said casing (2) presents a cylindrical body with a polygonal base, said first and second apertures (11, 14) being provided in at least one lateral wall of said cylindrical body. 15
7. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised in that** said first and second apertures (11, 14) are provided in the same lateral walls of said cylindrical body. 20
8. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised by** presenting wheels (29) for facilitating its movement. 25
9. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised by** comprising a tray (30) for collecting the condensation water, a pump (31) dipping into the tray (30) being connected to a pipe (32) terminating with an injector nozzle (33) arranged to spray the water accumulated in said tray onto said condenser (23). 30
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10. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised by** comprising a movable wall (35) which can be associated with said casing (2) in such a manner as to maintain the cold air delivered by said second apertures (14) localized. 40
11. A conditioning unit (1) as claimed in one or more of the preceding claims, **characterised in that** said movable wall (35) defines a preferably closed enclosure. 45

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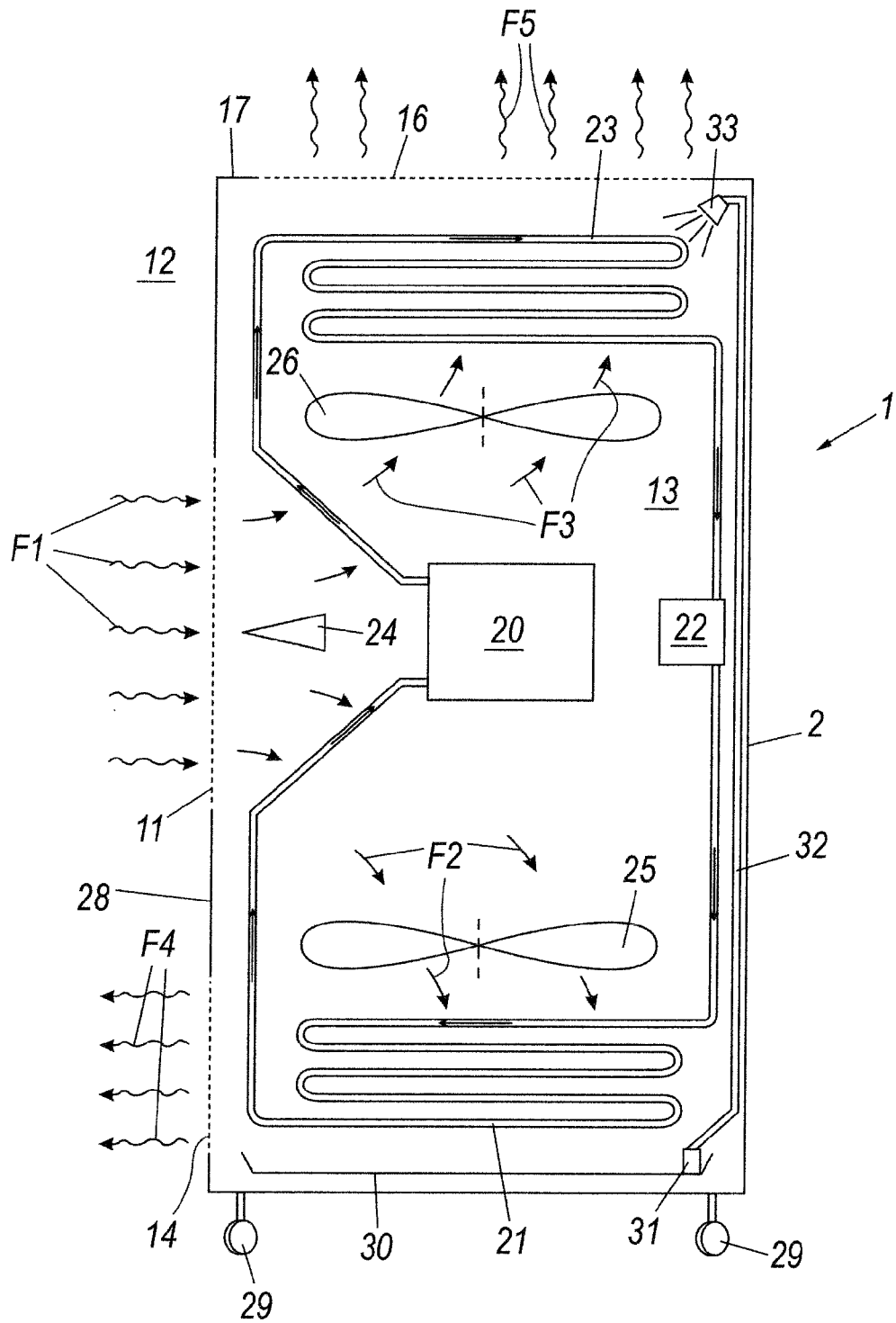


Fig. 1

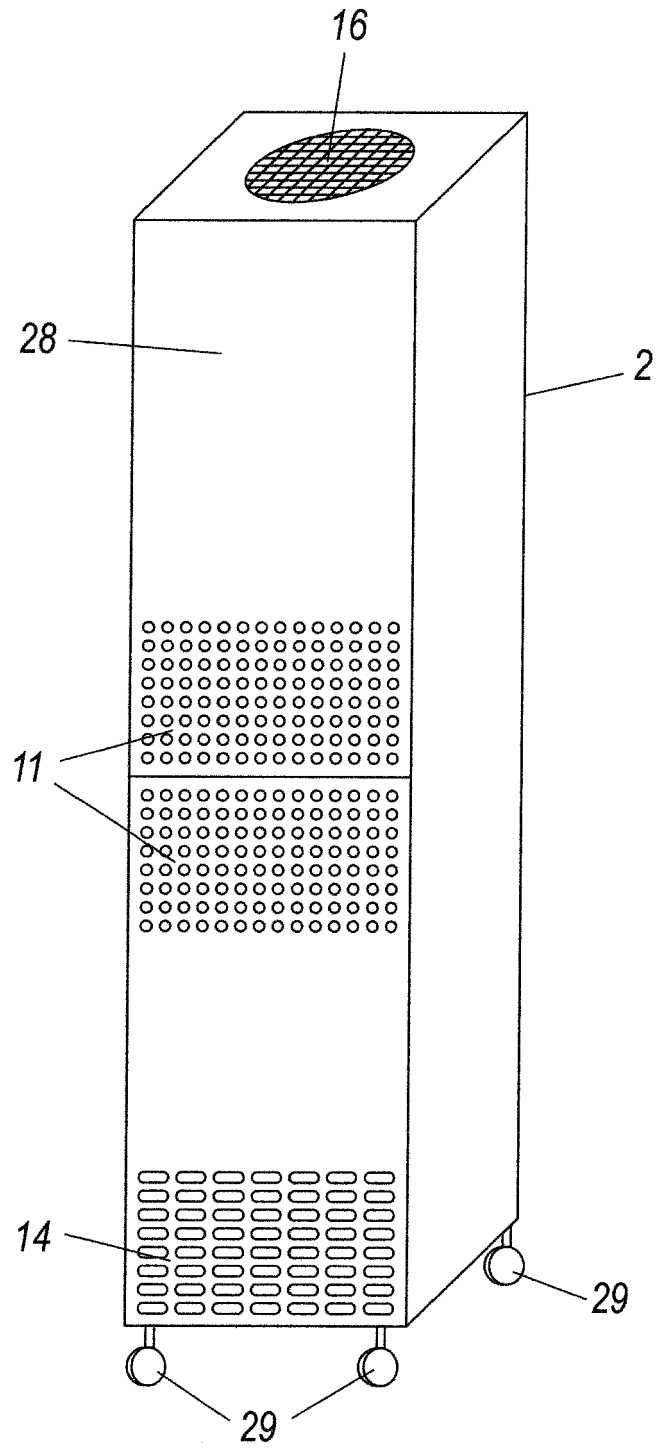


Fig. 2

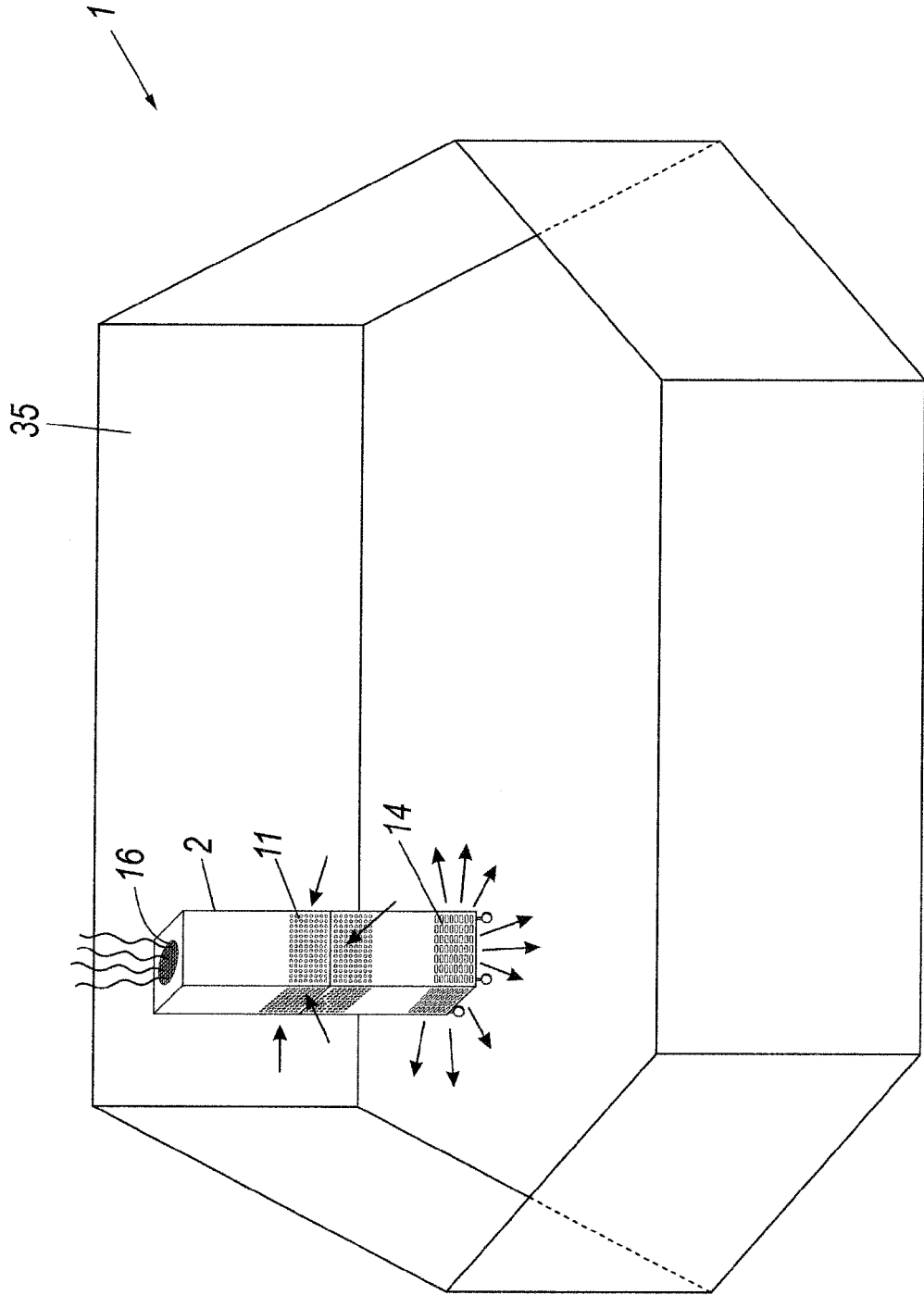


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 08 15 4411

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 405 549 B1 (BAFFES PETER [US]) 18 June 2002 (2002-06-18)	1-8	INV. F24F1/00
Y	* the whole document *	9	
Y	----- JP 2006 300465 A (EBARA REFRIGERATION EQUIPMENT) 2 November 2006 (2006-11-02) * abstract *	9	
A	----- US 4 729 293 A (TSUNODA HIDEO [JP] ET AL) 8 March 1988 (1988-03-08) * column 2, line 33 - line 38; figure 1 *	1-11	
A	----- JP 05 240460 A (SANYO ELECTRIC CO) 17 September 1993 (1993-09-17) * abstract; figure 1 *	9	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 1 April 2009	Examiner Vuc, Arianda
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 08 15 4411

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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01-04-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82