(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 116 788 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
11.11.2009 Bulletin 2009/46

(51) Int Cl.:
F24F 11/00 *(2006.01)* ***F24F 3/06*** *(2006.01)*
H05K 7/20 *(2006.01)*

(21) Application number: **09397511.8**

(22) Date of filing: **02.04.2009**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK TR

(30) Priority: **06.05.2008 FI 20085412**

(71) Applicant: **Fläkt Woods AB**
55184 Jönköping (SE)

(72) Inventor: **Mäkinen, Pekka**
FI-20100, Turku (FI)

(74) Representative: **Heinänen, Pekka Antero et al**
Heinänen Oy Patent Agency
Airport Plaza
Äyritie 8 D
01510 Vantaa (FI)

(54) Method for using outdoor air to cool room devices

(57) Method for using outdoor air to cool room devices, e.g. chilled beams (4). The invention is implemented such that the water returning from the room devices is used in the supply air radiator (3) to heat the supply air, in which case this water cools and is conducted back to the room devices to cool the room spaces.

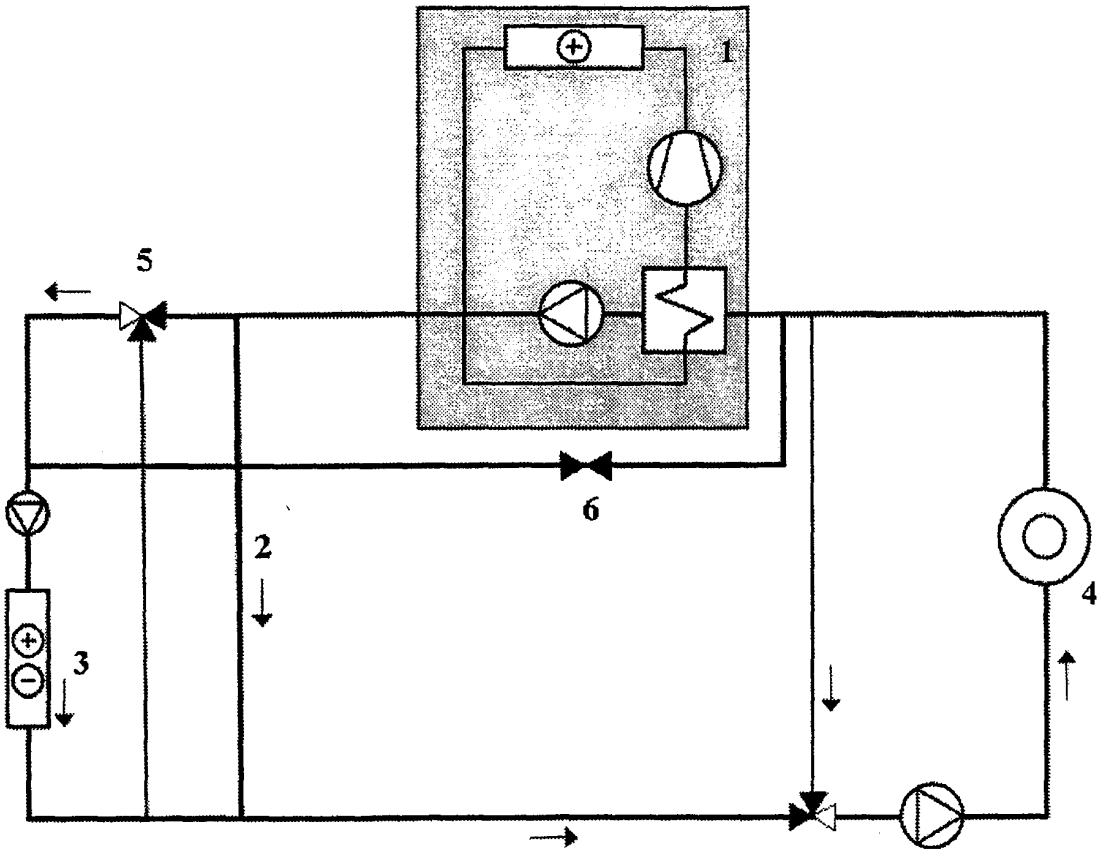

Fig. 1

EP 2 116 788 A2

Description

[0001] The object of this invention is a method for using outdoor air to cool room devices, e.g. chilled beams.

[0002] A need for cooling in the indoor spaces of buildings arises typically when the temperature of the outdoor air is high. The internal loads of room spaces, such as lighting and computers, create a need for cooling also when the temperature of the outdoor air is low, e.g. below 5 °C. In this case it is possible to use the colder temperature of the outdoor air for cooling the indoor air. Typically the colder temperature of the outdoor air is utilized only in inblowing fan air, i.e. air of a low temperature, e.g. 15 °C, is blown inside. This cooling power is not, however, sufficient but instead it is advantageous if the cooling energy contained in outdoor air can be conducted also to the room devices.

[0003] Cooling of the room devices occurring with outdoor air is thus not normally utilized in the cooling of ventilation because it is generally awkward to implement and requires new pipe branches, heat exchangers and pumps to be added to the typical pipe field. Since the cooling plant and the ventilation plant typically come from different suppliers, it is not easy to coordinate these additional structures into a viable apparatus.

[0004] When cooling with outdoor air is used, it is generally implemented by adding apparatuses to the cooling plant, with which the coldness of the outdoor air is transferred to the "main circulation circuit". This means a heat exchanger, its pumps and pipings, etc., must be added to the roof of the building. This type of cooling is generally either ON or OFF, i.e. it can only be used when the temperature of the outdoor air is so low that all the cooling can be managed with it.

[0005] The purpose of this invention is to achieve a method for using outdoor air for cooling room devices, to which method the problems described above are not attached. The method according to the invention is **characterized in that** the water returning from the room devices is used in the supply air radiator to heat the supply air, in which case this water cools and is conducted back to the room devices to cool the room spaces. In this way both heating energy and cooling energy are saved.

[0006] One preferred embodiment of the method according to the invention is **characterized in that** cooling with outdoor air is simultaneous with the cooling occurring by means of the cooling compressors. The cooling power with the outdoor air can thus be supplemented with the compressor when the temperature of the outdoor air is not sufficiently low to provide all the necessary cooling.

[0007] Another preferred embodiment of the method according to the invention is **characterized in that** the operation of the supply air radiator is switched between cooling, heating and cooling with outdoor air according to the situation.

[0008] Cooling of the outdoor air occurs preferably without any external accessories, heat exchangers and fans, which themselves consume energy and reduce the benefit achievable from cooling with outdoor air.

[0009] In the following, the invention will be described in more detail by the aid of a preferred embodiment with reference to the attached drawing.

[0010] In the diagram presented in the drawing, the main circulation circuit is presented with the reference number 2. The outdoor air comes inside via the cooling radiator/heating radiator 3, which is also called the supply air radiator. The water returning from all or part of the room devices, e.g. of the chilled beams 4, is conducted to the circulation circuit of the radiator 3. This water heats the air passing via the cooling radiator/heating radiator 3 to a suitable temperature for blowing inside. At the same time the water cools when giving energy to the air. The cooled water is conducted back to cooling the room devices. In this way the free cooling energy contained in outdoor air can be transferred to the room devices.

[0011] When sufficient cooling energy is not obtained from the outdoor air, the cooling compressor 1 can be used at the same time to give additional power. The water returning from the room devices divides partly into the branch 6, which conducts for cooling by outdoor air, and partly to the evaporator of the cooling compressor 1, where it is cooled.

[0012] In the apparatus used in the method according to the invention the cooling plant and the ventilation plant are thus made into one integrated entity, in which the cooling radiator of the supply air also functions as a heating radiator of the supply air. When cooling of the outdoor air is needed, it functions as a heating radiator. What is essential is that the supply air radiator can switch operation between cooling, heating and cooling with outdoor air according to the situation. In the method according to the invention cooling with outdoor air can be used in a much more extensive temperature range than in prior-art solutions because a compressor can be used simultaneously in parallel with it.

[0013] It is obvious to the person skilled in the art that the invention is not limited to the embodiments presented above, but that it can be varied within the scope of the claims presented below. It must be understood that the diagram presented by the drawing and the actuators presented in it are only one possibility for implementing the invention. They can thus be varied according to need.

Claims

1. Method for using outdoor air to cool room devices, e.g. chilled beams (4), **characterized in that** the water returning from the room devices is used in the supply air radiator (3) to heat the supply air, in which case this water cools and is conducted back to the room devices to cool the room spaces.

2. Method according to claim 1, **characterized in that** cooling with outdoor air is simultaneous with the cool-

ing occurring by means of the cooling compressors (1).

3. Method according to claim 1 or 2, **characterized in that** the operation of the supply air radiator (3) is switched between cooling, heating and cooling with outdoor air according to the situation.

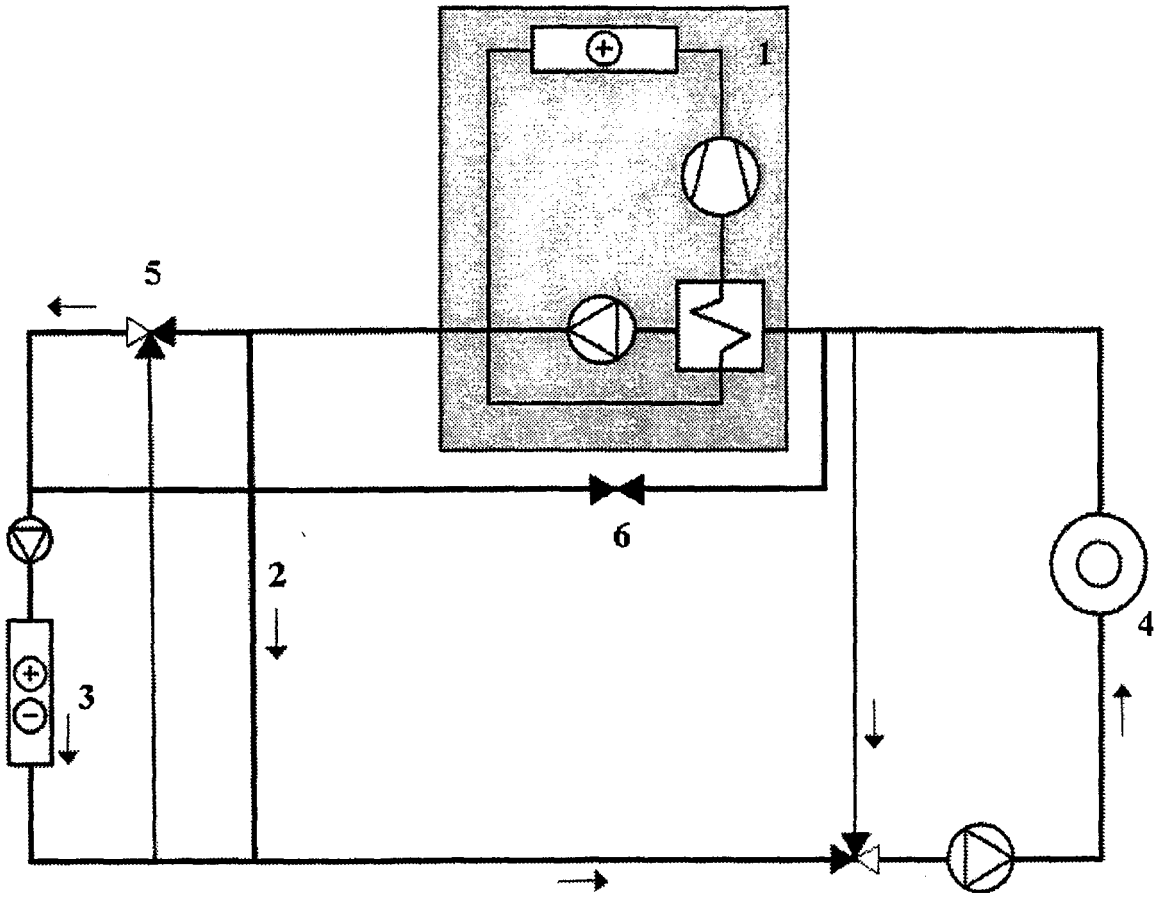

Fig. 1