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

(11) EP 1 301 839 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
17.10.2007 Bulletin 2007/42

(21) Application number: **01944098.1**

(22) Date of filing: **02.07.2001**

(51) Int Cl.:
G05D 23/19 *(2006.01)* ***B60K 28/06*** *(2006.01)*
B60N 2/56 *(2006.01)*

(86) International application number:
PCT/SE2001/001521

(87) International publication number:
WO 2002/006914 (24.01.2002 Gazette 2002/04)

(54) **SEAT WITH TEMPERATURE CONTROL AND VENTILATION AND SAFETY SYSTEM FOR A VEHICLE**

SITZ MIT TEMPERATURREGELUNG UND BELUEFTUNG, UND SICHERHEITSSYSTEM FUER EIN FAHRZEUG

SIEGE A REGULATION DE TEMPERATURE ET VENTILATION ET SYSTEME DE SECURITE POUR VEHICULE

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR

(30) Priority: **19.07.2000 SE 0002690**

(43) Date of publication of application:
16.04.2003 Bulletin 2003/16

(73) Proprietor: **Kongsberg Automotive AB**
565 28 Mullsjö (SE)

(72) Inventors:
- **FRISTEDT, Tommy**
  S-560 25 Bottnaryd (SE)
- **JOSEFSSON, Daniel**
  S-521 35 Falköping (SE)

(74) Representative: **Andersson, Per Rune**
Albihns Göteborg AB
Box 142
401 22 Göteborg (SE)

(56) References cited:
EP-A1- 0 227 610
EP-A1- 0 929 055
US-A- 5 921 314
US-A- 5 934 748

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 301 839 B1

Description

TECHNICAL FIELD

[0001] The present invention relates to a device and a method; respectively, for cooling of a seat, according to the preamble of the appended claim 1 and 12, respectively. In particular, the invention's main application is in connection with cooling and/or ventilation of electrically heatable seats for travellers in a vehicle.

BACKGROUND ART

[0002] By reasons of comfort and security, ventilation and/or cooling of seats in for example vehicles, is used. The driver's seat as well as the other seats in the vehicle may thus be arranged to be cooled by means of special cooling devices, for example in the form of electrical Peltier elements, or by means of a fan device that blows on the current surface, or a combination of these. Such a cooling element or fan may be placed in the seat or in the backrest of respective seat when it is manufactured. Further, the cooling element and the fan, respectively, are connected to a current supply unit that supplies current. The control systems according to previously known technology is of the time control kind, i.e. pure timer functions, which during certain predetermined time periods control the cooling element to a suitable temperature and the fan to a suitable number of revolutions.

[0003] US 5921314 teaches a device and a method for ventilating a seat in a vehicle. The device comprises an air-conditioning device and a fan. The seat comprises an electrical heater and a temperature sensor. The air-conditioning device comprises a Peltier element and a first and a second heat exchanger arranged for cooling, warming and drying of an air stream. The air-conditioning device is intended to cool the air via the first heat exchanger, situated on one side of the Peltier element; below the dew point in order to dry the air by a transport of the condensed water via a wick. The dried air is then via pipes brought to the second heat exchanger situated on the other side of the Peltier element, where the dried is heated. The heating of the air in the second heat exchanger gives a low partial pressure of water in the air which is advantageous since the lower the partial pressure of water, the better ability to absorb moist in the air stream. The heating of the air stream also gives the possibility to control the heat in the dried air stream.

[0004] US 5934748 teaches a ventilation device for a vehicle seat comprising temperature sensor, ventilation device, heating device and controlling means for controlling the different devices in order to avoid a too large cooling effect. The heating devices are positioned in the air stream from the ventilation device and is arranged to increase the temperature of the air stream in order to avoid a too cool air stream for a user.

[0005] A problem for previously known cooling devices relates to the desire that respective seat has to have an accurately adjusted temperature and dryness on its surface, i.e. on the surface that the traveller in the vehicle senses. For this purpose, the temperature of the cooling element respective the intensity of the fan may be controlled by means of a sensor unit, e.g. a temperature sensor that is arranged in the seat and that is connected to a control unit. By means of the detector unit and the control unit, the available temperature may be detected. The control unit also comprises current feeding circuits, which e.g. may be based on transistor or relay technology, for feeding current to the cooling element and/or the fan.

[0006] Although this previously known system normally provides a reliable cooling and dryness on the surface of a vehicle seat, it is, however, afflicted with certain disadvantages. Such a disadvantage relates to the fact that previously known systems, timer controlled or manually controlled, with a cooling element and a fan, provides a rather uncontrolled cooling and drying of the seat, due to the fact that the cooling via the cool airflow almost exclusively takes place by convection, which may lead to a local over-cooling of the user which in itself is a health hazard.

[0007] A further disadvantage with previously known systems is that a warm and damp user receives cold air directly on the body, which during the time of drying of the seat and the user may be sensed as cold and damp, and thus unpleasant, by the user. Even if the cooling not takes place by means of blowing of the air directly on the body, but via a conductive cooling of the seat, a cold and damp surface may be sensed as unpleasant.

[0008] A further disadvantage with previously known technology is that the quick cooling of the seat affects the material of the seat negatively in such a way that the material of the seat becomes less comfortable at low temperatures.

[0009] Further disadvantages with previous systems is that a control device with special sensors for a cooling device for a seat occupies space and is expensive.

DISCLOSURE OF INVENTION

[0010] A principal purpose with the present invention is thus to provide an enhanced cooling, drying, temperature control and ventilation of a vehicle seat comprising a cooling device, where the disadvantages stated above are eliminated and which provides a surface temperature and surface dryness that during the adjustment becomes more comfortable for the traveller. This purpose is achieved by means of a device of a kind mentioned in the preamble, which characteristics are disclosed in the appended claim 1.

[0011] This purpose is also achieved with a method as disclosed in claim 12.

[0012] In light of previously known technology for the existing problems, the invention is directed towards a procedure and a device for cooling or ventilation of a seat where one obtains a quick cooling and drying of a seat and a user, without the user experiencing the disadvan-

tages existing for previously known technology. By maintaining a high degree of convective cooling, a short drying time is acquired. In order to remove the disadvantages which are afflicted with a known procedure, the invention is based on the supply of local conductive heat supply to the user's exposed areas in order to reduce the negative local chilling, that also would lead to a shorter drying time for the seat and the user. Furthermore, in order to achieve a quick, good and cheap adjustment that does not occupy too much space, the invention is based on the use of already available equipment as far as possible.

[0013] With a vehicle seat, all seat parts such as sitting surface and back parts are concerned, i.e. the invention may in all its parts be exercised freely on all the seat parts of the seat, such as sitting surface and back parts. The invention may also be used only for ventilation of the seat, i.e. when cooling is lacking. Ventilation is often more important for the back part of the seat than for the sitting surface of the seat.

[0014] Advantageous embodiments are evident from the appended dependent claims.

BRIEF DESCRIPTION OF DRAWINGS

[0015] The invention will be described below in connection with an example of a preferred embodiment and the enclosed drawings, where

Fig. 1 is a principal circuit diagram showing a device according to a first embodiment of the present invention,

Fig. 2 is a principal circuit diagram showing a device according to a second embodiment of the present invention,

Fig. 3 is a principal circuit diagram showing a device according to a third embodiment of the present invention,

Fig. 4 is a principal circuit diagram showing a device according to a fourth embodiment of the present invention,

Fig. 5 is a principal circuit diagram showing a device according to a fifth embodiment of the present invention.

Fig. 6 is a principal circuit diagram that in an above view shows a detector unit in accordance with known technology, when two temperature sensors in the seat are used at the adjustment,

Fig. 7 is a principal circuit diagram showing a security device according to the invention, and

Fig. 8 is a principal outline of a control algorithm according to the invention.

MODES FOR CARRYING OUT THE INVENTION

[0016] The embodiments which are described in connection with the explaining text are not to be regarded as examples of the invention solely, but also as a detailed description of the invention. The figures and the embodiments show principally the sitting surface of a seat, but the invention may in all its parts be exercised freely on all the seat parts of the seat, such as sitting surface and back parts. The invention may also be used only for ventilation of the seat, i.e. when cooling is lacking. Ventilation is often more important for the back part of the seat than for the sitting surface of the seat.

[0017] Figure 1 shows a principal circuit diagram for a device according to a first embodiment of the invention. According to the first embodiment; the invention is intended to be used in connection with a cooling device 1 (shown as a dashed square) for a seat 2 in a vehicle and en electrical heater 3 for heating of the seat 2. The figure shows a control unit 4 on principle, which internal components and connections are not shown. In the figure, electrical connections with the control unit 4 are indicated with dashed lines.

[0018] The cooling device 1 is placed in or in connection with the seat 2 and consists of a cooling element 5, e.g. a Peltier element, and a fan 6 for blowing air, here called blowing fan 6, via the cooling element 5 through the seat 2 in the direction towards the bottom side of the sitting surface 7, which the sitting passenger is in contact with. Both the cooling element and the blowing fan are controlled by the control unit 4 via electrical connections, but may also be switched to manual control. The control unit 4 controls the cooling power of the cooling element 5, for a Peltier element this is performed via control of the current intensity, and the air flow from the blowing fan 6, e.g. by changing the number of revolutions for the blowing fan 6.

[0019] According to previously known technology, electrically heatable seats are used in the vehicles of today by reasons of comfort and security. The driver's seat as well as the other seats of the vehicle may thus be arranged to be heated by means of special electrical heaters in the form of electrically conductive wires placed in the form of a heating coil in respective seat. Such an electrical heater is normally placed in the seat and the backrest of respective seat when it is manufactured. Further, the electrical heater is connected to a current supply unit that supplies current. Thus the electrical heater may be heated to a suitable temperature.

[0020] The temperature of such a known electrical heater is controlled by means of a detector unit, e.g. comprising a temperature sensor connected to the control unit. By means of the detector unit and the control unit, the available temperature may be detected. The control unit also comprises current supply circuits (not shown), that e.g. may be based on transistor or relay technology, for supplying current to the electrical heater. Thus the control unit is arranged to supply a certain current through

the electrical heater until a certain desired value for the temperature in the seat is obtained, when heating is needed.

[0021] The adjustment of this desired value may e.g. be performed by means of fixed resistors or by means of an adjustable potentiometer that is operated by the traveller in the vehicle, or by a control algorithm in the control unit or in an external microprocessor or computer.

[0022] According to the first embodiment, see Fig. 1, of the invention a detector unit 8 at the electrical heater 3 is used to detect the temperature in the seat 2 and to supply information about the temperature to the control unit 4, which is described in detail below. A suitable detector unit preferably consists of a thermistor, e.g. of the NTC (Negative Temperature Coefficient) type. The control unit also comprises further current supply circuits (not shown), that e.g. may be based on transistor or relay technology, for supplying current to the cooling element 5 and the fan 6. Thus, when cooling is needed, the control unit 6 is arranged to supply a certain current through the cooling element 5 and the fan 6 until a certain desired value for the temperature in the seat is obtained. The adjustment of this desired value may e.g. be performed by means of fixed resistors or by means of an adjustable potentiometer that is operated by the traveller in the vehicle, or by a control algorithm in the control unit 4 or in a separate control unit. The control unit 4 uses the measured values from the detector unit 8 for the temperature control of the seat, both for heating and cooling of the seat depending on how the control algorithm in the control unit is made. Then the control unit 4 controls the cooling procedure for the seat 2 by determining the amount of current that is supplied to the cooling element 5, blowing fan 6 respective electric heater 3, which provides desired cooling power, air flow respective heating power. If the seat 2 is very warm, e.g. when the sun has been shining on it, a fast cooling of the seat is required in order to quickly let the user obtain maximum comfort. When the user also is damp, e.g. after having perspired or due to the high temperature of the seat, it is also a main concern to get the user dry quickly. If only the cooling device 1 is used, the result is a powerful convective cooling of the user, which leads to that the user may experience a cold and damp feeling at the contact surface between the body and the seat. In order to avoid the cold and damp feeling at the contact surface, the electrical heater 3 is used according to the invention, which electrical heater 3 may be controlled as stated above, and is here used to increase the temperature in the seat, which leads to a local conductive heating in the contact surface between the seat surface 7 and the user, which in turn leads to that a quick drying of the user and the seat surface takes place, at the same time as a quick cooling of the whole seat takes place without the user being submitted to a too fast and too large convective cooling in the contact surface. To sum up, the arrangement above provides a quick cooling of a strongly over-heated seat without risk or discomfort for the user. A quick drying of the seat is also acquired, which provides an enhanced comfort. The arrangement according to the invention also admits a continuous control to maintain a dry seat surface 7 with a suitable temperature during a long time, e.g. during driving at longer journeys. The use of the electrical heater 3 also provides a better temperature on the seat material which may become firm and uncomfortable at too low temperatures.

[0023] The detector unit 8 detects the temperature before the adjustment starts to provide a starting value to the control unit 4, which determines if cooling or heating is required. Manual control means may also be connected to the control unit to let the user determine if cooling or heating is to be initiated, or both at the same time. The detector unit 8 also detects the temperature both during cooling and during heating of the seat 2. During cooling, the detector unit is subject to both conductive and convective cooling, which may result in a measured temperature value representing the cooling, depending on which type of detector unit that is used. The control unit 4 may start the electrical heater 3 in connection with the starting of the cooling device 1 or at an occasion chosen in dependence of the control algorithm and/or the measured temperature value of the detector unit.

[0024] The system according to the first embodiment of the invention may be supplemented with an additional fan 9 which advantageously may be placed in or in connection with an air conditioning equipment 10 already available in the vehicle. The fan 9 at the air conditioning equipment may also replace the fan 6 at the seat 2. The two fans 6, 9 may be used separately or in combination. An advantage with such an arrangement is that the fans 6, 9 may be used simultaneously in order to increase the amount of air to the seat 2. An other advantage is that they may be used separately in order to control the air flow to different locations in the seat 6.

[0025] In Fig. 2, a second embodiment of the invention is shown, where the detector unit 8 of the electrical heater 3 is used to detect the temperature in the seat 2 and to provide the control unit 4 with information concerning the temperature, where the cooling element 5 either is a separate part connected to the air conditioning equipment 10, or is a part of the air conditioning equipment 10, e.g. "Automatic Climate Control" (ACC), which normally not is placed in the seat 2, but at a suitable place in the car, e.g. the engine house (not shown). After the cooling element 5, the cooled air is further led in the air conditioning equipment 10 via a conduit (not shown) to the seat 2 where requisite cooling of the seat takes place. The control of the air flow may be executed either by means of a blowing fan 6 placed in or in connection with the air conditioning equipment 10 or in connection with the seat 2. For blowing fans 6 working at a fixed number of revolutions, the air flow may be controlled with suitable choking devices (not shown) which are controlled by the control unit 2. The same advantages that have been mentioned for the first embodiment are acquired in combination with the electrical heater 3.

[0026] For a third embodiment, shown in figure 3,

where the detector unit 8 of the electrical heater 3 is used to detect the temperature in the seat 2 and to provide the control unit 4 with information concerning the temperature, the air in the passenger compartment that has been cooled by the air conditioning equipment 10 is used for cooling the seat 4. A cooling fan 6 is then arranged to blow the air in the compartment in such a manner that a partial amount of the air in the compartment may be directed and controlled towards the seat. The blowing fan 6 may be placed in connection with the seat 2, e.g. under the seat 2 or in connection with the air conditioning equipment 10 or in any other suitable place. The same advantages that have been mentioned for the first embodiment are acquired in combination with the electrical heater 3.

[0027] For a fourth embodiment, shown in figure 4, where the detector unit 8 of the electrical heater 3 is used to detect the temperature in the seat 2 and to provide the control unit 4 with information concerning the temperature, the air in the compartment that has been cooled by the air conditioning equipment 10 is used for cooling the seat. A fan 26, 29, here called induced draft fan 26, 29, is then arranged to suck the air in the compartment in such a manner that a partial amount of the air in the compartment may be directed and controlled towards the seat and from the surface of the seat towards the floor. The induced draft fan 26, 29 may be placed in connection to the seat, e.g. under the seat 2, in figure 4 marked with 26, or in connection with the air conditioning equipment 10, in figure 4 marked with 29, or in some other suitable place. Alternatively, these two induced draft fans 26, 29 may be used in the same arrangement. An advantage that is achieved with the arrangement according to figure 4 is that the sensor 8 detects a temperature that for instance depends on the air that just has passed the seat surface 7, i.e. the air closest to the user's body, which leads to that the control will depend on a measured value that is more based on the temperature that corresponds to the target temperature/desired value, i.e. the temperature on the seat surface 7. The same advantages that have been mentioned for the first embodiment are acquired in combination with the electrical heater 3.

[0028] For a fifth embodiment, shown in figure 5, where the detector unit 8 of the electrical heater 3 is used to detect the temperature in the seat 2 and to provide the control unit 4 with information concerning the temperature, the air in the compartment that has been cooled by the air conditioning equipment 10 is used for cooling the seat. The induced draft fan 26, 29 is then arranged to suck the air in the compartment in such a manner that a partial amount of the air in the compartment may be directed and controlled towards the seat and from the surface of the seat towards the floor. The induced draft fan 26, 29 may be placed in connection to the seat, e.g. under the seat 2, in figure 5 marked with 26, or in connection with the air conditioning equipment 10, in figure 4 marked with 29, or in some other suitable place. In connection with the air flow that has been sucked in after the seat surface 7, downstream the air flow that just has the seat surface 7, i.e. the air closest to the user's body, a humidity sensor 28 is placed, detecting the degree of humidity in the air flow, which degree of humidity thus depends on the user's humidity and the seat surface's 7 humidity. The humidity sensor 28 provides information for the control unit 4, which can control the air flow depending on both temperature and humidity. An advantage that is achieved from this arrangement is that an optimal adjustment of the fan 26, the air conditioning equipment 10 and the electrical heater 3 takes place, which optimizes the use of these units and provides an optimum drying and cooling of the user for optimum comfort. The same advantages that have been mentioned for the first embodiment are acquired in combination with the electrical heater 3.

[0029] In order to control the arrangements mentioned above, according to all embodiments (with reference to Fig. 1-5), a control unit 4 is used, comprising a communication unit 13 that can communicate with other units, both external and internal. According to PCT/SE99/00261, there is a device and a procedure intended for heating of a vehicle seat comprising an electrical heater connected to a control unit. The control unit comprises current supply means for supplying a current through the electrical heater allowing it to be heated. There is also a temperature sensor connected to said control unit for detection of the temperature at the electrical heater, where the control unit is arranged for supplying said current if a measured temperature falls below a predetermined desired value. The control unit further comprises a communication unit for reception of information from a separate manoeuvring unit via a transmission channel for transfer of the information. According to what is disclosed in PCT/SE99/00261, at least one function unit for manoeuvring the control unit via the transferred information is connected to the manoeuvring unit. The manoeuvring unit thus comprises programmed logic functions for generation of the information, at least in dependence of the condition of the function unit, and programmed functions for sending the information to the communication unit.

[0030] The manoeuvring unit used in PCT/SE99/00261 enables a simplified device and a simplified procedure for heating of a vehicle seat to be provided. An economically advantageous solution is provided according to what is disclosed in PCT/SE99/00261, as the manoeuvring unit may be manufactured from proportionately cheap standard electronic components in a very compact fashion, and then programmed to provide necessary functions for, by way of example, the current vehicle model or type of vehicle seat.

[0031] The device according to PCT/SE99/00261 preferably works completely separately from a central computer unit or similar at a motor vehicle and thus no special adaptations of such a central computer unit is required. The device and the procedure according to what is disclosed in PCT/SE99/00261 is based on a modular concept where a great flexibility is acquired with a few un-

complicated electronic components that are possible to standardize.

[0032] According to what is disclosed in PCT/SE99/00261, the information comprises information concerning the desired temperature, where the manoeuvring device is arranged to generate the information starting from information concerning the design of the vehicle seat, stored in the manoeuvring device. PCT/SE99/00261 thus discloses a device and a procedure that may be used for e.g. control of heat and ventilation according to the present invention.

[0033] An arrangement for transfer of information is previously known from PCT/SE97/01171. The transfer is controlled by information between the control unit 4 and the central computer unit 11 following a periodic lapse with a certain predetermined period time t_1. The information transfer is based on the basic concept that information that corresponds to a certain desired value of the desired temperature value T_B is transferred from the central computer unit 11 to the control unit 4. Preferably, an information transfer also takes place in the opposite direction, i.e. from the control unit 4 to the central computer unit 11. This further piece of information from the control unit 4 may suitably comprise status information. During the complete period t_1, a transfer from the control unit 4 to the central computer unit 11 takes place during a certain period of time t_2, while the transfer from the central computer unit 11 to the control unit 4 takes place during another period of time t_3. The transfer that is disclosed in PCT/SE97/01171 may be used combined with the present invention in such a way that that same equipment may be used at different seats, only the control algorithm that controls the control procedure has to be changed.

[0034] According to PCT/SE97/01172 there is a procedure for heating of a seat comprising an electrical heater connected to a control unit arranged for supplying current through the electrical heater. According to what is disclosed in PCT/SE97/01172, the procedure comprises a detection of current temperature in connection with the electrical heater, and also an adjustment of the temperature by supplying said current through the electrical heater if said current temperature falls below a predetermined desired temperature. According to what is disclosed in PCT/SE97/01172, the invention is based on the basic concept that it comprises a determination of an additional value, ΔT, to said desired temperature T_B. This additional value is added to said predetermined desired temperature in connection with said adjustment. The additional value may be positive or negative. The invention admits a compensation where a slightly "too high" (or "too low") value of the desired temperature is used. Thus an adjustment with individual adaptation to a certain seat design is supplied, i.e. that the same equipment may be used for different seats, and the only thing that has to be changed is the control algorithm that controls the control procedure, which thus admits use in combination with the present invention.

[0035] To sum up, according to previously known technology, the purpose with the communication unit 13 is principally to see to that information concerning the desired value T_B for the temperature control of the electrical heater 3 is transferred to the control unit 4 from an external unit in the form of a central computer unit 11. Preferably the central computer unit 11 is constituted by a computer already available in the vehicle that e.g. may be used for the vehicle's climate control equipment, the vehicle's ignition system or similar purposes. The transfer of information takes place via a transmission channel 12, preferably being constituted by an electrical wire.

[0036] One of the advantages with the present invention is that already available data wires, so-called buses, are used in the car and the current seat. This reduces the costs for the cooling device that is furnished the chair, and it saves space. When using a computer as control unit, a great flexibility is achieved for handling changed conditions, i.e. the computer is fed with a suitable algorithm to use for the adjustment. Since the software, the algorithm, is crucial for the adjustment, the same hardware, fans, electrical heaters, cooling element and sensors may be mounted in seats of different types, which is cost effective. In order to acquire a correct adjustment, it is sufficient if the computer is informed of which kind of seat that the hardware has been installed in, after which the computer that is equipped with different parameters for different seats makes adjustments to these conditions. The computer also provides the user with a possibility of changing the comfort by himself as there may be pre-programmed alternatives in the computer which may be chosen by the user, e.g. extra air flow, temperature control depending on the user's clothing, long trip driving or extra fast drying.

[0037] In connection with the electrical heater 3, the detector unit 8 is arranged, which in turn comprises a first temperature sensor 8a and a second temperature sensor 8b, which are electrically connected to the control unit 4, as shown in Fig. 6. The temperature sensors preferably consist of thermistors of the NTC (Negative Temperature Coefficient) type, that shows a temperature dependent resistance R_1 and R_2 that corresponds to the temperature T1 and T2 respectively, that by placement of the sensors 8a, 8b is detected in connection with the electrical heater 3 and at a predetermined distance from the electrical heater 3 respectively. The first temperature sensor 8a may be placed directly on the electrical heater 3 or in the close vicinity of the electrical heater 3. The second temperature sensor 8b is placed at a predetermined distance from the electrical heater 3, e.g. between two of the lines defined by the pattern that covers maximum surface in which the electrical heater 3 is laid, or, depending on the seat's design, at another position at a distance from the electrical heater 3, e.g. in the vicinity of the sitting surface.

[0038] As the detector unit comprises two temperature sensors 8a, 8b, a superposed detected value is acquired, consisting of the sum of the current resistances of the two temperature sensors. This added value then corre-

sponds to a superposed temperature value that during the heating of the seat 2 is compared with a desired value T_B, which in turn corresponds to the desired temperature T_S on the surface of the seat. If the detected temperature exceeds the desired value T_B, the current supply through the electrical heater will cease, analogous to what has been stated above. The superposed resistance value of the temperature sensors 8a, 8b will consist of two components, partly a first component that is affected by the relatively fast temperature variations of the temperature sensor 8a that is placed in the close vicinity of the electrical heater 3, and partly a second component that is affected by the relatively slow temperature variations of the temperature sensor 8b that is placed relatively far from the electrical heater 3. All together, this provides a temperature control that corresponds to a balance between a temperature control based on each one of the placements. By a suitable tuning of the placements of the temperature sensors 8a, 8b, an optimum adapted heating of the seat is obtained, where the desired temperature of the seat's surface is obtained relatively quickly, but without being accompanied by too large temperature variations, which would be the case when a single temperature sensor is placed relatively far from the electrical heater. Neither is the too slow warm-up of the seat obtained, which would be the consequence of a placement of a single temperature sensor placed relatively close to the electrical heater.

[0039] Further advantages with a detector unit of this kind is that the first temperature sensor 8a that is placed on or in the vicinity of the electrical heater 3 detects the electrical heater's temperature even during a convective cooling of the seat, i.e. with the cooling device 1. The other sensor 8b that is placed at a distance from the electrical heater, on the other hand, senses the convective cooling, which means that the convective cooling of the seat 2 affects the other temperature sensor 8b. It is the most cold of the two temperature sensors 8a, 8b that controls the electrical heater's 3 control cycle, which means that the second temperature sensor 8b controls the electrical heater's 3 control cycle during cooling of the seat. A central connection 14 may be placed between the two temperature sensors for diagnostics or as measuring sensors to an algorithm for an enhanced adjustment. When the central connection 14 is used, information about both the electrical heater's 3 temperature, which is detected by the first temperature sensor 8a and a temperature at a distance from the electrical heater 3 which is detected by 8b and that depends on the convective cooling may be provided to the control unit 4.

[0040] Further advantages with a detector unit of this kind is that it may be used even when the electrical heater 3 not is turned on, or when an electrical heater is missing to determine temperature differences depending on the user's condition. The first temperature sensor 8a may be placed in the seat on or in the vicinity of the user's body, e.g. under one of the thighs, under the buttocks or behind the back, where the first temperature sensor 8a detects a temperature that depends on the user's temperature and where the air flow is low. The other sensor 8b may be placed where the air flow is higher, i.e. at a distance from the user's body, e.g. between the user's legs. The central connection 14 may also here be used to provide information of the two temperature sensors 8a, 8b to the control unit, e.g. determine if one of the temperature sensors detects a temperature that is too cold or too warm in relation to the temperature that the other temperature sensor detects, or if any of the temperature sensors detects a temperature that lies at or over predetermined temperature limits, i.e. too hot or too cold. The information concerning the two temperature sensors provides the control algorithm and thus the control unit the possibility to control e.g. different fans and cooling element, in order to more precisely control air flow and cooling to local spots in the seat, e.g. to a locally warm spot without lowering the temperature further at an already locally cold spot.

[0041] To sum up, it must be mentioned that the present invention uses equipment already available in the seat such as an electrical heater 3, detector unit 8 and equipment necessary for these units, such as cable pullings, "data buses", control unit 4 and central computer unit 11, which is both economically advantageous and space saving. Further, the method to use electrical heaters 3 for cooling the seat 2 together with a cooling device 1, provides a fast-cooling and fast-drying device with optimum comfort for the user without any convective cooling problems for the user. Further advantages is the increased possibility to more quickly, more accurately and more individually adapted adjust the seat temperature and the dampness of the sitting surface.

[0042] Fig. 7 shows that the arrangement according to fig. 1-6 also may be connected to an external system where an external detector 15 measures the driver's health condition, e.g. via an eye detector which measures the eye's activity, a pulse meter, breathing or similar. When the external detector 15 detects that the driver is falling asleep, a signal is provided to the control unit 4 to start an algorithm, a health algorithm, where all climate systems available in the vehicle via the health algorithm are adjusted to provide a stimulating effect to the driver, e.g. cooling of the seat and thus a cooling of the driver via the cooling device 1, or by an increase of the fan velocity and cooling power, or by alternating use of cold, heat and fan, or in any other way that provides a stimulating effect to the driver. The external system may be any system that detects deviations in the behaviour of the driver or the car in relation to a predetermined standard.

[0043] An algorithm is shown schematically in Fig. 8, a humidity algorithm, that preferably may be a part of a larger control algorithm for control of a device via a control unit described according to any of the embodiments of the invention mentioned above. The humidity algorithm is based on that the material of the seat is known, and on that the humidity content of the air is coupled to the

air temperature via the heat capacity of the air according to known scientific methods, after which a certain predetermined air temperature coupled to a first humidity content of the air and a further air temperature, which air temperature may be measured with e.g. the detector unit 8, coupled to a second humidity content of the air, provides a temperature difference ΔT and a humidity content difference, which provides a necessary time period Δ_{Time} calculated in e.g. the central computer unit 11, in order to get rid of the humidity content of the air by ventilation, which consists of the humidity content difference, by the control unit 4 controlling the electrical heater 3 to emit a certain power Ph by current supply, i, and that the fan 6, 9 according to fig. 1-3 is controlled to emit a certain flow, a certain power Pf by current supply, i, and possibly also the cooling element 5 is controlled to absorb a certain power Pc by current supply. In figure 8, the temperature is shown with a dashed line, and the powers Ph, Pf, Pc and the current intensity with a common solid line, which, however, shall not be interpreted as that they supply an equal amount of power or current, but solely as a schematic view of the algorithm as time lapses.

[0044] The humidity content and thus the time period Δ_{Time} may also be acquired as a measured change of the air temperature and the air flow, which provides control of the electrical heater 3 and/or the fan 6 and/or the cooling element 5.

[0045] For certain air flows in combination with a certain temperature change, the air is always dry, i.e. mainly free of humidity, which may be used at control of the electrical heater 3 and/or the fan 6 and/or the cooling element 5 in order to obtain the desired effect, e.g. during drying.

[0046] A change of the electrical heater's power in combination with the time t for reaching a certain temperature $T + \Delta T$ starting from a first temperature T, also provides an idea of the humidity content in the air, which in turn provides the necessary period of time Δ_{Time} that is used in a humidity control algorithm in the control unit 4 during control of the electrical heater 3 and/or the fan 6 and/or the cooling element 5, and that may be used to provide e.g. a sufficient time period to a timer function at e.g. drying or pre-cooling of the seat.

[0047] The invention is not limited to what has been disclosed above, but different embodiments are possible within the scope of the claims. The fan may for example be controlled by a button manoeuvred by the user, or by a chair computer, or by another electronic unit.

[0048] The air conditioning equipment 10 described above, may consist of a simple compartment ventilation consisting of a sole fan or by another device appropriate for the purpose.

[0049] The invention may advantageously be used solely for ventilation, i.e. not for cooling, of different seat parts, e.g. the back of a user is often humid and warm why a device or a procedure according to the invention may be used for the ventilation and/or heating/cooling of the back part of the seat, i.e. for ventilation solely, a fan may be placed in the back part of the seat and for cooling according to the invention, an electrical heater and a cooling device may be placed in the back part of the seat. According to previously known technology, an electrical heater and a sensor are often placed in the back part of the seat when it is manufactured.

[0050] The cooling device 1 is not tied to what has been mentioned above, but may comprise any kind of cooling element respective fan that provides the desired result. The cooling element 1 may e.g. be a part of the air conditioning equipment that is already available, where a cooling agent is led from the air conditioning equipment to a cooling coil (not shown) placed in or in the vicinity of the seat. The fan 6, 9, 26, 29 may also be replaced by any kind of blowing/sucking device that provides the desired result. Several fans may be placed in the seat in order to provide a more local influence at certain spots in the seat. There may also be an air distribution system where a multitude of channels leads the air to desired locations in the seat and where the air flow may be determined and conducted by means of special control devices, e.g. flaps, throttling devices etc.

[0051] The cooling device may also be used in seats that lack electrical heaters, with a placement of the sensor at a suitable location, e.g. at the seat's surface, for control of the control cycle.

[0052] The invention is not limed to the usage of a detector unit with two temperature sensors. In principle, conventional NTC or PTC elements with only one sensor may be used.

[0053] The temperature sensor and the humidity sensor respectively, may be of any kind that provides the desired result and may be placed at a suitable place free of choice to provide satisfactory information to the control unit. An advantageous placement of the two sensors should however be in the vicinity of the user, i.e. in the vicinity of the seat's surface and/or in the surface of the back part of the seat. The number of sensors is not limited, however, but a number of sensors may advantageously be used, e.g. one sensor for the electrical heater and one for detection of the temperature at a distance from the electrical heater, e.g. in the seat's surface. Except different placements of the sensors in the seat, other sensors may also be placed at different locations in the car in order to provide the control unit with information.

[0054] The arrangement according to the invention may also be used for pre-cooling of the seat when the user indicates his presence with e.g. a transmitter, e.g. by unlocking the vehicle and turning the alarm off. The temperature adjustment of the seat then already starts before the user has been seated in the car.

Claims

1. Device for temperature control and ventilation of a seat (2), wherein the device comprises an electrical heater (3) placed in the seat, a cooling device (1)

comprising a cooling element (5) and a fan (6, 9) arranged for blowing cold air in the direction from a lower side of the seat (2) towards the seat's sitting surface (7), and a detector unit (8) in connection with the electrical heater (3) for detection of a temperature (T) at said electrical heater (3), **characterized in that** a control unit (4) is arranged to, at the same time, activate the cooling device (1) and the electrical heater (3), in dependence of at least the detected temperature (T), wherein the cooling device (1) is arranged to give a convective cooling of the seat (2) for cooling and drying of the seat (2) and a user, and wherein the electrical heater (3) is arranged to give a local heat supply to the user's exposed areas in contact with the sitting surface (7) in order to reduce a, due to the activated cooling device (1), otherwise local over-cooling.

2. Device according to claim 1, **characterized in that** the detected temperature (T) represents both conductive and convective cooling from the cooling device (1) and conductive heat from the electrical heater (3).

3. Device according to any one of the preceding claims, **characterized in that** the cooling device (1) of the seat (2) is arranged in connection with the seat (2).

4. Device according to claim 1 or 2, where an air conditioning device (10) is arranged in connection with said seat (2) **characterized in that** the cooling device (1) of the seat (2) is arranged in connection with the air conditioning equipment (10).

5. Device according to claim 4, **characterized in that** the fan (9) is arranged in connection with the air conditioning equipment (10).

6. Device according to claim 1 or 2, **characterized in that** the seat's (2) cooling device (1) consists of an air conditioning equipment (10) arranged in connection with the seat (2).

7. Device according to claim 6, **characterized in that** the cooling device (1) comprises a fan (9) that is arranged in connection with the air conditioning equipment (10).

8. Device according to any one of the preceding claims, **characterized in that** a humidity sensor (28) is arranged in connection with the sitting surface (7) of the seat (2) for detection of humidity.

9. Device according to any one of the preceding claims, **characterized in that** the detector unit (8) comprises at least a first temperature sensor (8a) on or in the vicinity of the electrical heater (3) with at least an additional temperature sensor (8b) at a predetermined distance from the electrical heater (3).

10. Device according to claim 9, **characterized in that** the temperature sensors (8a, 8b) are connected such that a superposed detected value is acquired that is fed to the control unit (4).

11. Device according to any one of claims 9 or 10, **characterized in that** a central connection (14) is placed between the two temperature sensors (8a, 8b), where the central connection is arranged to give information about the temperature sensors (8a, 8b) to a control unit (4).

12. Method for temperature control and ventilation of a seat (2) comprising an electrical heater (3) placed in the seat, a cooling device (1) comprising a cooling element (5) and a fan (6, 9) for blowing cold air in the direction from a lower side of the seat (2) towards the seat's sitting surface (7), and a detector unit (8) in connection with the electrical heater (3) detecting a temperature (T) at said electrical heater (3), the method comprises that a control unit (4) activates, at the same time, the cooling device (1) and the electrical heater (3) in dependence of at least the detected temperature (T), wherein the cooling device (1) gives a convective cooling of the seat (2) for cooling and drying of the seat (2) and a user, and wherein the electrical heater (3) gives a local heat supply to the user's exposed areas in contact with the sitting surface (7) in order to reduce a, due to the activated cooling device (1), otherwise local over-cooling.

13. Method according to claim 12, **characterized in that** the detected temperature (T) represents both conductive and convective cooling from the cooling device (1) and conductive heat from the electrical heater (3).

14. Method according to any one of claims 12 or 13, **characterized in that** the method comprises the steps of;

- detection of a temperature (T1) in on or in the vicinity of the electrical heater (3);
- detection of a second temperature (T2) at a predetermined distance from the electrical heater (3), where;
- the temperatures together give rise to a temperature value (T), and where;
- the temperature value (T) is compared to a desired temperature value (T_B) when performing said control.

15. Method according to claim 14, **characterized in that** the measured temperature values (T1, T2) are added to a superposed common temperature value in the interval between said measured temperature val-

ues.

Patentansprüche

1. Vorrichtung zur Temperatursteuerung und Belüftung eines Sitzes (2), wobei die Vorrichtung eine in dem Sitz angeordnete elektrische Heizung (3), eine Kühleinrichtung (1) mit einem Kühlelement (5) und einem Gebläse (2, 9), das zum Blasen kalter Luft in der Richtung von einer Unterseite des Sitzes (2) zur Sitzfläche (7) des Sitzes eingerichtet ist, und eine Ermittlungseinheit (8) in Verbindung mit der elektrischen Heizung (3) zur Ermittlung einer Temperatur (T) an der elektrischen Heizung (3) aufweist,
dadurch gekennzeichnet, dass eine Steuereinheit (4) zum gleichzeitigen Aktivieren der Kühleinheit (1) und der elektrischen Heizung (3) in Abhängigkeit von mindestens der ermittelten Temperatur (T) eingerichtet ist, wobei die Kühleinrichtung (1) zum Liefern einer konvektiven Kühlung des Sitzes (2) zum Kühlen und Trocknen des Sitzes (2) und eines Benutzers eingerichtet ist, und wobei die elektrische Heizung (3) zum Liefern einer örtlichen Wärmezufuhr zu exponierten Bereichen des Benutzers eingerichtet ist, die mit der Sitzfläche (7) in Kontakt stehen, um eine anderenfalls aufgrund der aktivierten Kühleinrichtung (1) zu starke örtliche Kühlung zu verringern.

2. Vorrichtung nach Anspruch 1,
dadurch gekennzeichnet, dass die ermittelte Temperatur (T) sowohl konduktive und konvektive Kühlung von der Kühleinrichtung (1) als auch konduktive Erwärmung von der elektrischen Heizung (3) darstellt.

3. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass die Kühleinrichtung (1) des Sitzes (2) in Verbindung mit dem Sitz (2) angeordnet ist.

4. Vorrichtung nach Anspruch 1 oder 2, wobei eine Klimaanlage (10) in Verbindung mit dem Sitz (2) angeordnet ist,
dadurch gekennzeichnet, dass die Kühleinrichtung (1) des Sitzes (2) in Verbindung mit der Klimaanlage (10) angeordnet ist.

5. Vorrichtung nach Anspruch 4,
dadurch gekennzeichnet, dass das Gebläse (9) in Verbindung mit der Klimaanlage (10) angeordnet ist.

6. Vorrichtung nach Anspruch 1 oder 2,
dadurch gekennzeichnet, dass die Kühleinrichtung (1) des Sitzes (2) aus einer Klimaanlage (10) besteht, die in Verbindung mit dem Sitz (2) angeordnet ist.

7. Vorrichtung nach Anspruch 6,
dadurch gekennzeichnet, dass die Kühleinrichtung (1) ein Gebläse (9) aufweist, das in Verbindung mit der Klimaanlage (10) angeordnet ist.

8. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass ein Feuchtigkeitssensor (28) in Verbindung mit der Sitzfläche (7) des Sitzes (2) zum Ermitteln von Feuchtigkeit eingebaut ist.

9. Vorrichtung nach einem der vorhergehenden Ansprüche,
dadurch gekennzeichnet, dass die Ermittlungseinheit (8) mindestens einen ersten Temperatursensor (8a) auf dem elektrische Heizung (3) oder in dessen Nähe mit mindestens einem zweiten Temperatursensor (8b) in einer vorbestimmten Entfernung von dem elektrische Heizung (3) aufweist.

10. Vorrichtung nach Anspruch 9,
dadurch gekennzeichnet, dass die Temperatursensoren (8a, 8b) so verbunden sind, dass ein überlagerter ermittelter Wert gewonnen wird, welcher der Steuereinheit (4) zugeführt wird.

11. Vorrichtung nach einem der Ansprüche 9 oder 10,
dadurch gekennzeichnet, dass ein mittlerer Anschluss zwischen den zwei Temperatursensoren (8a, 8b) angeordnet ist, wobei der mittlere Anschluss zur Abgabe von Informationen über die Temperatursensoren (8a, 8b) an eine Steuereinheit (4) eingerichtet ist.

12. Verfahren zur Temperatursteuerung und Belüftung eines Sitzes (2) mit einer in dem Sitz angeordneten elektrische Heizung (3), einer Kühleinrichtung (1) mit einem Kühlelement (5) und einem Gebläse (2, 9) zum Blasen kalter Luft in der Richtung von einer Unterseite des Sitzes (2) zur Sitzfläche (7) des Sitzes, und einer Ermittlungseinheit (8) in Verbindung mit der elektrischen Heizung (3), die eine Temperatur (T) an der elektrischen Heizung (3) ermittelt, wobei das Verfahren umfasst, dass eine Steuereinheit (4) gleichzeitig die Kühleinheit (1) und die elektrischen Heizung (3) in Abhängigkeit von mindestens der ermittelten Temperatur (T) aktiviert, wobei die Kühleinrichtung (1) eine konvektive Kühlung des Sitzes (2) zum Kühlen und Trocknen des Sitzes (2) und eines Benutzers liefert, und wobei die elektrische Heizung (3) eine örtliche Wärmezufuhr zu exponierten Bereichen des Benutzers liefert, die mit der Sitzfläche (7) in Kontakt stehen, um eine anderenfalls aufgrund der aktivierten Kühleinrichtung (1) zu starke örtliche Kühlung zu verringern.

13. Verfahren nach Anspruch 12,
dadurch gekennzeichnet, dass die ermittelte Temperatur (T) sowohl konduktive und konvektive Kühlung von der Kühleinrichtung (1) als auch konduktive Erwärmung von der elektrischen Heizung (3) darstellt.

14. Verfahren nach einem der Ansprüche 12 oder 13,
dadurch gekennzeichnet, dass das Verfahren folgende Schritte umfasst:

Ermitteln einer Temperatur (T1) auf dem elektrische Heizung (3) oder in dessen Nähe;
Ermitteln einer zweiten Temperatur (T2) in einer vorbestimmten Entfernung vom elektrische Heizung (3), wobei;

- die Temperaturen zusammen einen Anstieg auf einen Temperaturwert (T) ergeben , und wobei;
- der Temperaturwert (T) mit einem Soll-Temperaturwert (T_B) verglichen wird, wenn die Steuerung ausgeführt wird.

15. Verfahren nach Anspruch 14,
dadurch gekennzeichnet, dass die gemessenen Temperaturwerte (T1, T2) zu einem überlagerten gemeinsamen Temperaturwert im Intervall zwischen den gemessenen Temperaturwerten zusammengerechnet werden.

Revendications

1. Dispositif de commande de température et de ventilation d'un siège (2), dans lequel le dispositif comporte un élément de chauffage électrique (3) placé dans le siège, un dispositif de refroidissement (1) comportant un élément de refroidissement (5) et un ventilateur (6, 9) disposés pour souffler de l'air froid dans la direction allant du côté inférieur du siège (2) vers la surface d'assise (7) du siège, et une unité de détection (8) connectée à l'élément de chauffage électrique (3) pour la détection d'une température (T) au niveau dudit élément de chauffage électrique (3), **caractérisé en ce que** une unité de commande (4) est agencée pour, simultanément, activer le dispositif de refroidissement (1) et l'élément de chauffage électrique (3), en fonction d'au moins la température détectée (T), dans lequel le dispositif de refroidissement

(1) est agencé pour donner un refroidissement par convection du siège (2) pour refroidir et sécher le siège (2) et un utilisateur, et dans lequel l'élément de chauffage électrique (3) est agencé pour donner un apport thermique local aux zones exposées de l'utilisateur en contact avec la surface d'assise (7) afin de réduire un refroidissement local sinon excessif, suite à l'activation du dispositif de refroidissement (1).

2. Dispositif selon la revendication 1, **caractérisé en ce que** la température détectée (T) représente à la fois un refroidissement conductif et convectif par le dispositif de refroidissement (1) et une chaleur de conduction de l'élément de chauffage électrique (3).

3. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** le dispositif de refroidissement (1) du siège (2) est agencé en connexion avec le siège (2).

4. Dispositif selon la revendication 1 ou 2, dans lequel un dispositif de conditionnement d'air (10) est agencé en connexion avec ledit siège (2) **caractérisé en ce que** le dispositif de refroidissement (1) du siège (2) est agencé en connexion avec l'équipement de conditionnement d'air (10).

5. Dispositif selon la revendication 4, **caractérisé en ce que** le ventilateur (9) est agencé en connexion avec l'équipement de conditionnement d'air (10).

6. Dispositif selon la revendication 1 ou 2, **caractérisé en ce que** le dispositif de refroidissement (1) du siège (2) consiste en un équipement de conditionnement d'air (10) agencé en connexion avec le siège (2).

7. Dispositif selon la revendication 6, **caractérisé en ce que** le dispositif de refroidissement (1) comporte un ventilateur (9) qui est agencé en connexion avec l'équipement de conditionnement d'air (10).

8. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce qu'**un détecteur d'humidité (28) est agencé en connexion avec la surface d'assise (7) du siège (2) pour la détection d'humidité.

9. Dispositif selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'unité de détection (8) comporte au moins un premier capteur de température (8a) sur l'élément de chauffage électrique (3) ou à proximité de celui-ci, au moins un capteur de température supplémentaire (8b) étant à une distance prédéterminée de l'élément de chauffage électrique (3).

10. Dispositif selon la revendication 9, **caractérisé en ce que** les capteurs de température (8a, 8b) sont connectés de telle manière qu'une valeur détectée superposée est acquise qui est envoyée à l'unité de commande (4).

11. Dispositif selon l'une quelconque des revendications 9 ou 10, **caractérisé en ce qu'**une connexion centrale (14) est placée entre les deux capteurs de température (8a, 8b), la connexion centrale étant disposée pour donner des informations concernant les capteurs de température (8a, 8b) à une unité de commande (4).

12. Procédé de commande de température et de ventilation d'un siège (2) comportant un élément de chauffage électrique (3) placé dans le siège, un dispositif de refroidissement (1) comportant un élément de refroidissement (5) et un ventilateur (6, 9) pour souffler de l'air froid dans la direction allant d'un côté inférieur du siège (2) vers la surface d'assise (7) du siège, et une unité de détection (8) en connexion avec l'élément de chauffage électrique (3) détectant une température (T) au niveau dudit élément de chauffage électrique (3), le procédé étant tel qu'une unité de commande (4) actionne, en même temps, le dispositif de refroidissement (1) et l'élément de chauffage électrique (3) en fonction d'au moins la température détectée (T), dans lequel le dispositif de refroidissement (1) donne un refroidissement par convection du siège (2) pour refroidir et sécher le siège (2) et un utilisateur, et dans lequel l'élément de chauffage électrique (3) donne un apport de chaleur local aux zones exposées de l'utilisateur en contact avec la surface d'assise (7) afin de réduire un refroidissement local sinon excessif dû au dispositif de refroidissement activé (1).

13. Procédé selon la revendication 12, **caractérisé en ce que** la température détectée (T) représente à la fois un refroidissement conductif et convectif du dispositif de refroidissement (1) et une chaleur de conduction de l'élément de chauffage électrique (3).

14. Procédé selon la revendication 12 ou 13, **caractérisé en ce que** le procédé comporte les étapes de :

- détection d'une température (T1) dans l'élément de chauffage électrique (3) ou à proximité de celui-ci ;
- détection d'une seconde température (T2) à une distance prédéterminée de l'élément de chauffage électrique (3), où
- les températures prises conjointement donnent naissance à une valeur de température (T), et où
- la valeur de température (T) est comparée à une valeur de température souhaitée (T_B) lorsqu'on exécute ladite commande.

15. Procédé selon la revendication 14, **caractérisé en ce que** les valeurs de température mesurées (T1, T2) sont ajoutées à une valeur commune de température superposée dans l'intervalle entre lesdites valeurs de température mesurées.

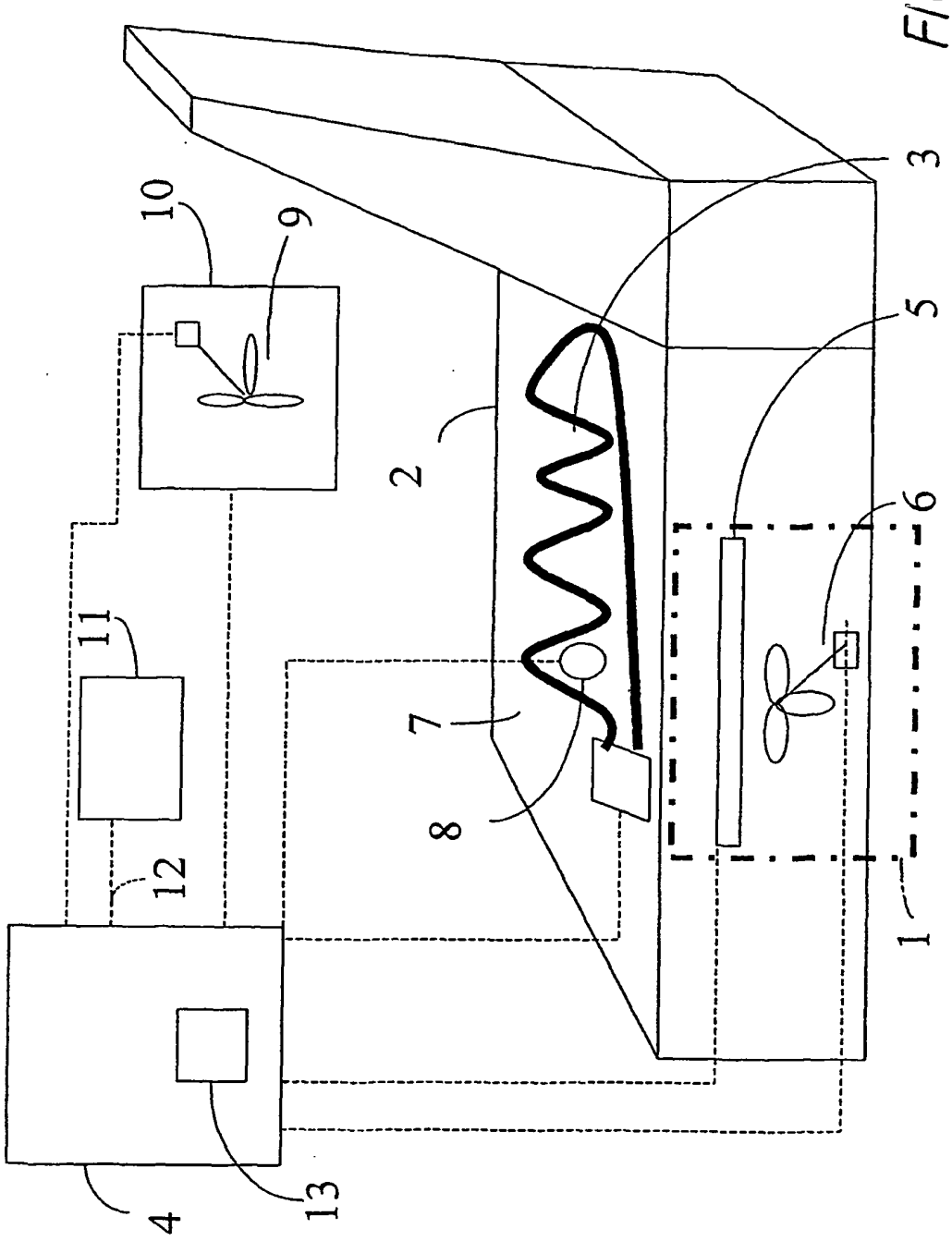


FIG.1

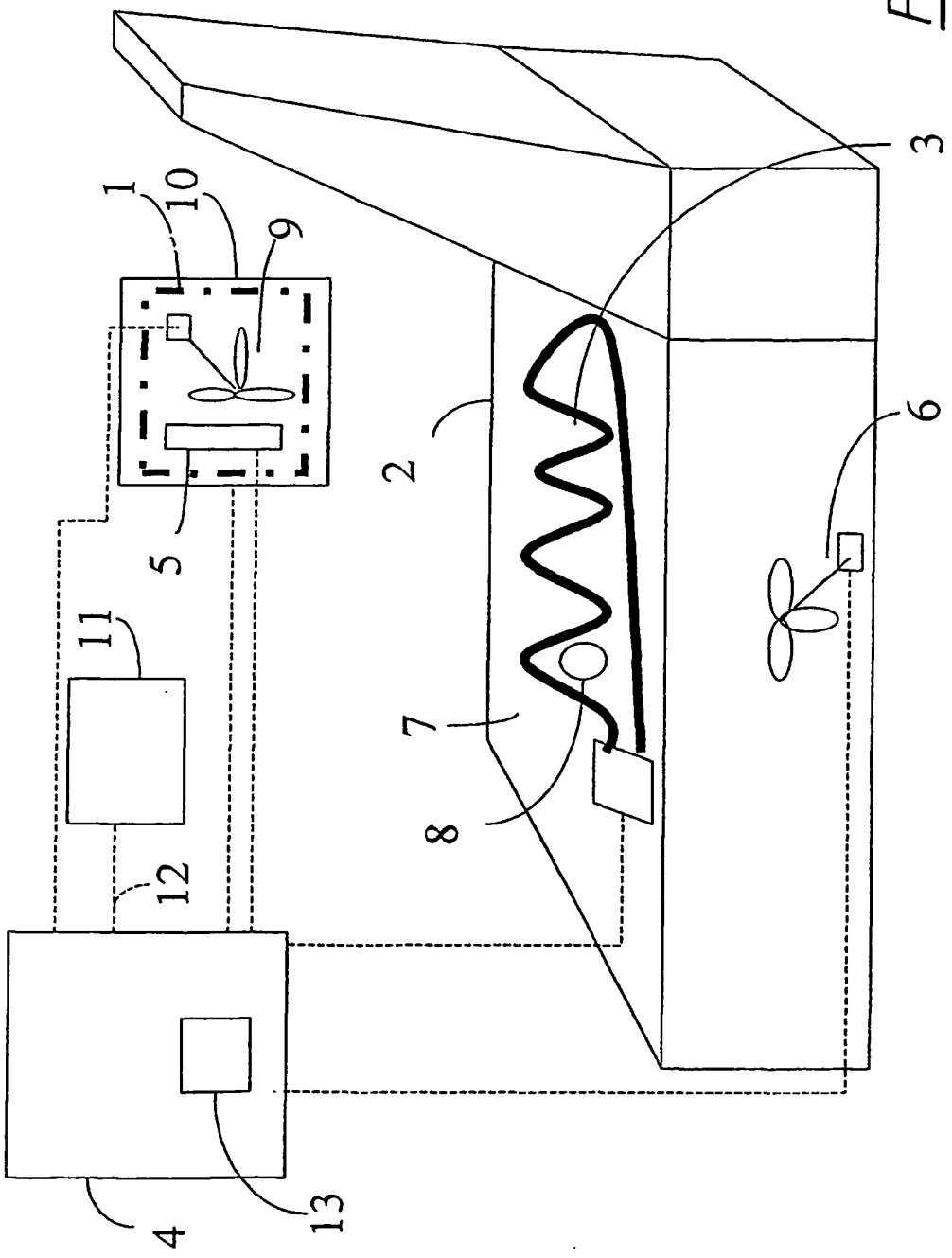


FIG.2

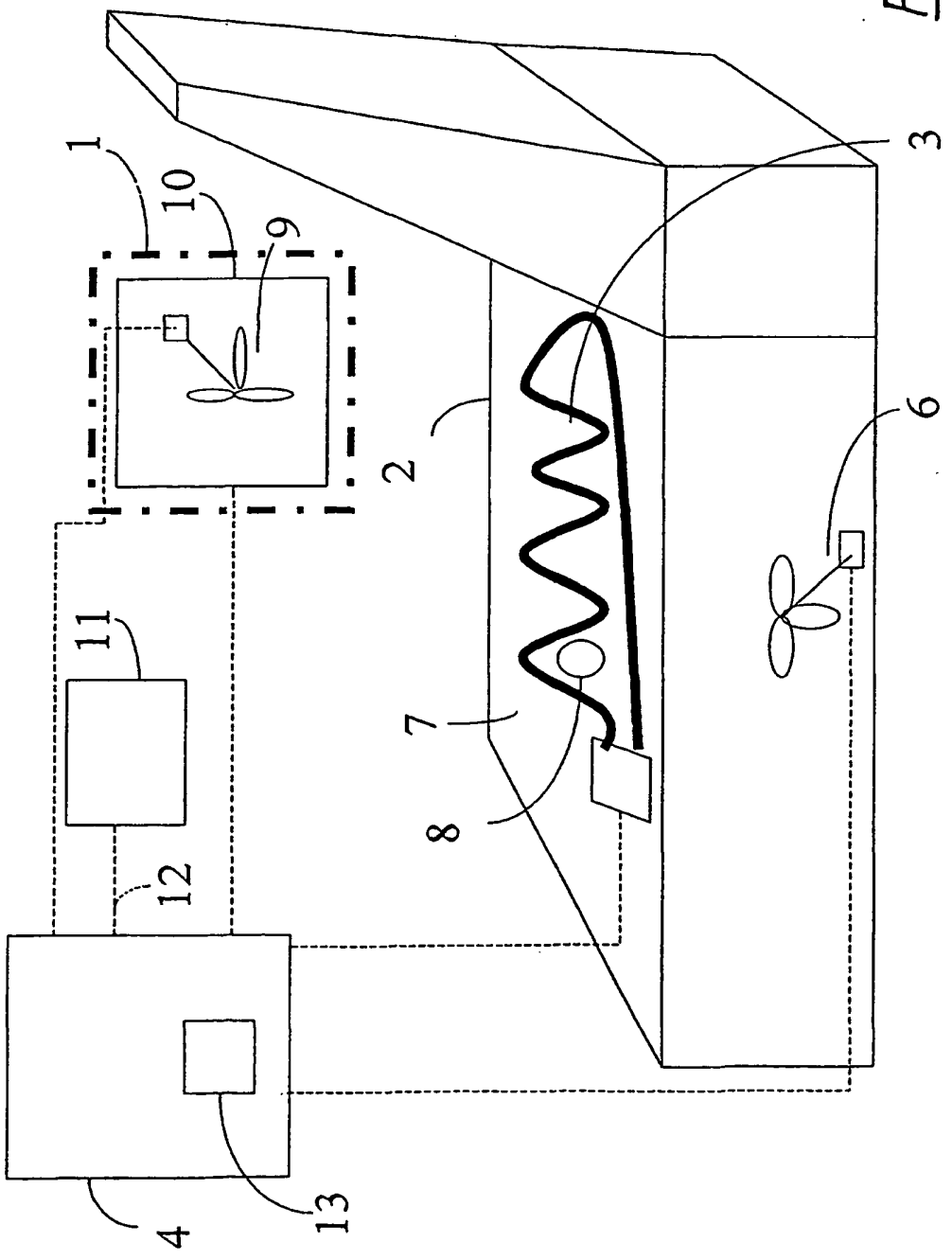


FIG.3

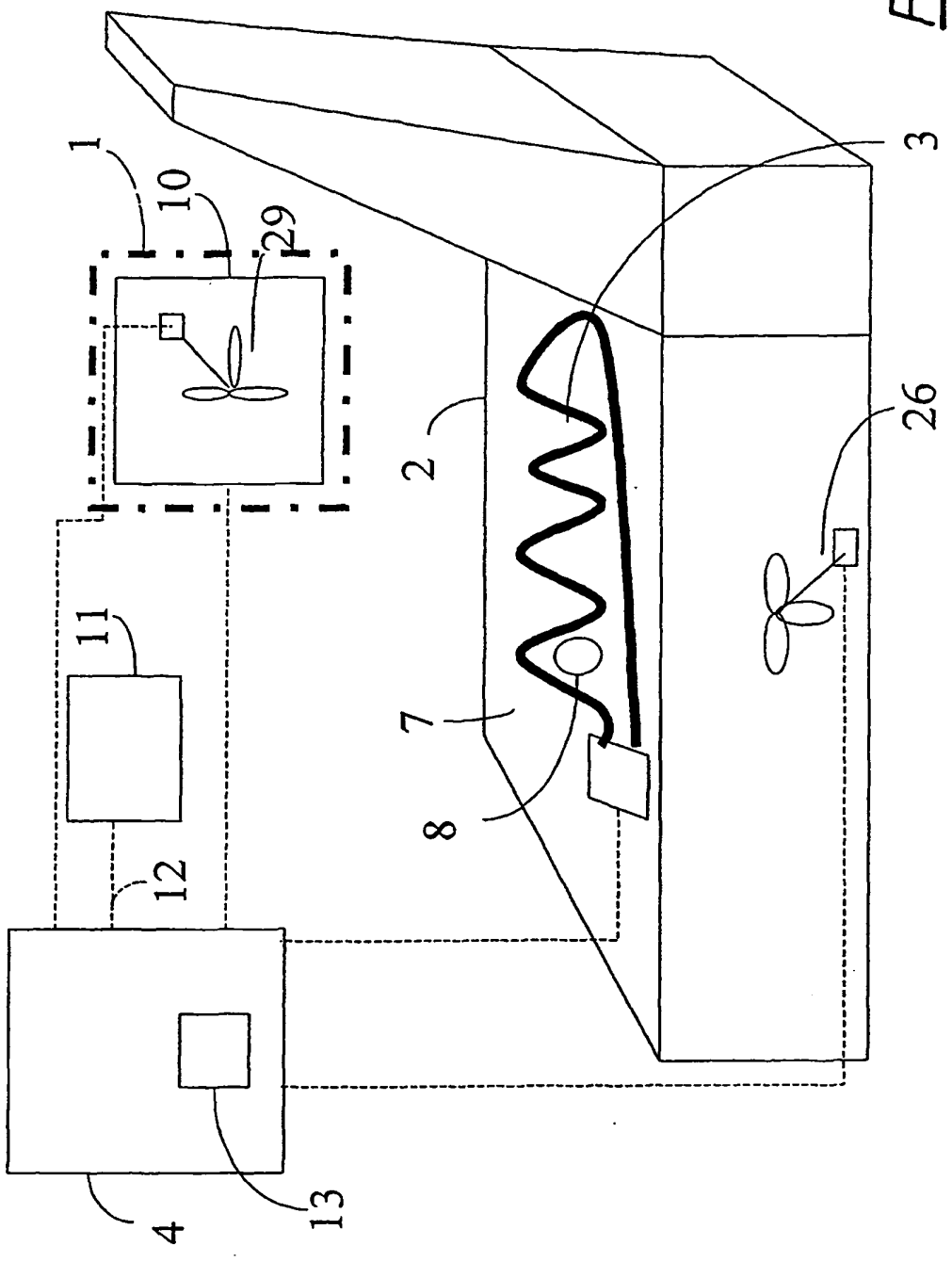


FIG.4

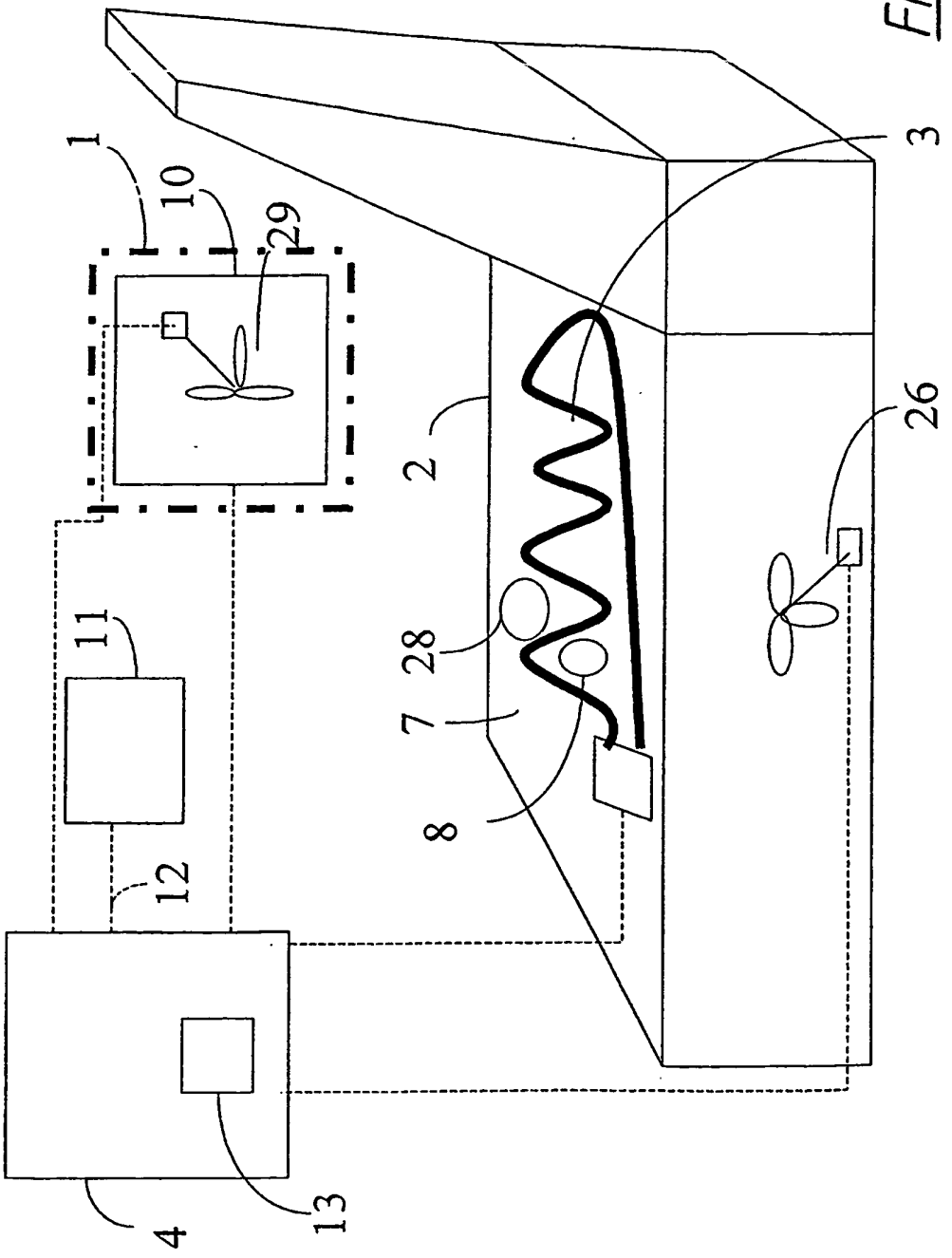
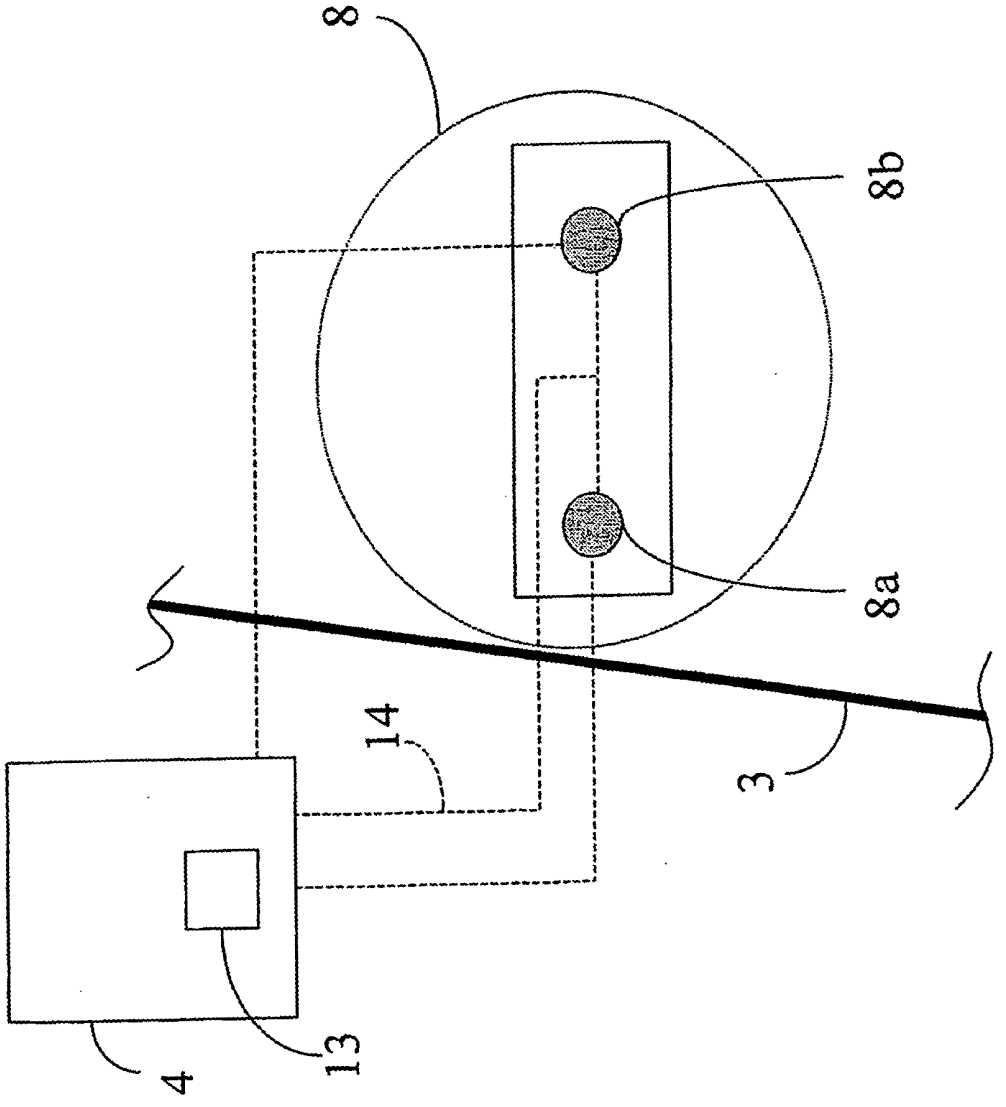


FIG.5

FIG.6



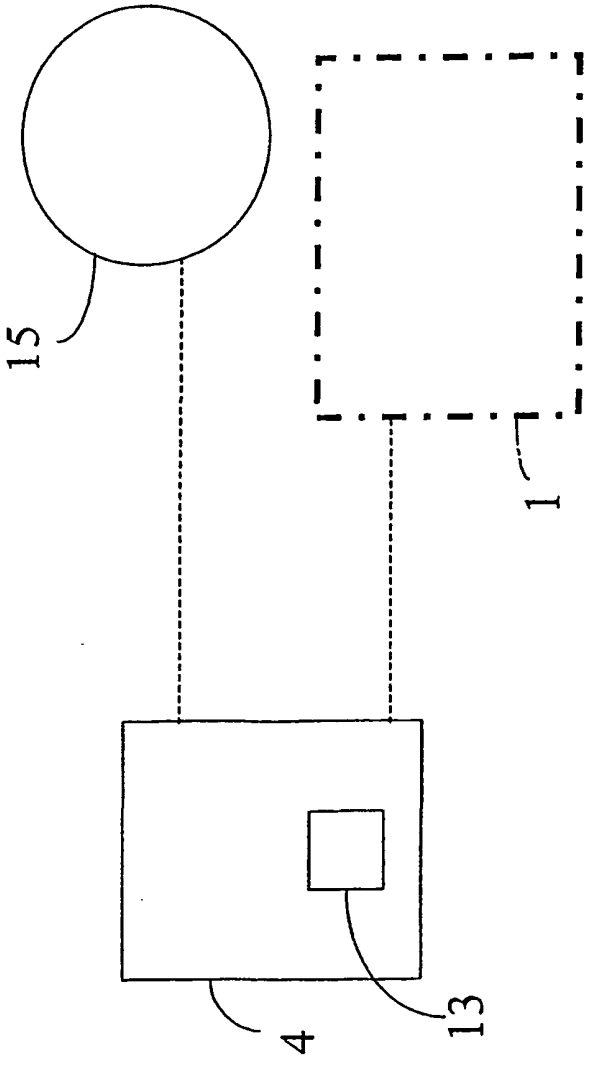


FIG.7

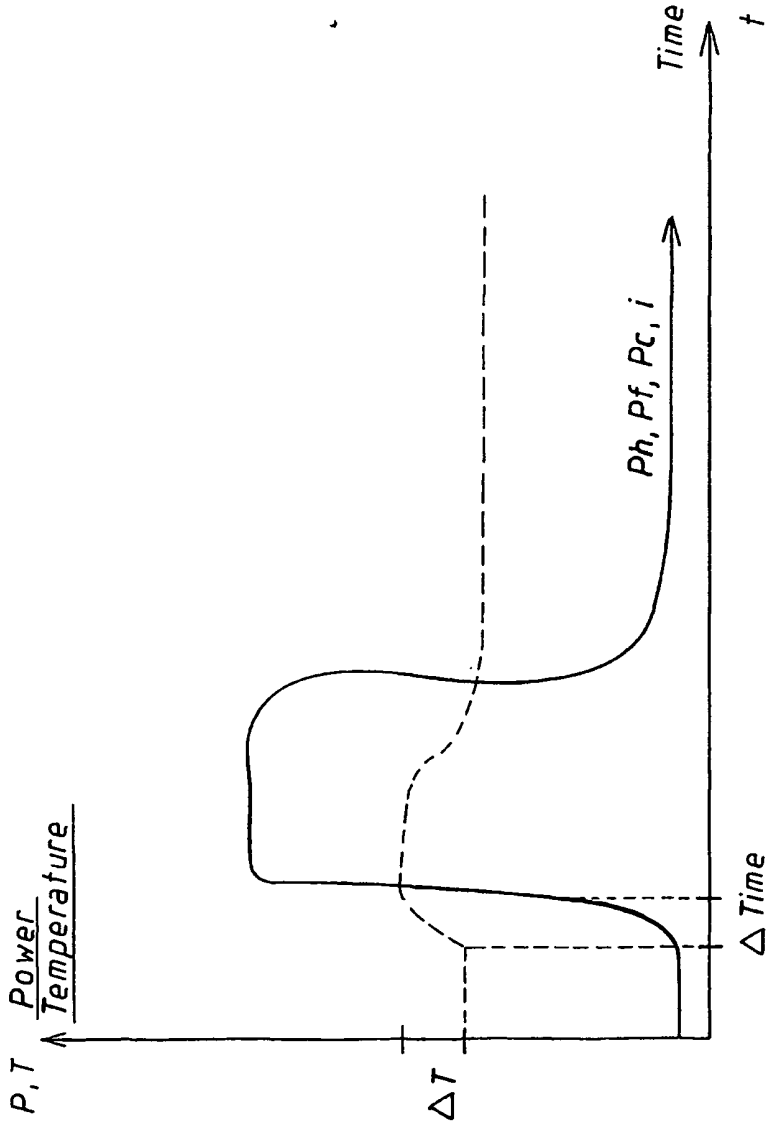


FIG.8

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 5921314 A **[0003]**
- US 5934748 A **[0004]**
- SE 9900261 W **[0029] [0029] [0030] [0030] [0031] [0031] [0032] [0032]**
- SE 9701171 W **[0033] [0033]**
- SE 9701172 W **[0034] [0034] [0034]**