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(54) CONTROL OF ACTIVE CLIMATIC BEAMS

STEUERUNG VON AKTIVEN KLIMATISCHEN STRAHLEN

COMMANDE DE POUTRES CLIMATIQUES ACTIVES

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Description

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 battery, 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 according to claim 1 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 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.

[0004] According to another aspect of the invention, an air conditioning system according to claim 11 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] According to EP 105 678 A1 an air conditioning blow-out panel is provided for achieving both comfortableness and energy saving by effectively conducting airflow control based on sensor information of the entire air conditioning space. The air conditioning blow-out panel is allowed to be attached/detached to/from a main body of an air conditioning indoor unit. The air conditioning blow-out panel includes an airflow regulation mechanism, a driving unit, a control unit and a network connection unit. The airflow regulation mechanism is configured to regulate at least one of the airflow volume and the airflow direction. The driving unit is configured to drive the airflow regulation mechanism. The control unit is configured to drive the driving unit. The network connection unit is connected to a network for obtaining a single or plurality of pieces of sensor information. The network connection unit is configured to receive a control command generated based on the sensor information and transmit it to the control unit. Furthermore, the control unit is configured to drive the driving unit based on the control command generated based on the sensor information obtained through the network.

[0006] 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

[0007] 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:

FIG. 1 is a schematic of an embodiment of an air conditioning system;
FIG. 2 is a schematic of an embodiment of a room layout including an air conditioning system; and
FIG. 3 is a schematic of another embodiment of a room layout including an air conditioning system.

[0008] 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

[0009] Shown in FIG. 1 is a schematic arrangement of a plurality of climatic beams 10. Six climatic beams 10 are shown in FIG. 1, but 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.

[0010] 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, CO_2 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.

[0011] 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.

[0012] Referring to FIG. 2, an embodiment of a room layout is shown. The layout includes two rooms 20, a first room 20a and a second room 20b. 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 subcontrollers 14a-14f, respectively. In this embodiment, each subsontroller 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 CO_2 level are room-specific. For example, in the case of room 20a, room-specific inputs are directed from subcontroller 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-14c are identified as residing in room 20a. In some embodiments, the room specific inputs are provided by a temperature sensor 22 and a CO_2 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.

[0013] 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 climate 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 CO_2 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.

[0014] 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 scope of the invention as disclosed by the appended claims. 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.

Claims

1. A method of operating a climatic beam air conditioning system comprising:

operably connecting one or more controllers (12) respectively including two or more subcontrollers (14), to two or more climatic beams (10) in two or more locations (20a, 20b) so that each climatic beam (10) is connected to a unique subcontroller (14) directly controlling the operation of the climatic beam (10) to which it is connected;
communicating inputs from the two or more locations (20a, 20b) to the one or more controllers (12), wherein each controller (12) of the one or more controllers (12) by means of its subcontrollers (14) is operably connected to two or more climatic beams (10); and
communicating independent commands to each climatic beam (10) of the two or more climatic beams (10) from the one or more controllers (12) to control operation of the two or more climatic beams (10) based on the inputs communicated from the two or more locations (20a, 20b).

2. The method of Claim 1, wherein each controller (12) is configured to control operation of two climatic beams (10) of the two or more climatic beams (10).

3. The method of Claim 1, wherein communicating in-

puts comprises communicating a desired temperature from a user interface (16).

4. The method of Claim 3, wherein the user interface (16) is disposed in one location (20a, 20b) of the two or more locations (20a, 20b).

5. The method of Claim 1 , wherein communicating inputs comprises communicating data from one or more sensors (22, 24) connected to a subcontroller (14) of the one or more controllers (12) and disposed in at least one location (20a, 20b) of the two or more locations (20a, 20b).

6. The method of Claim 5, wherein the one or more sensors (22, 24= include a room temperature sensor (22) and/or a carbon dioxide sensor (24).

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 a coil temperature of the two or more climatic beams (10).

9. The method of Claim 1, wherein the two or more climatic beams (10) and one or more controllers (12) are interconnected via a communications bus (18).

10. The method of Claim 1 , wherein the two or more locations (20a, 20b) are two or more rooms (20a, 20b).

11. An air conditioning system comprising:

two or more active climatic beams (10);
one or more controllers (12); and
a communication bus (18) operably connected to the two or more controllers (12), configured to distribute inputs to the one or more controllers (12) and distribute independent outputs from the one or more controllers (12) to each climatic beam (10) of the two or more climatic beams (10);
characterized in that each controller (12) includes two or more subcontrollers (14), with each climatic beam (10) connected to a unique subcontroller (14) directly controlling the operation of the climatic beam (10) to which it is connected.

12. The system of Claim 11, further comprising at least one user interface (16) operably connected to a controller (12) of the one or more controllers (12), wherein the user interface (16) is in particular configured to provide a desired temperature setting to the controller (12).

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

14. The system of Claim 11, wherein each controller (12) of the one or more controllers (12) controls operation of at least two of the two or more climatic beams (10).

15. The system of Claim 11, further comprising a temperature sensor (22) operably connected to the one or more controllers (12) configured to sense a room temperature and/or a carbon dioxide sensor (24) operably connected to the one or more controllers (12).

Patentansprüche

1. Verfahren zum Betreiben eines Klimaanlagensystems mit einem Klimabalken, umfassend:

funktionsmäßiges Verbinden einer oder mehrerer Steuerungen (12), die jeweils zwei oder mehrere Untersteuerungen (14) beinhalten, mit zwei oder mehreren Klimabalken (10) an zwei oder mehreren Positionen (20a, 20b), sodass jeder kKlimabalken (10) mit einer einzigartigen Untersteuerung (14) verbunden ist, die den Betrieb des Klimabalkens (10), mit dem sie verbunden ist, direkt steuert;
Kommunizieren von Eingaben von den zwei oder mehreren Positionen (20a, 20b) an die eine oder mehreren Steuerungen (12), wobei jede Steuerung (12) der einen oder mehreren Steuerungen (12) mittels ihrer Untersteuerungen (14) funktionsfähig mit zwei oder mehreren Klimabalken (10) verbunden ist; und
Kommunizieren von unabhängigen Befehlen an jeden Klimabalken (10) der zwei oder mehreren Klimabalken (10) von der einen oder mehreren Steuerung (12), um den Betrieb der zwei oder mehreren Klimabalken (10) basierend auf den von den zwei oder mehreren Positionen (20a, 20b) übertragenen Eingaben zu steuern.

2. Verfahren nach Anspruch 1, wobei jede Steuerung (12) konfiguriert ist, um den Betrieb von zwei Klimabalken (10) der zwei oder mehreren Klimabalken (10) zu steuern.

3. Verfahren nach Anspruch 1, wobei das Kommunizieren von Eingaben das Kommunizieren einer gewünschten Temperatur von einer Benutzeroberfläche (16) umfasst.

4. Verfahren nach Anspruch 3, wobei die Benutzeroberfläche (16) an einer Position (20a, 20b) der zwei oder mehreren Positionen (20a, 20b) angeordnet ist.

5. Verfahren nach Anspruch 1, wobei die Kommunikationseingaben die Kommunikation von Daten von einem oder mehreren Sensoren (22, 24) umfassen, die mit einer Untersteuerung (14) der einen oder mehreren Steuerungen (12) verbunden und an mindestens einer Position (20a, 20b) der zwei oder mehreren Positionen (20a, 20b) angeordnet sind.

6. Verfahren nach Anspruch 5, wobei der eine oder die mehreren Sensoren (22, 24) einen Raumtemperatursensor (22) und/oder einen Kohlendioxidsensor (24) beinhalten.

7. Verfahren nach Anspruch 1, wobei die Eingaben eine Sollwertrückstellung beinhalten.

8. Verfahren nach Anspruch 1, wobei die Befehle den Betrieb einer Außenluftklappe und/oder einer Spulentemperatur der zwei oder mehreren Klimabalken (10) steuern.

9. Verfahren nach Anspruch 1, wobei die zwei oder mehreren Klimabalken (10) und eine oder mehrere Steuerungen (12) über einen Kommunikationsbus (18) miteinander verbunden sind.

10. Verfahren nach Anspruch 1, wobei die zwei oder mehreren Positionen (20a, 20b) zwei oder mehr Räume (20a, 20b) sind.

11. Klimaanlagensystem, umfassend:

zwei oder mehr aktive Klimabalken (10);
eine oder mehrere Steuerungen (12); und
einen Kommunikationsbus (18), der funktionsfähig mit den zwei oder mehreren Steuerungen (12) verbunden ist, der konfiguriert ist, um Eingaben an die eine oder die mehreren Steuerungen (12) zu verteilen und unabhängige Ausgänge von der einen oder den mehreren Steuerungen (12) an jeden Klimabalken (10) der zwei oder mehreren Klimabalken (10) zu verteilen;
dadurch gekennzeichnet, dass jede Steuerung (12) zwei oder mehr Untersteuerungen (14) beinhaltet, wobei jeder Klimabalken (10) mit einer einzigartigen Untersteuerung (14) verbunden ist, die direkt den Betrieb des Klimabalkens (10) steuert, mit dem sie verbunden ist.

12. System nach Anspruch 11, ferner umfassend mindestens eine Benutzeroberfläche (16), die funktionsfähig mit einer Steuerung (12) der einen oder mehreren Steuerungen (12) verbunden ist, wobei die Benutzeroberfläche (16) insbesondere konfiguriert ist, um der Steuerung (12) eine gewünschte Temperatureinstellung bereitzustellen.

13. System nach Anspruch 11, wobei die Eingaben eine oder mehrere von einer Außentemperatur, einer Raumtemperatur und einem Kohlendioxidgehalt beinhalten.

14. System nach Anspruch 11, wobei jede Steuerung (12) der einen oder mehreren Steuerungen (12) den Betrieb von mindestens zwei der zwei oder mehreren Klimabalken (10) steuert.

15. System nach Anspruch 11, ferner umfassend einen Temperatursensor (22), der funktionsfähig mit der einen oder mehreren Steuerungen (12) verbunden ist, der konfiguriert ist, um eine Raumtemperatur zu erfassen, und/oder einen Kohlendioxidsensor (24), der funktionsfähig mit einer oder mehreren Steuerungen (12) verbunden ist.

Revendications

1. Procédé de fonctionnement d'un système de climatisation à poutre climatique comprenant :

la connexion de manière opérationnelle d'un ou de plusieurs contrôleurs (12) comprenant respectivement deux sous-contrôleurs (14) ou plus à deux poutres climatiques (10) ou plus situés à deux emplacements (20a, 20b) ou plus, de sorte que chaque poutre climatique (10) soit connectée à un sous-contrôleur unique (14) commandant directement le fonctionnement de la poutre climatique (10) à laquelle il est connecté ;
la mise en communication d'entrées des deux emplacements (20a, 20b) ou plus des un ou plusieurs contrôleur(s) (12), chaque contrôleur (12) des un ou plusieurs contrôleurs (12) au moyen de ses sous-contrôleurs (14) étant connecté de manière opérationnelle à deux ou poutres climatiques (10) ou plus ; et
la mise en communication de commandes indépendantes à chaque poutre climatique (10) des deux poutres climatiques (10) ou plus à partir des un ou plusieurs contrôleurs (12) pour commander le fonctionnement des deux poutres climatiques (10) ou plus sur la base des entrées communiquées à partir des deux emplacements (20a, 20b) ou plus.

2. Procédé selon la revendication 1, dans lequel chaque contrôleur (12) est configuré pour commander le fonctionnement de deux poutres climatiques (10) des deux poutres climatiques (10) ou plus.

3. Procédé selon la revendication 1, dans lequel les entrées communicantes comprennent la communication d'une température souhaitée à partir d'une interface d'utilisateur (16) .

4. Procédé selon la revendication 3, dans lequel l'interface d'utilisateur (16) est disposée dans un emplacement (20a, 20b) des deux emplacements (20a, 20b) ou plus.

5. Procédé selon la revendication 1, dans lequel les entrées communicantes comprennent la communication de données provenant d'un ou de plusieurs capteurs (22, 24) connectés à un sous-contrôleur (14) des un ou plusieurs contrôleurs (12) et disposés dans au moins un emplacement (20a, 20b) des deux emplacements (20a, 20b) ou plus.

6. Procédé selon la revendication 5, dans lequel les un ou plusieurs capteurs (22, 24) comprennent un capteur de température ambiante (22) et/ou un capteur de dioxyde de carbone (24).

7. Procédé selon la revendication 1, dans lequel les entrées comprennent une réinitialisation de point de consigne.

8. Procédé selon la revendication 1, dans lequel les commandes commandent le fonctionnement d'un registre d'air frais et/ou d'une température de bobine des deux poutres climatiques (10) ou plus.

9. Procédé selon la revendication 1, dans lequel les deux poutres climatiques (10) ou plus et un ou plusieurs contrôleurs (12) sont interconnectés par l'intermédiaire d'un bus de communications (18).

10. Procédé selon la revendication 1, dans lequel les deux emplacements (20a, 20b) ou plus sont deux pièces (20a, 20b) ou plus.

11. Système de climatisation comprenant :

deux poutres climatiques actives (10) ou plus ;
un contrôleur (12) ou plus ; et
un bus de communication (18) connecté de manière opérationnelle aux deux contrôleurs (12) ou plus, configuré pour distribuer des entrées aux un ou plusieurs contrôleurs (12) et distribuer des sorties indépendantes à partir des un ou plusieurs contrôleurs (12) à chaque poutre climatique (10) des deux poutres climatiques (10) ou plus ;
caractérisé en ce que chaque contrôleur (12) comprend deux sous-contrôleurs (14) ou plus, chaque poutre climatique (10) étant connectée à un sous-contrôleur unique (14) commandant directement le fonctionnement de la poutre climatique (10) auquel il est connecté.

12. Système selon la revendication 11, comprenant en outre au moins une interface d'utilisateur (16) connectée de manière opérationnelle à un contrôleur (12) des un ou plusieurs contrôleurs (12), l'interface d'utilisateur (16) étant en particulier configurée pour assurer un réglage de la température souhaitée sur le contrôleur (12).

13. Système selon la revendication 11, dans lequel les entrées comprennent l'un ou plusieurs d'une température extérieure, d'une température ambiante et d'un niveau de dioxyde de carbone.

14. Système selon la revendication 11, dans lequel chaque contrôleur (12) des un ou plusieurs contrôleurs (12) commande le fonctionnement d'au moins deux des deux poutres climatiques (10) ou plus.

15. Système selon la revendication 11, comprenant en outre un capteur de température (22) connecté de manière opérationnelle aux un ou plusieurs contrôleurs (12) configurés pour détecter une température ambiante et/ou un capteur de dioxyde de carbone (24) connecté de manière opérationnelle aux un ou plusieurs contrôleurs (12).

FIG. 1

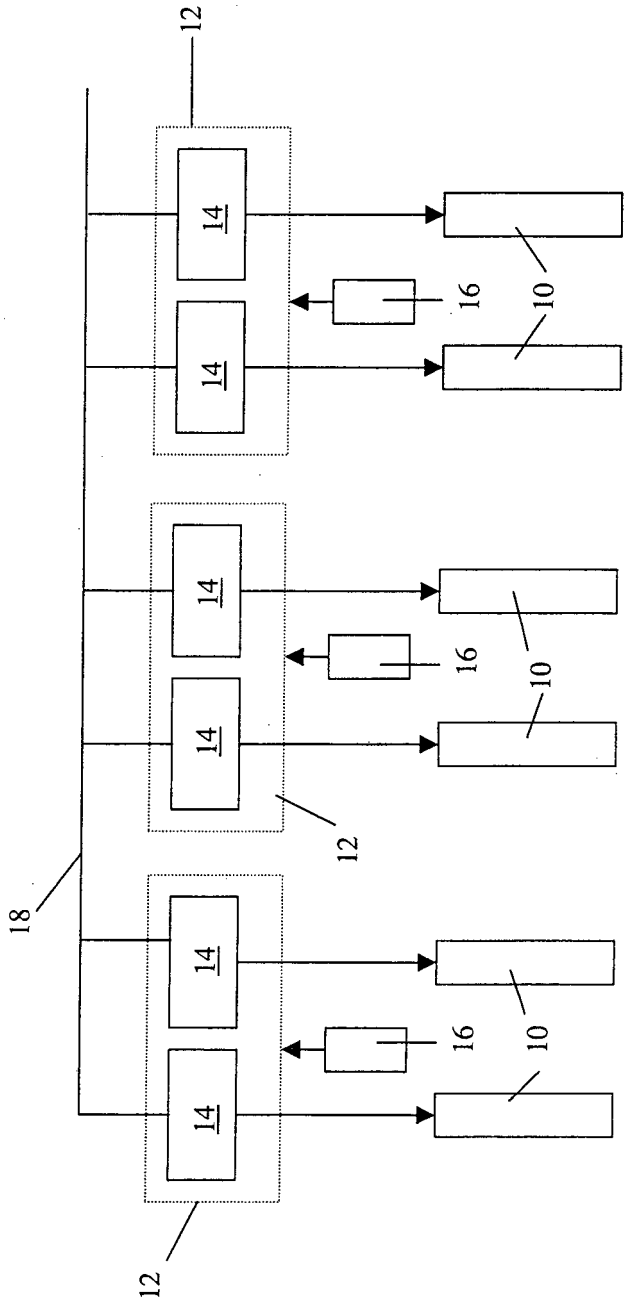
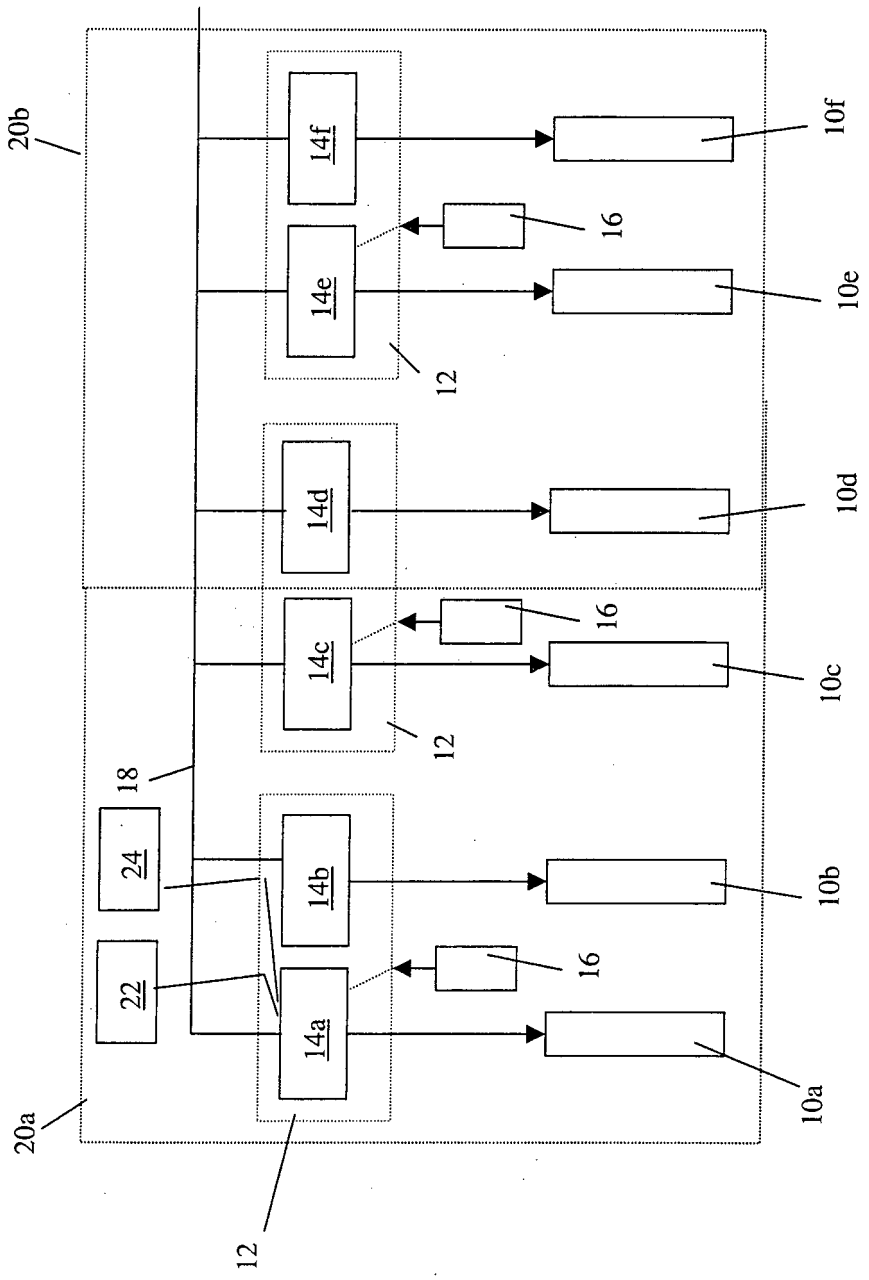


FIG. 2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14e
14d
14c
14b
14a
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12
12
18
24
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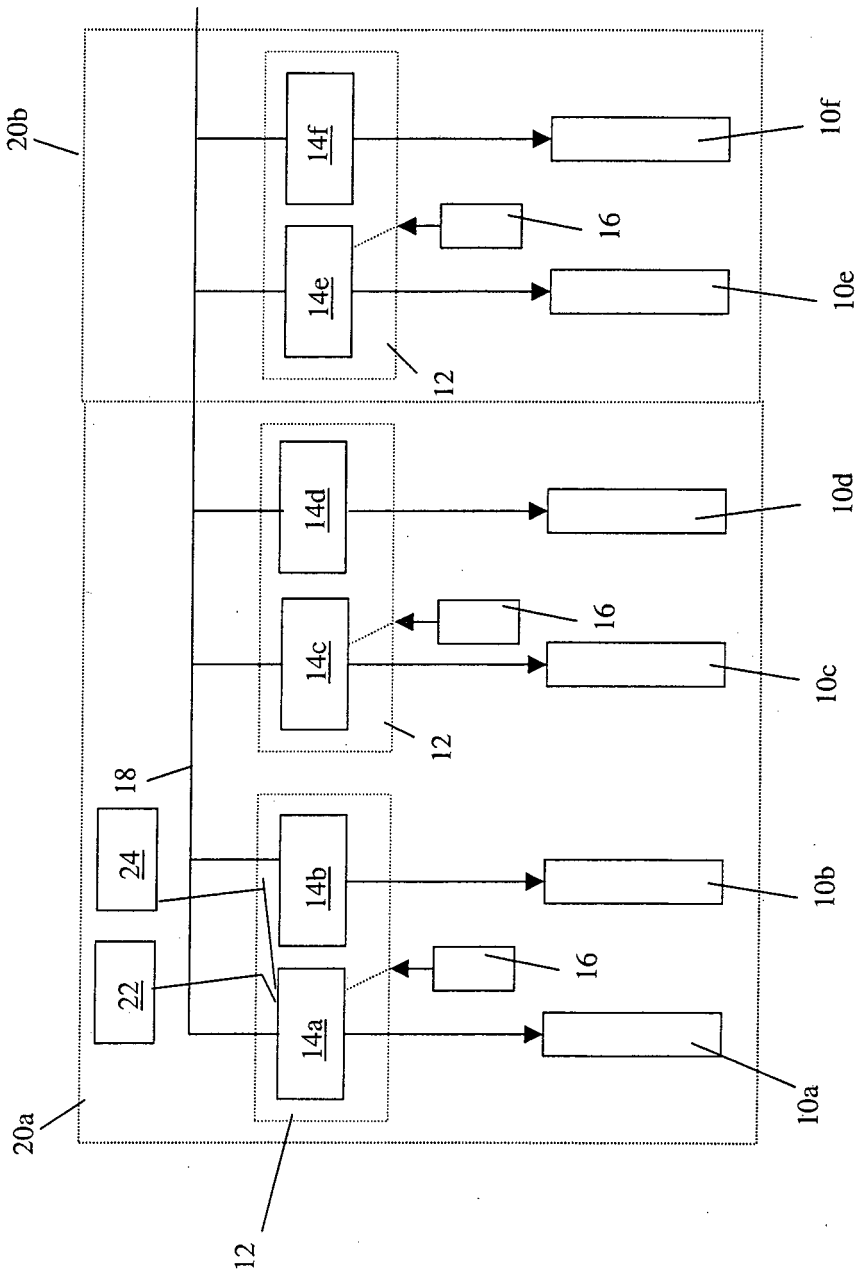
10f
10e
10d
10c
10b
10a

FIG. 3


20b
20a
14f
14e
14d
14c
14b
14a
12
16
18
24
22
10f
10e
10d
10c
10b
10a

REFERENCES CITED IN THE DESCRIPTION

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