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(54) Improved cooling unit

(57) An improved cooling unit (1) is described, composed of a supporting and containing structure comprising at least one base (3) on which at least one compressor (5) is arranged, communicating on its front part with at least one condenser (7) and on its upper part with at least one evaporator (9), such supporting and containing structure comprising at least one shelf (13) for supporting such evaporator (9) arranged in a substantially horizontal position above such compressor (5), such shelf (13) being joined in an edge thereof to at least one deflecting profile (15) adapted to convey air flows (F_c) coming from at least one second axial fan (17) towards such evaporator (9).

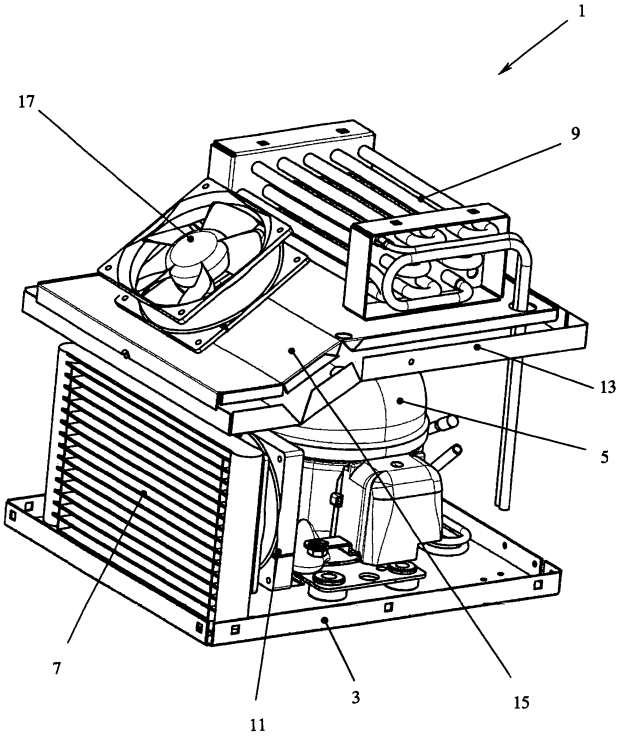

FIG. 1

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Description

[0001] The present invention refers to an improved cooling unit.

[0002] The prior art provides cooling units comprising all components of a refrigerating machine, such units being adapted to be coupled with one or more refrigerating cells made separately.

[0003] The peculiarity of such cooling units is that they are real stand-alone and functionally independent modules: in such a way, a manufacturer of a refrigerating cell can be limited to make such cell, by choosing and finding afterwards the most suitable cooling unit for the cell itself: therefore, it is then only enough to operatively couple the cell with the cooling unit deemed adequate, consequently limiting design costs and complexitiy, allowing the manufacturers of cells and/or refrigerated exhibitors to demand to third parties the technical competencies necessary for making the actual refrigerating machine.

[0004] Known cooling units are therefore usually composed of an external containing casing, inside which the various necessary components are placed in a functionally cooperating way, such as a compressor, an evaporator, a condenser, the various fans for circulating air flows and the ducts for transporting the refrigerating fluids, in addition to the common components necessary for electric supply, control, etc. Such external container is then equipped with one or more grids adapted to allow the passage of the various air flows, such as the flow towards the condenser and the compressor, and the recirculation of the air flow cooled by the evaporator to the refrigerating cell to which the unit is coupled and vice versa.

[0005] Obviously, the external container sizes are determined both by the sizes of the individual components and by the lay-out according to which such components are arranged inside the container itself. In parallel, the sizes of the individual components are determined by the refrigerating power with which the related cooling unit must be equipped. It is therefore clear that, technically, while it would be adequate, for manufacturers of refrigerating cells, to have refrigerating units available with more and more reduced external sizes, in such a way as to make it easy to place them into the working internal volume, such sizes are constrained by the required refrigerating power and by the sizes of the components necessary to obtain such power.

[0006] Document DE-U1-20 2005016871 discloses a cooling unit according to the preamble of Claim 1.

[0007] Object of the present invention is solving the above prior art problems, by providing an improved cooling unit that allows a relevant decrease of the external sizes of its own container, though strongly limiting the decrease of offered refrigerating power.

[0008] Another object of the present invention is providing an improved cooling unit that allows a relevant decrease of the external sizes of its own container optimising the lay-out of internal components.

[0009] Moreover, an object of the present invention is providing an improved cooling unit that allows a relevant decrease of the external sizes of its own container using an internal deflecting element that allows conveying and optimising the air flows towards the evaporator.

[0010] The above and other objects and advantages of the invention, as will appear from the following description, are obtained with an improved cooling unit as claimed in claim 1. Preferred embodiments and non-trivial variations of the present invention are the subject matter of the dependent claims.

[0011] It will be immediately obvious that numerous variations and modifications (for example related to shape, sizes, arrangements and parts with equivalent functionality) can be made to what is described, without departing from the scope of the invention as appears from the enclosed claims.

[0012] The present invention will be better described by some preferred embodiments thereof, provided as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 shows a top perspective view of a preferred embodiment of the improved cooling unit according to the present invention without its external coatings;
- Figure 2 shows a side view of the improved cooling unit of Figure 1;
- Figure 3 shows a top perspective view of the improved cooling unit of Figure 1 partially equipped with external coatings;
- Figure 4 shows a top perspective view of the improved cooling unit of Figure 1 equipped with external coatings;
- Figure 5 shows another top perspective view of the improved cooling unit of Figure 1; and
- Figure 6 shows a schematic side view of the improved cooling unit of Figure 2 in which some air flows are pointed out.

[0013] In order to shorten the description, herein below we will omit the descriptions related to the operating modes of the components that are common with other cooling units and necessary for the basic operation of the unit itself, that are anyway deemed widely known in the art, such as for example electric supply system, compression system, system for condensing, evaporating and channeling the refrigerating gases, etc., to describe more in detail the aspects and the components characterising the cooling unit 1 according to the present invention.

[0014] Therefore, with particular reference to Figures 1 and 2, it is possible to note that the improved cooling unit 1 according to the present invention is composed of a supporting and containing structure comprising at least one base 3 on which the following are arranged, suitably cooperating and mutually communicating as taught by the prior art: at least one compressor 5 of a refrigerating fluid communicating on its front part with at least one

condenser 7, preferably of the type with micro-channels to obtain a relevant weight saving with respect to prior art cooling units, and on its upper part with at least one evaporator 9. Preferably, between the compressor 5 and the condenser 7, at least one first axial fan 11 is arranged, adapted to take air flows from such condenser 7 and to eject such flows towards such compressor 5. Advantageously, the supporting and containing structure comprises at least one shelf 13 for supporting the evaporator 9, arranged in a substantially horizontal position above the compressor 5, such shelf 13 being joined at one edge thereof to at least one deflecting profile 15, suitably slanted, adapted to convey air flows F_C coming from at least one second axial fan 17 towards the evaporator 9. In particular, the adoption of the deflecting profile 15, slanted and joined to the shelf 13, allows arranging in a slanted position, in agreement with the slanting of the profile 13 itself, such second axial fan 17, consequently allowing a strong reduction of the global sizes of the unit 1 according to the present invention, in the below-specified measure.

[0015] Obviously, the supporting and containing structure is equipped with suitable size coatings, both to make the cooling unit 1 an independent and stand-alone module, and to protect the components arranged therein. Therefore, with particular reference to Figures 3, 4 and 5, it is possible to note that such side coatings comprise:

- at least one front wall 19 equipped with at least one suction opening 20, preferably covered with at least one related protecting grid 21, such opening 20 being arranged next to the condenser 7 in order to allow the first axial fan 11 to take air from outside;
- at least two side walls 23, at least one of which is equipped with at least one access opening 25, possibly covered with at least one protecting panel 27, adapted to allow possible assistance or maintenance interventions of the components arranged inside the supporting and containing structure;
- at least one rear wall 29 equipped with at least one disposal opening, preferably covered with at least one related protecting grid 31, such disposal opening being arranged downstream of the condenser 7 and the compressor 5 to allow disposing towards outside the air flows that, forced by the first axial fan 11, move near the compressor 5;
- at least one upper wall 33 equipped with at least one first slit 35 arranged next to the second axial fan 17, such first slit 35 being adapted to allow taking the air flows F_C from inside the refrigerating cell by such second axial fan 17, and at least one second slit 37 arranged next to the evaporator 9, such second slit 37 being adapted to allow the air flows F_R, cooled by the evaporator 9, to go out towards the top and to be inserted again into the refrigerating cell.

[0016] With particular reference to Figure 6, it is therefore possible to note that, once having placed the cooling unit 1 according to the present invention in cooperation with a refrigerating cell (not shown), typically such unit being arranged below the cell itself, the second axial fan 17 is adapted to guarantee the re-circulation of cooled air inside such cell, taking the air flows F_C coming from inside this latter one through the first slit 35 and forcing such flows to pass through the evaporator 9 that takes care of cooling them, in order to be afterwards inserted again upwards as cooled air flows F_R inside the refrigerating cell: during the path of the air flows F_C, the deflecting profile 15, with the help of the shelf 13, takes care of correctly orienting the flows F_C coming from the second axial fan 17 towards the evaporator 9, though such second axial fan 17 is arranged in a slanted position and, consequently, not optimally oriented towards the evaporator 9. The Applicant has therefore discovered that, using a compressor with R404A refrigerating gas and a displacement of 7.28 cm^3 at 936 Kcal under ASHRAE conditions (reference working conditions), the adoption of the deflecting profile 15 advantageously allows obtaining a cooling unit 1 according to the present invention having a global volume lower by 64% to 67% than the volume of comparable cooling units belonging to the prior art, with a reduction of the yielded refrigerating power included between 35% and 37% only, such loss having to be ascribed only to the compromise choice related to the compressor, made in such a way as to optimise the relationship between sizes and provided performance.

Claims

1. Improved cooling unit (1) composed of a supporting and containing structure comprising at least one base (3) on which at least one compressor (5) is arranged, communicating on its front part with at least one condenser (7) and on its uppoer part with at least one evaporator (9), **characterised in that** said supporting and containing structure comprises at least one shelf (13) for supporting said evaporator (9) arranged in a substantially horizontal position immediately above said compressor (5), said shelf (13) being joined in an edge thereof to at least one deflecting profile (15), placed immediately above said compressor (5) and adapted to convey air flows (F_C) coming from at least one second axial fan (17), placed immediately above said deflecting profile (15), towards said evaporator (9), placed immediately adjacent to said second axial fan (17) and immediately above said shelf (13), said deflecting profile (15) being slanted and said second axial fan (17) being arranged in a similar slanted position, and **in that**, in the reduced space between said compressor (5) and said condenser (7), at least one first axial fan (11) is arranged, adapted to take air flows from said condenser (7) and to eject said flows towards said compressor (5).

2. Improved cooling unit (1) according to claim 1, **char-**

acterised in that said condenser (7) is of the type with micro-channels.

3. Improved cooling unit (1) according to claim 1, **characterised in that** said supporting and containing structure is equipped with side coatings comprising:

- at least one front wall (19) equipped with at least one suction opening (20), said opening (20) being arranged next to said condenser (7) to allow said first axial fan (11) to take air from outside;
- at least two side walls (23), at least one of said walls (23) being equipped with at least one access opening (25) inside said supporting and containing structure;
- at least one rear wall (29) equipped with at least one disposal opening arranged downstream of said condenser (7) and said compressor (5), adapted to allow disposing towards outside the air flows that, forced by said first axial fan (11), pass near said compressor (5);
- at least one upper wall (33) equipped with at least one first slit (35) arranged next to said second axial fan (17), said first slit (35) being adapted to allow taking said air flows (F_c) from inside a refrigerating cell by said second axial fan (17), and at least one second slit (37) arranged next to said evaporator (9), said second slit (37) being adapted to allow the air flows (F_R) cooled by said evaporator (9) to go out towards the top and to insert them again into said refrigerating cell.

4. Improved cooling unit (1) according to claim 3, **characterised in that** said suction opening (20) is covered with at least one related protecting grid (21) and/or said access opening (25) is covered with at least one protecting panel (27) and/or said disposal opening is covered with a related protecting grid (31).

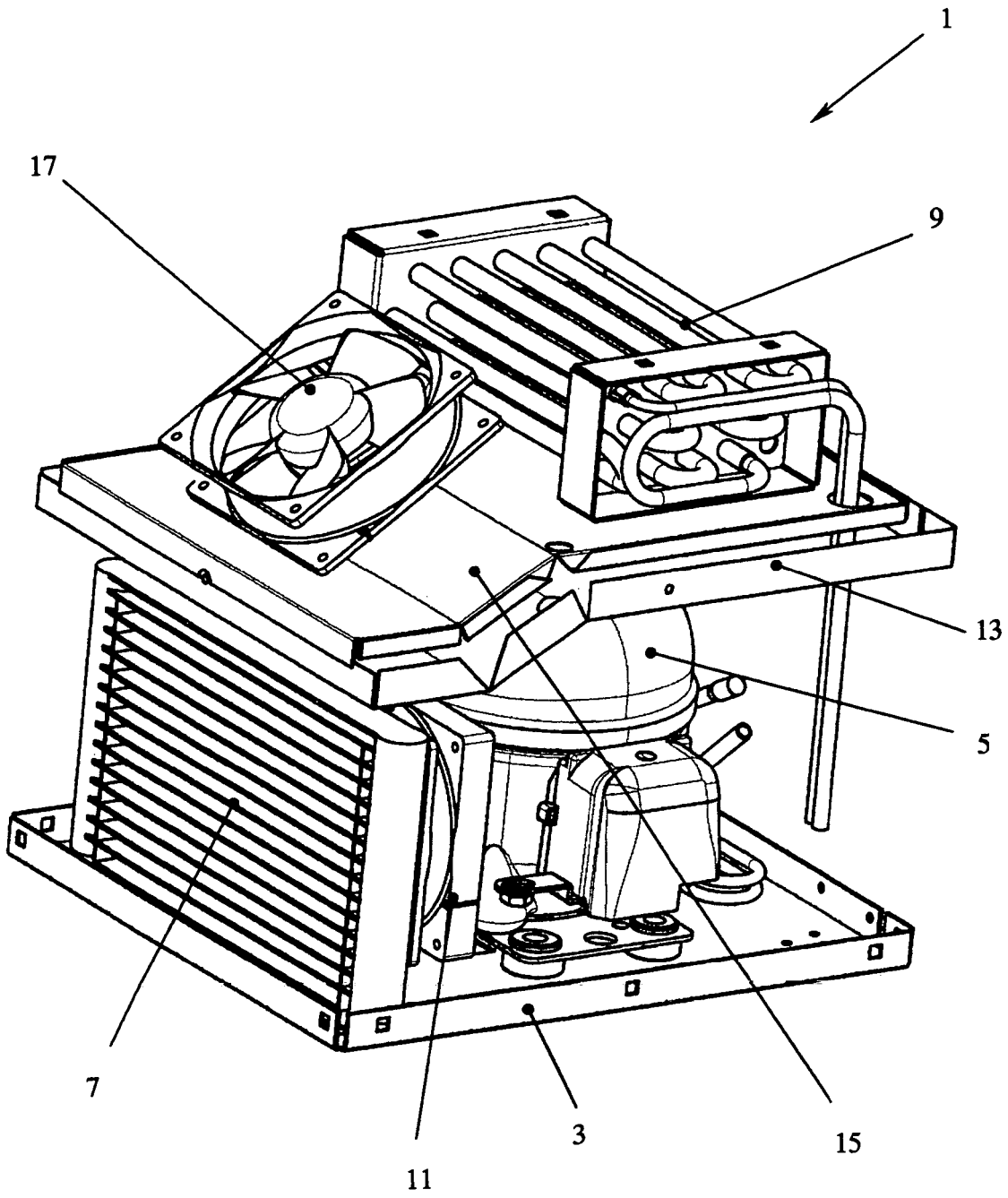

FIG. 1

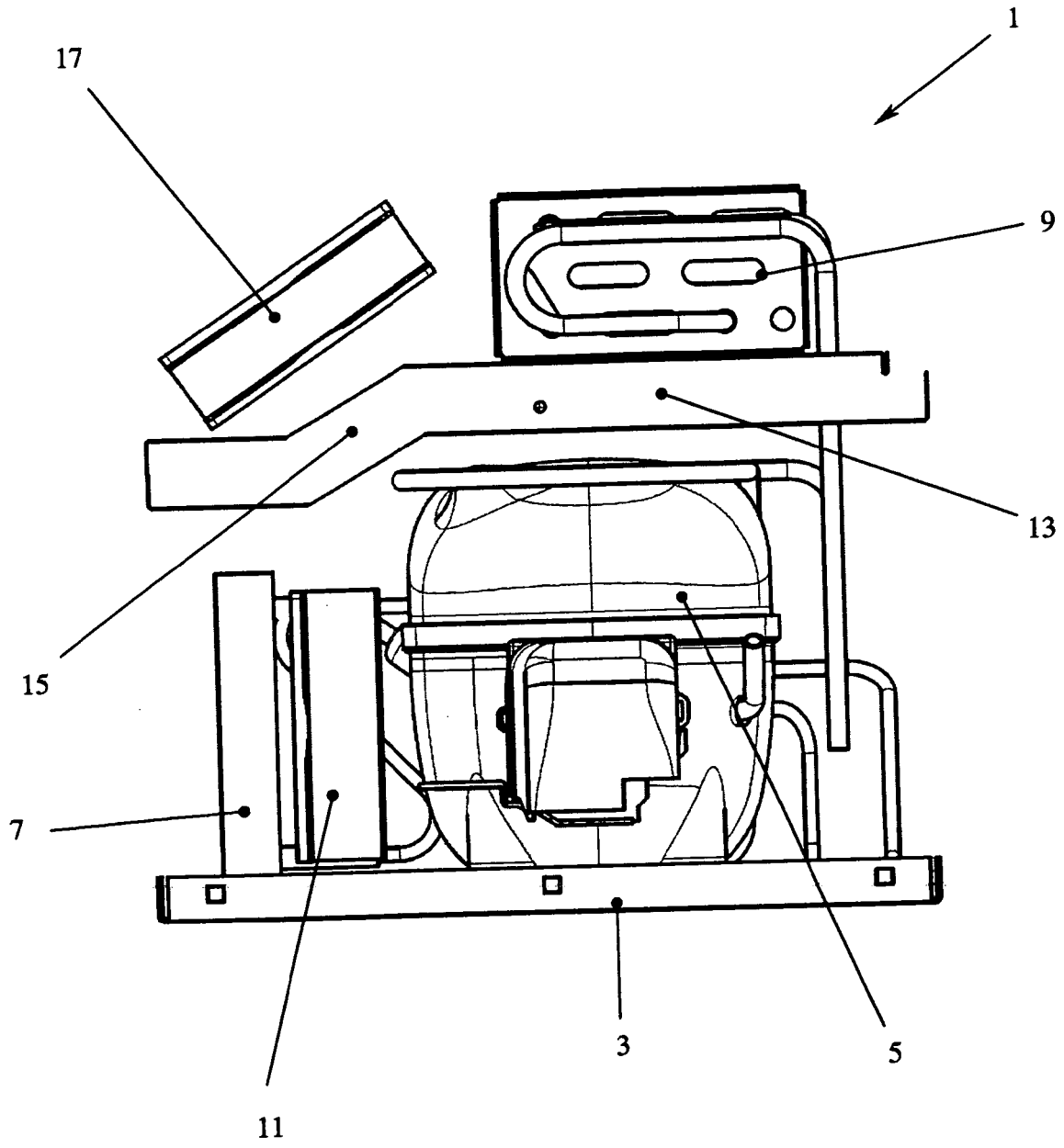

FIG. 2

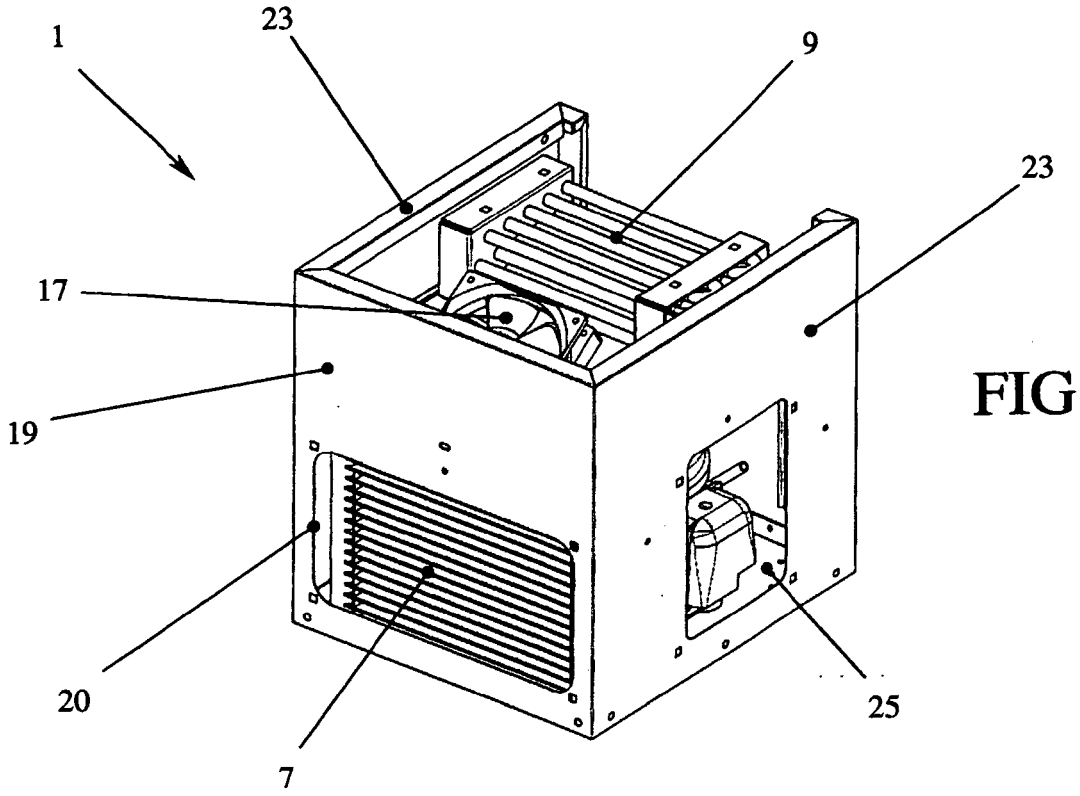

FIG. 3

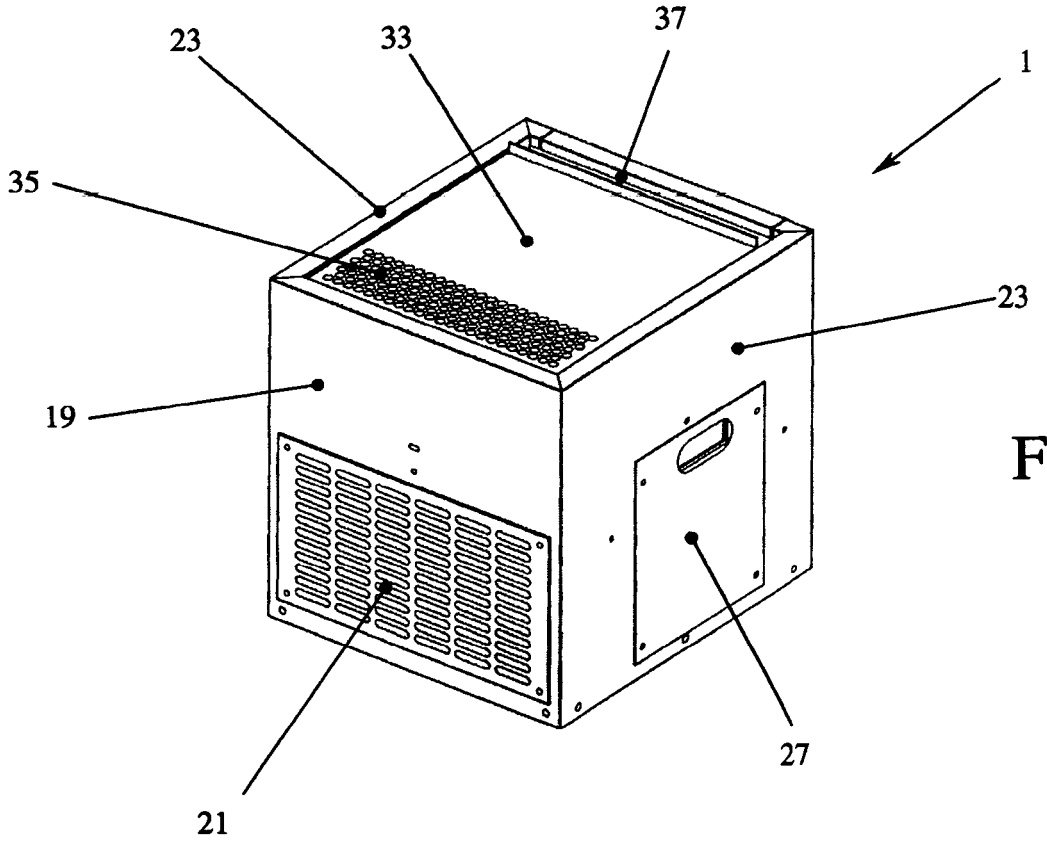

FIG. 4

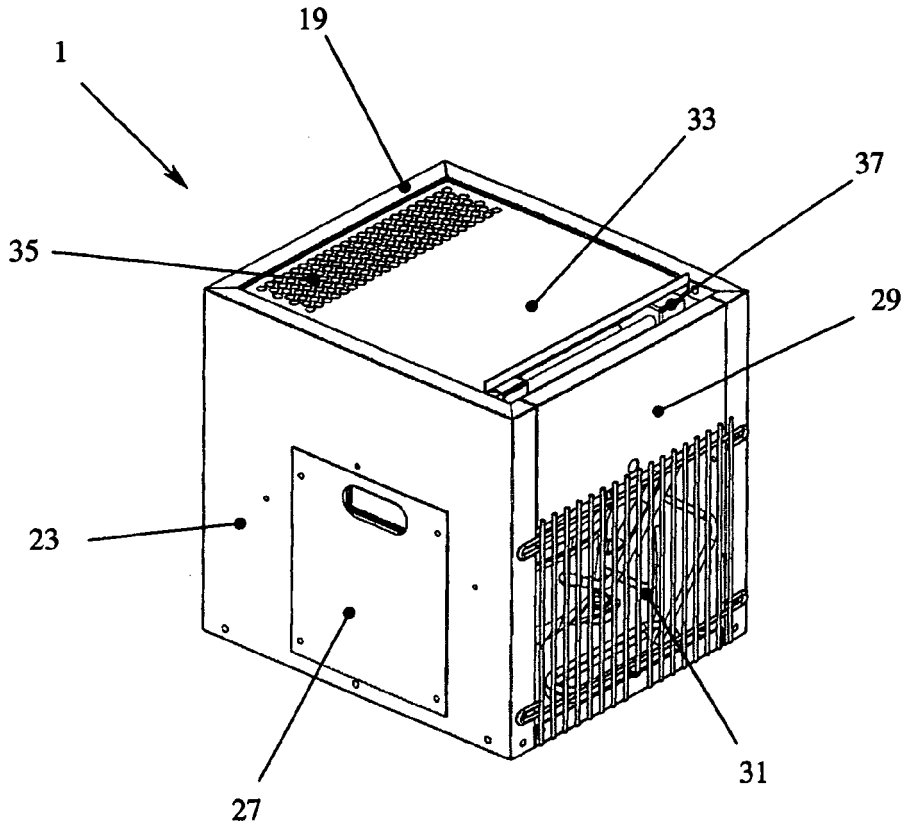

FIG. 5

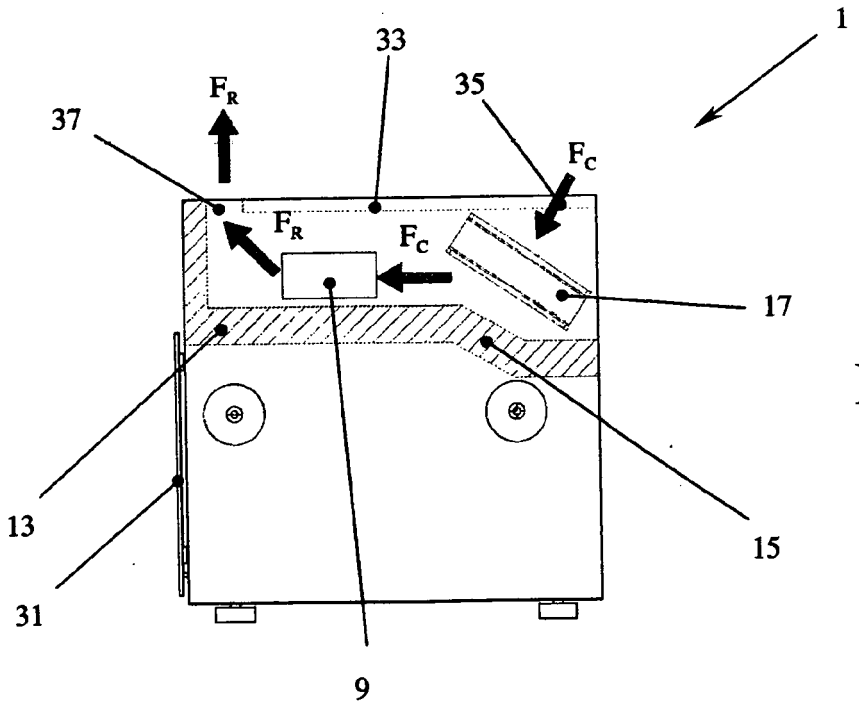

FIG. 6

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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