CONTROL OF ACTIVE CLIMATIC BEAMS

Inventors: Olivier Josserand, La Boisse (FR); Eric Royet, Thil (FR)

Appl. No.: 14/003,143
PCT Filed: Mar. 4, 2011
PCT No.: PCT/IB2011/000686
§ 371 (c)(1), (2), (4) Date: Feb. 4, 2014
Publication Classification
Int. Cl. F25D 29/00 (2006.01)

U.S. Cl. CPC .............................. F25D 29/00 (2013.01) USPC .............................. 62/86; 62/125; 62/126

ABSTRACT

A method of operating a climatic beam air conditioning system includes operably connecting one or more controllers to two or more climatic beams in two or more locations. Inputs are communicated from the two or more locations to the one or more controllers. Each controller of the one or more controllers is operably connected to two or more climatic beams. Independent commands are communicated to each climatic beam of the two or more climatic beams from the one or more controllers to control operation of the two or more climatic beams based on the inputs communicated from the two or more locations.
CONTROL OF ACTIVE CLIMATIC BEAMS

BACKGROUND OF THE INVENTION

[0001] The subject matter disclosed herein relates to active climatic beam air conditioning systems. More specifically, the subject disclosure relates control of multiple active climatic beams in air conditioning systems.

[0002] An active climatic beam is a water-driven induction unit, often mounted in a ceiling. It uses a supply of fresh ventilation air to draw room air into the chilled beam’s air conditioning unit, which is typically a coil supplied with cold or warm water depending on whether cooling or heating is of the room is desired. Tempered ventilation air leaves the beam supply ducting through slots or nozzles with sufficient velocity that room air is induced into the beam and through the coil. The supply air and room air are then mix and reenter the room via outlet slots in the beam. Climatic beams are typically controlled individually, with each beam having an independent controller. Since it is often common to have multiple climatic beams in a large room, this requires the use of multiple controllers to control the room environment.

BRIEF DESCRIPTION OF THE INVENTION

[0003] According to one aspect of the invention, a method of operating a climatic beam air conditioning system includes operably connecting one or more controllers to two or more climatic beams in two or more locations. Inputs are communicated from the two or more rooms to the one or more controllers. Each controller of the one or more controllers is operably connected to one or more climatic beams. Independent commands are communicated to each climatic beam of the two or more climatic beams from the one or more controllers to control operation of the two or more climatic beams based on the inputs communicated from the two or more locations.

[0004] According to another aspect of the invention, an air conditioning system includes two or more active climatic beams and one or more controllers operably connected to the two or more climatic beams. The one or more controllers are configured to control operation of the two or more climatic beams. A communication bus operably connected to the one or more controllers, configured to distribute inputs to the one or more controllers and distribute independent outputs from the one or more controllers to each climatic beam of the two or more climatic beams.

[0005] These and other advantages and features will become more apparent from the following description taken in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The subject matter, which is regarded as the invention, is particularly pointed out and distinctly claimed in the claims at the conclusion of the specification. The foregoing and other features, and advantages of the invention are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

[0007] FIG. 1 is a schematic of an embodiment of an air conditioning system;

[0008] FIG. 2 is a schematic of an embodiment of a room layout including an air conditioning system; and

[0009] FIG. 3 is a schematic of another embodiment of a room layout including an air conditioning system.

[0010] The detailed description explains embodiments of the invention, together with advantages and features, by way of example with reference to the drawings.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Shown in FIG. 1 is a schematic arrangement of a plurality of climatic beams 10. Six climatic beams 10 are shown in FIG. 1, it is to be appreciated that any number of climatic beams 10 may be utilized. The climatic beams 10 are operably connected to electronic controllers 12. In the embodiment of FIG. 1, two climatic beams 10 are connected to one controller 12, but it is to be appreciated that other embodiments may include other quantities of climatic beams 10, for example three climatic beams 10 connected to one controller 12. Each controller 12 includes two or more subcontrollers 14, with each climatic beam 10 connected to a unique subcontroller 14. The subcontroller 14 directly controls operation of the climatic beam 10 to which it is connected.

[0012] The arrangement includes one or more user interfaces 16. The user interfaces 16 are connected to the controllers 12 and allow input of the user such as desired temperature and the like for a room or other space in which the climatic beams 10 are located. The controllers 12 receive further inputs, such as room temperature, CO2 level of the room, user room setpoint, and/or setpoint reset, where setpoint reset is an amount the room temperature is permitted to vary from the user setpoint before the system is engaged to heat or cool. Based on these inputs, the controllers 12 direct operation of the climatic beams 10, for example, opening or closing of a fresh air damper, and/or changing a water flow through a valve actuator connected to a coil of the climatic beam 10.

[0013] In some embodiments, the controllers 12 are interconnected via a communications bus 18, and each subcontroller 14 is assigned a unique identifier. Such interconnection allows for a layout of a space with climatic beams 10 and controllers 12 installed therein to be reconfigured without moving climatic beams 10 or controllers 12, but only reprogramming the subcontrollers 14 as will be described below with reference to FIGS. 2 and 3.

[0014] Referring to FIG. 2, an embodiment of a room layout is shown. The layout includes two rooms 20a and 20b and a second room 20c. In this embodiment, climatic beams 10a, 10b, and 10c are located in room 20a, and climatic beams 10d, 10e, and 10f are located in room 20b. The climatic beams 10a-10f are connected to one controller 14a-14f, respectively. In this embodiment, each subcontroller 14a-14f receives common input regarding, for example, outside temperature. The subcontrollers 14 are linked via the communications bus 18, however, so that inputs to the subcontrollers 14 regarding, for example, room temperature and CO2 level are room-specific. For example, in the case of room 20a, room-specific inputs are directed from controller 14a through the communications bus 18, to subcontrollers 14b-14c to control climatic beams 10b-10c in the same way as climatic beam 10a, since subcontrollers 14a-14f are identified as residing in room 20a. In some embodiments, the room specific inputs are provided by a temperature sensor 22 and a CO2 sensor 24 located in the room 20a. Further, the desired temperature may be provided to the subcontrollers 14 by a user interface 16 located in the room 20a, or at some centralized location outside of the room 20a. As can easily be seen, the same principles apply to control of the climatic beams 10d-10f located in room 20b, and could be extrapolated to the
control of any number of climatic beams 10 distributed throughout a space, for example an entire floor or floors of a building.

[0015] Interconnecting the subcontrollers 14 via the communications bus 18 allows for rearrangement of the rooms 20 without the need to change or modify climatic beams 10 or subcontrollers 14 or wiring. As shown in FIG. 3, room 20a is modified to include climatic beams 10a-10d and their corresponding subcontrollers 14a-14d, while room 20b now contains climatic beams 10e and 10f, and subcontrollers 14e and 14f. To properly control the environments of modified rooms 20a and 20b, it is only necessary to change the associations of the subcontrollers 14 which control climatic beams 10 with respect to rooms 20a and 20b, thus ensuring that, for example, climatic beam 10d and subcontroller 14d (which changed rooms from 20b to 20a) now receive the correct room-specific inputs, from temperature sensor 22 and CO₂ sensor 24 located in room 20a, rather than those located in room 20b. Also, the user interface 16 located in room 20a could be now associated with climatic beam 10d and subcontroller 14d, and will therefore control their operation.

[0016] While the invention has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the invention is not limited to such disclosed embodiments. Rather, the invention can be modified to incorporate any number of variations, alterations, substitutions or equivalent arrangements not heretofore described, but which are commensurate with the spirit and scope of the invention. Additionally, while various embodiments of the invention have been described, it is to be understood that aspects of the invention may include only some of the described embodiments. Accordingly, the invention is not to be seen as limited by the foregoing description, but is only limited by the scope of the appended claims.

1. A method of operating a climatic beam air conditioning system comprising:
   - arranging two or more climatic beam units in two or more locations;
   - operably connecting one or more controllers to the two or more climatic beams.
   - communicating inputs from the two or more locations to the one or more controllers, wherein each controller of the one or more controllers is operably connected to two or more climatic beams; and
   - communicating independent commands to each climatic beam of the two or more climatic beams from the one or more controllers to control operation of the two or more climatic beams based on the inputs communicated from the two or more locations.

2. The method of claim 1, wherein each controller is configured to control operation of two climatic beams of the two or more climatic beams.

3. The method of claim 1, wherein communicating inputs comprises communicating a desired temperature from a user interface.

4. The method of claim 3, wherein the user interface is disposed in one location of the two or more locations.

5. The method of claim 1, wherein communicating inputs comprises communicating data from one or more sensors connected to a subcontroller of the one or more controllers and disposed in at least one location of the two or more locations.

6. The method of claim 5, wherein the one or more sensors include a room temperature sensor and/or a carbon dioxide sensor.

7. The method of claim 1, wherein the inputs include a setpoint reset.

8. The method of claim 1, wherein the commands control operation of a fresh air damper and/or an evaporative temperature of the two or more climatic beams.

9. The method of claim 1, wherein the two or more climatic beams and one or more controllers are interconnected via a communications bus.

10. The method of claim 1, wherein the two or more locations are two or more rooms.

11. An air conditioning system comprising:
   - two or more active climatic beams arranged in two of more locations;
   - one or more controllers operably connected to the two or more climatic beams, the one or more controllers configured to control operation of the two or more climatic beams, and
   - a communication bus operably connected to the two or more controllers, configured to distribute inputs to the one or more controllers and distribute independent outputs from the one or more controllers to each climatic beam of the two or more climatic beams.

12. The system of claim 11, further comprising at least one user interface operably connected to a controller of the one or more controllers.

13. The system of claim 12, wherein the user interface is configured to provide a desired temperature setting to the controller.

14. The system of claim 11, wherein the inputs include one or more of outside temperature, room temperature and carbon dioxide level.

15. The system of claim 11, wherein each controller of the one or more controllers controls operation of at least two of the two or more climatic beams.

16. The system of claim 11, further comprising a temperature sensor operably connected to the one or more controllers configured to sense a room temperature.

17. The system of claim 11, further comprising a carbon dioxide sensor operably connected to the one or more controllers.

* * * * *