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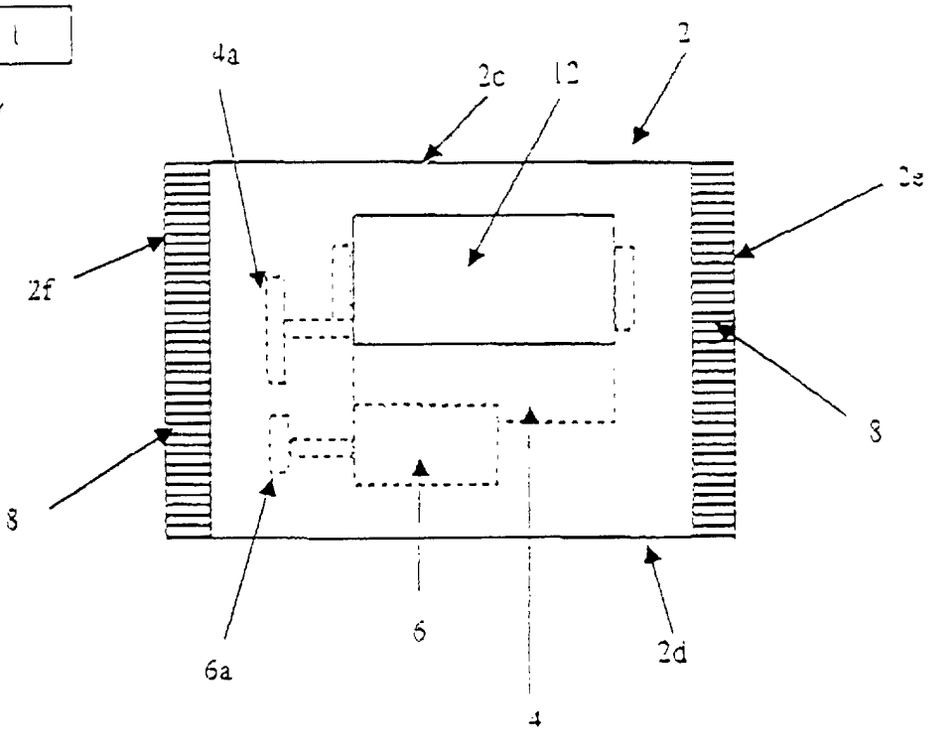
(54) Cooling and/or heating units

(57) Cooling unit for a refrigerated cooling system comprises an enclosure (2) housing a motor driven fan (4). At least two separate cooling coils (8) are mounted at different sides of the enclosure (2) the coils (8) being connected in parallel in a refrigeration circuit of the system so as to form the evaporator of the system. In use, the fan (4) draws air into the enclosure (2) via the coils (8) to be cooled thereby with the cooled air being discharged via an outlet (12) into appropriate ducting for distribution. The use of two or more separate coils to form the evaporator enables the size of the enclosure to be substantially reduced.

Figure 1

Top View



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Description

[0001] The present invention relates to cooling and/or heating units for cooling and/or heating systems, particularly ducted systems.

[0002] Conventionally, a cooling unit for a refrigerated cooling system comprises an enclosure housing a fan and a motor for driving the fan. The fan draws air into the enclosure via a cooling coil which forms the evaporator of the cooling system and the cooled air is discharged from an outlet of the enclosure into ducting for transmission into one or more zones to be cooled. The cooling capacity of the system is dependent on the surface area of the cooling coil (the evaporator) and, conventionally, the coil forms a wall of the enclosure whereby the enclosure has a size commensurate with the peripheral size of the coil. In many cases, this results in an enclosure of substantial size and bulk with substantial dead space internally of the enclosure due to the need to accommodate a coil of a surface area to provide a required cooling capacity. The size and bulk of the unit adds to the cost of construction and also can result in difficulties in installation particularly when the unit is being installed in a relatively confined space. Similar considerations apply when the coil forms the heating coil of a heat pump system or of a reverse cycle cooling system.

[0003] According to the present invention, there is provided a cooling unit for a refrigerated cooling system, comprising an enclosure, a motor-driven fan mounted within the enclosure, and at least two separate cooling coils mounted at different sides of the enclosure, said coils being connected in parallel in a refrigeration circuit of the system to form an evaporator of the system, and the fan being operative to draw air into the enclosure via the coils to be cooled by passage through the coils, with the cooled air being discharged from the enclosure via an outlet.

[0004] Further according to the invention, there is provided a cooling unit for a refrigerated cooling system, comprising a fan, at least two separate cooling coils connected in parallel in the circuit of a refrigerated cooling system to form an evaporator of the system, the coils being disposed at different sides of the fan whereby the fan is operative to draw in air in different directions via the separate cooling coils and to discharge the air thereby cooled via an outlet.

[0005] In a preferred embodiment of the invention each coil at least partially forms a respective side wall of an enclosure of cuboid shape within which the fan is mounted. The coils may be mounted at opposite sides of the enclosure or at any two or more different sides according to operational and installational requirements.

[0006] According to another aspect of the invention, there is provided a heating unit for a heat pump system. comprising an enclosure, a motor-driven fan mounted within the enclosure, and at least two separate heating coils mounted at different sides of the enclosure, said coils being connected in parallel in a circuit of the system to form a condenser of the system, and the fan being operative to draw air into the enclosure via the coils to be heated by passage through the coils, with the heated air being discharged from the enclosure via an outlet.

[0007] An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic plan view of a cooling unit in accordance with an embodiment of the invention; and

Figure 2 is a schematic front view of the unit shown in Figure 1.

[0008] In accordance with the present invention, a cooling unit of a refrigerated cooling system comprises an enclosure 2 housing a fan 4 driven by an electric motor 6 preferably also mounted within the enclosure 2. Any suitable form of driving connection can be established between the motor 6 and the fan 4 although in the particular embodiment illustrated this is effected by means of a simple belt drive system comprising a V-belt or other drive belt (not shown) coupling a drive pulley 6a on a shaft of the motor 6 and a driven pulley 4a on a shaft of a rotor of the fan 4. In the embodiment shown, the enclosure 2 is of cuboid form having upper and lower side walls 2a, 2b and four vertical side walls 2c to 2f. In contrast to conventional cooling units in which a single cooling coil of a defined surface area to provide the required cooling capacity is mounted at one side of the enclosure, with the enclosure being made of a size commensurate with the size of the coil, in accordance with the invention cooling is effected using two or more separate coils 8 mounted at different sides of the enclosure, with the different coils 8 being connected in parallel in the cefrigerated cooling circuit In the particular embodiment shown there are two cooling coils 8 at two opposite sides of the enclosure and at opposite sides of the fan 4. In the particular embodiment shown, the fan 4 is a centrifugal fan having opposed inlets 10 adjacent the respective coils 8, the fan 4 discharging through an outlet 12 in the upper side wall 2a of the enclosure 2. In this configuration, the upper side wall 2a of the enclosure 2 is adapted to be connected to suitable ducting so that the cooled air is discharged directly from the enclosure 2 into the ducting for subsequent distribution. Although in the illustrated embodiment, the fan is a centrifugal fan, other suitable forms of fan could alternatively be used.

[0009] In the embodiment shown the evaporator or cooling side of the cooling system is formed by two separate coils 8 connected in parallel; however depending on the installation and cooling requirements the evaporator could be formed by more than two separate coils connected in parallel, for example three or four coils. The positioning of the two (or more) coils is not restricted to the illustrated configuration and to an extent will be

determined by the installational requirements of a particular system. For example, for a two-coil unit one coil may be positioned at one of the vertical sides as illustrated and the second coil may be at an adjacent vertical side or the lower side. For a three-coil unit, two of the coils may be positioned at opposite vertical sides as shown, with the third coil being positioned at another one of the vertical sides or even at the lower side. It will also be understood that the outlet 12 does not need to be in the upper side wall as illustrated. It could alternatively be in the lower side wall for downwards discharge or in one the vertical side walls for horizontal discharge, depending on installation requirements. In this latter case, by way of example a cooling unit with four cooling coils for horizontal discharge may comprise two coils at opposite vertical sides in the manner illustrated, one coil mounted at the upper side and one coil at another one of the vertical sides.

[0010] As will be apparent the illustrated embodiment provides significant versatility in the arrangement of the two or more separate cooling coils at selected ones of the six sides of the enclosure and this can be varied in accordance with the required cooling capacity and the installation requirements of the unit. Depending on the structure the coil 8 may form substantially the entirety of the side wall of the enclosure 2 at the side at which it is mounted or it may be mounted within a frame structure which jointly forms with the coil 8 the side wall.

[0011] The use of two or more separate coils permits the size of the cooling unit to be substantially reduced without affecting the cooling capacity, with the dead space within the interior of the enclosure being substantially reduced. The reduction in size of the cooling unit not only reduces manufacturing costs, but also substantially reduces transportation costs but also facilitates installation as less space is required for installation and can therefore be fitted into spaces which could not accommodate a conventional cooling unit of equivalent cooling capacity.

[0012] Although the invention has been described in relation to a cooling unit, it will be appreciated that in a refrigerated cooling system having a reverse cycle capability so that effectively, the system can then be selectively used as a heating system, the described cooling unit in the reverse cycle mode then becomes a heating unit. Correspondingly the invention is also applicable to the heating unit of a heat pump type heating system operating on a refrigerative cycle whereby the described coils, enclosure, and fan form a heating unit for discharge of heated air via the outlet and into ducting.

[0013] Although it is to be understood that any suitable form of refrigerant may be used in the cooling and/or heating system of which the described cooling and/or heating unit forms a part, in one preferred form the refrigerant is water.

[0014] The embodiment has been described by way of example only and modifications are possible within the scope of the invention.

Claims

1. A cooling unit for a refrigerated cooling system. comprising an enclosure, a motor-driven fan mounted within the enclosure, and at least two separate cooling coils mounted at different sides of the enclosure, said coils being connected in parallel in a refrigeration circuit of the system to form an evaporator of the system, and the fan being operative co draw air into the enclosure via the coils to be cooled by passage through the coils, with the cooled air being discharged from the enclosure via an outlet.

2. A cooling unit according to claim 1, wherein the outlet is in a wall of the enclosure different from walls of the enclosure including the cooling coils.

3. A cooling unit according to claim 2, wherein the outlet is arranged to communicate with ducting for distribution of the cooled air.

4. A cooling unit according to any one of claims 1 to 3, wherein the enclosure is of cuboid form having rectangular upper and lower walls and four rectangular vertical walls.

5. A cooling unit according to claim 4, wherein said at least two separate coils are mounted in different ones of the vertical walls.

6. A cooling unit according co claim 4, wherein one of said at least two coils is mounted in one of the vertical walls and the other of said at least two coils is mounted in the upper or lower wall.

7. A cooling unit for a refrigerated cooling system, comprising a fan, at least two separate cooling coils connected in parallel in the circuit of a refrigerated cooling system to form an evaporator of the system, the coils being disposed at different sides of the fan whereby the fan is operative to draw in air in different directions via the separate cooling coils and to discharge the air thereby cooled via an outlet.

8. A cooling unit according to claim 7, wherein a respective one of two such coils is at a respective one of two opposite sides of the fan.

9. A cooling unit according to claim 7 or claim 8, having three or more said coils each at a different side of the fan.

10. A cooling unit according to any one of claims 7 to 9, wherein each coil at least partially forms a respective side wall of an enclosure within which the fan is mounted.

11. A refrigerated cooling system including a cooling

unit according to any one of claims 1 to 10.

12. A cooling system according to claim 11 having the capability for reverse cycle operation whereby the cooling unit then operates as a heating unit.

13. A heating unit for a heat pump system, comprising an enclosure, a motor-driven fan mounted within the enclosure, and at least two separate heating coils mounted at different sides of the enclosure, said coils being connected in parallel in a circuit of the system to form a condenser of the system, and the fan being operative to draw air into the enclosure via the coils to be heated by passage through the coils, with the heated air being discharged from the enclosure via an outlet.

Figure 1

Top View

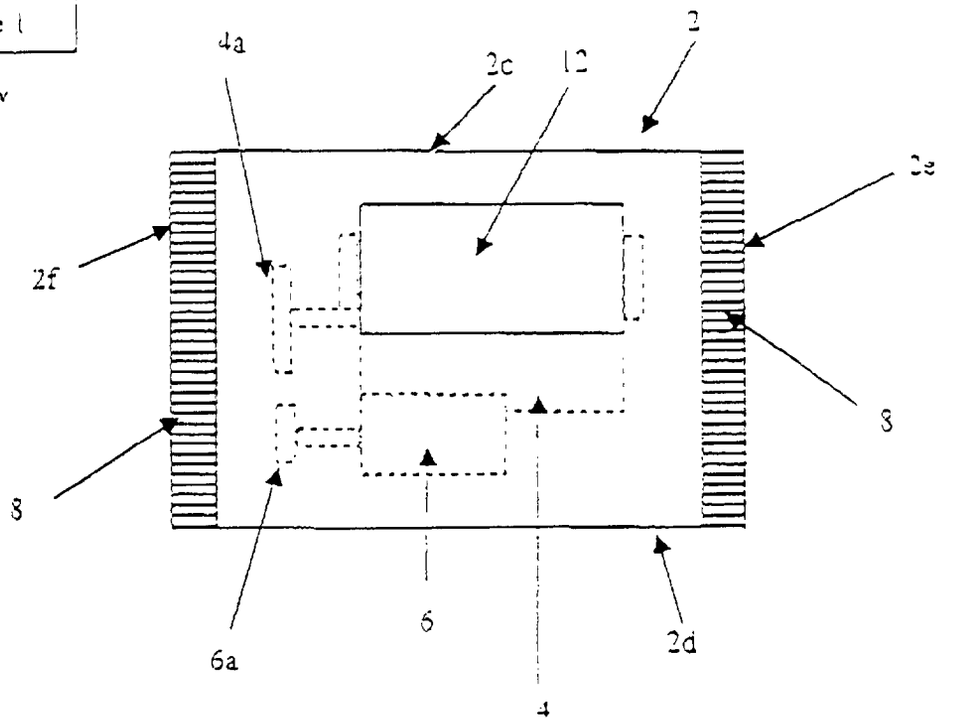
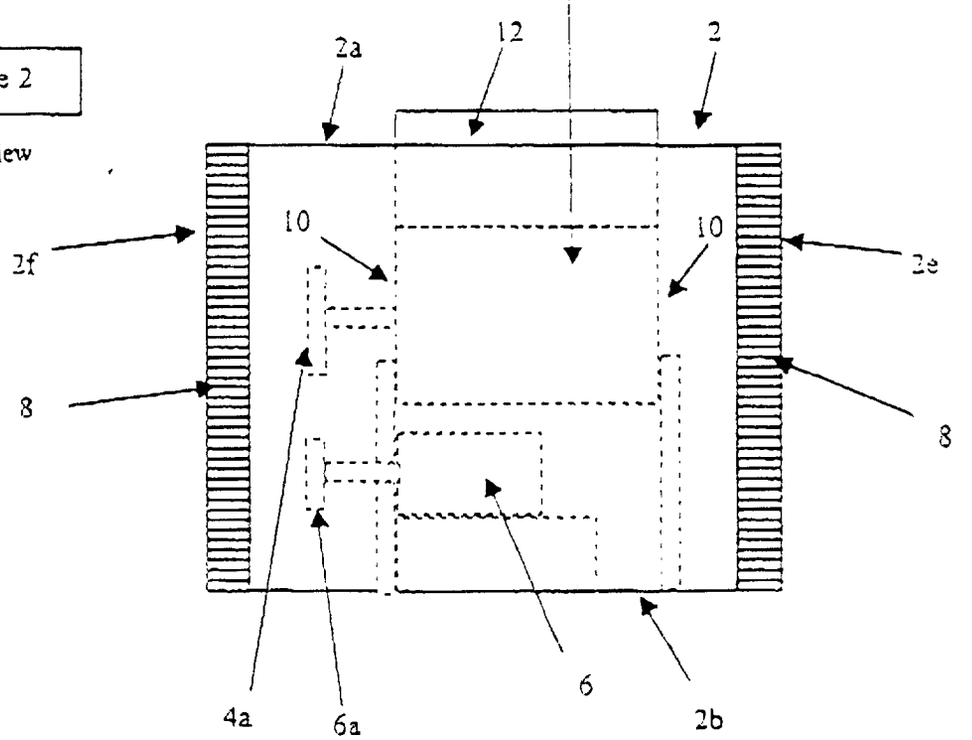


Figure 2

Front View



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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 4117

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 September 2001	Jessen, F

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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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