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(71) Applicants: **GENTHERM GMBH** [DE/DE]; Rudolf-Diesel-Str. 12, D-85235 Odelzhausen (DE). **GENTHERM AUTOMOTIVE SYSTEMS (CHINA) LTD.** [CN/CN]; Langfang Economic and Technical Development Zone, No.3 Jinyuan Road, Langfang, Hebei 065001 (CN).

(72) Inventors: **KUKURUZA, Wladimir**; Prof.-Messerschmitt-Straße 38, D-86159 Augsburg (DE). **SANDMAIR, Florian**; Haspelstraße 6, D-82276 Adelshofen (DE). **ZHANG, Jonathan (Yu)**; #1, Jindeyuan, Guiyang Road, Heping District, Tianjin 300052 (CN). **GIES, Manfred**; St-Lantpert-Straße 6, D-85235 Odelzhausen (DE).

(74) Agent: **NTD UNIVATION INTELLECTUAL PROPERTY AGENCY LTD.**; Room 1802, 18th Floor, Block A, Investment Plaza, 27 Jinrongdajie, Xicheng District, Beijing 100033 (CN).

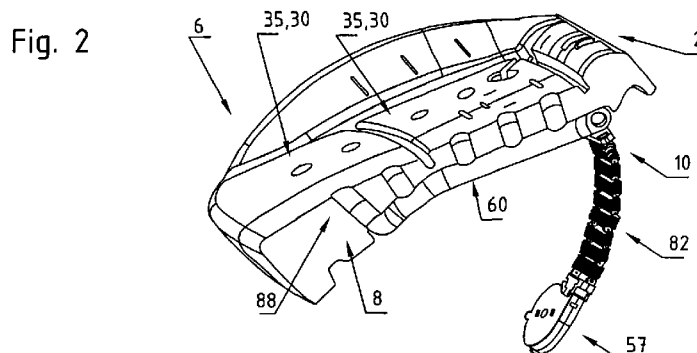
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(54) Title: VENTILATION SYSTEM



(57) Abstract: Climate conditioning device (10) for a climate conditioned object (2), the climate conditioning device (10) having at least one of the following components: a) a temperature control device (70) to heat or cool the climate conditioned object (2), b) an air moving device (57) to generate an air stream to exchange thermal energy with the surrounding.

## VENTILATION SYSTEM

### Field of the invention

One subject in accordance with the invention at hand is a ventilation system in accordance with the generic term of claim 1. The system may be used e. g. for climate control of seat surfaces, particularly in vehicles.

### Background of the invention

For the ventilation of seat surfaces, it has been known, for example from DE 197 36 951, to arrange a space fabric on the surface of the seat and to guide a flow of air through it.

From DE 195 27 352 C2 it has been known to design the foam padding of a seat in the shape of nubs.

Some applications require alternative or improved options that are advantageous with regard to their manufacturing costs, to their ability to create a pleasant climate, to an efficient distribution of thermal energy and/or to their energy consumption.

### Summary of the invention

To improve the prior art, a technical concept with the characteristics of claim 1 is being proposed. Additional advantageous embodiments can be gleaned from the additional claims and the subsequent description.

### Brief description of the drawings

In the following, details of the invention will be explained. These statements should make the invention comprehensible. However, they have only exemplary character. Of course, individual or several characteristics as described may be omitted, modified or supplemented within the framework of the invention defined by independent claims. Also, the characteristics of various embodiments may be combined with each other. The decisive factor is that the concept of the invention be essentially implemented. If one characteristic can be partially fulfilled, this will include that this characteristic is fulfilled completely as well, or is essentially completely fulfilled. "Essentially" shall denote in this context in particular that the implementation permits obtaining the desired benefit to a recognizable extent. This may mean in

particular that a corresponding characteristic is met at least at 50 %, 90 %, 95 % or 99 %. If a minimum amount is indicated, it will of course be possible to use more than such a minimum amount. If the number of a component is indicated with at least one, this shall also include embodiments with two, three or any other multitude of components. What is described for one object may also be applied to the overwhelming part or totality of all other objects of the same type. Unless stated to the contrary, intervals shall include their boundary points.

In the following, reference will be made to:

FIG. 1 Vehicle 1 with a seat as climate conditioned object 2 in a partial longitudinal cut

FIG. 2 Enlarged view of a climate conditioning device 10 for the climate conditioned object 2 of Fig. 1 in a length section of a seat cushion

FIG. 3 Perspective view of a climate control device 20 of climate conditioned object 2 of Fig. 2

FIG. 4 Alternative embodiment of a climate control device 20' of a climate conditioned object 2 of Fig. 2

### **Detailed description**

The invention is particularly well suited for use in a vehicle 1 as in Fig. 1. This denotes in particular all land, water or aircraft such as, for example, an airplane, a rail vehicle, a ship or a motor vehicle.

The invention is moreover suited for use in all objects, whose surface is to be conditioned at least partially in such a way that at least certain climatic parameters, for example temperature or humidity, are kept at a desired interval or at a certain value at least close to the surface. Beds in vehicles, in tents or in houses are one field of possible use. Therefore, "climate conditioned object" denotes in particular all components with which a user may come in contact, especially in a passenger compartment of a vehicle 1, such as a steering mechanism for a vehicle, a dashboard, an armrest, a door paneling, a seat cover, a seat or a cup holder. It may be useful for at least one vehicle to have at least one climate conditioned object 2,

such as, for example, a seat. This permits a pleasant climate of a passenger even during long trips under extreme conditions.

Figure 1 shows a vehicle seat 5 with a seat part 6 and a backrest 7. In the exemplary embodiment these are covered with a non-perforated leather cover. The seat part has a contact surface, which is usually occupied by a passenger when the seat is in use.

It may be useful for at least one climate conditioned object 2 to have at least one cushion 8, such as a block of foam polyurethane.

The cushion 8 has a surface 30, which is divided into several air exchange surfaces 35, divided by grooves in a user directed A-side.

The cushion is provided with a multitude of through-holes 88, connecting A- and B-side, which is oriented away from the user.

Preferably each of the air exchange surfaces 35 has at least one through-hole 88.

It may be useful for at least one climate conditioned object to have at least one cover 9. This denotes any kind of surface covering the padding, for example textile covers or an external skin of a padding foam. But the invention is especially suitable to improve the comfort of leather surfaces.

It may be useful for at least one climate conditioned object 2 to have at least one climate conditioning device 10. This denotes all devices that serve to regulate one or more climate parameters, like temperature, humidity and air movement in an area to be conditioned, for example surfaces touched by the user(s) in the passenger compartment of a vehicle 1.

It may be useful for at least one climate conditioning device 10 to have at least one temperature control device 70, e. g. a thermoelectric device. A thermoelectric device shall especially mean a solid-state active heat pump. It usually is a flat part, which under consumption of electrical energy transfers heat from its one side to its other side. PTC-heaters, heating wires or ventilators are other examples for a temperature control device.

The climate conditioning device 10 preferably has an air guiding device 90, which allows a fluid to pass through it or along its surface. Therefor it is provided with one or more hollow spaces 74. Such a hollow space can be formed e.g. like a channel or a multitude of channels running in parallel, side-by-side or interwoven with each other. The fluid preferably is air. The channels are preferably tubes or tubes with side branches.

It may be useful for at least one climate conditioning device 10 to have at least one air moving device 57. This denotes any device that can be used for a change of air in a specific area, for example, an on-board air conditioner or axial or radial ventilators. Some applications require two air moving devices 57 per climate conditioned object 2 or per temperature conditioned surface. The air moving device 57 pulls air from the surrounding into the air moving device 57 and pushes it into a main channel 82 of the air guiding device 90. The main channel 82 can be a part of the housing of the air moving device 57, like in Fig. 4. It can also be a separate component like in Fig. 2 + 3. The main channel can contain at least one climate conditioning device 10, like TEDs (thermoelectric devices) and/or resistor heaters. Preferably it contains TEDs and a resistor heater.

In a preferred embodiment the air moving device 57 is a flat axial ventilator, combined with a temperature control device 70 as a preassembled module. The ventilator preferably has a thickness of less than 2 centimeters, preferably less than 15 mm. This leads to a very flat unit, which can be put under any vehicle seat.

The main air channel 82 provided with at least one fork, resulting the central air collector to split up into at least two or more air guiding branches 60 A, B.

An air guiding branch is preferably at least partly built of one or more fluid conductors, e. g. pipes or tubes. Such a fluid conductor 60 is preferable at least partly made of an elastic but tear-resistant and pressure-resistant material. That can be one or more of these components: rubber, polyurethane (especially resistant to hydrolysis), silicone, latex, PVC or a gel of synthetic material like polyurethane gel. The material should have an elongation rupture of at least 100 %. Alternatively or additionally, a fluid conductor can be made at least partially of a textile material, for example of a weave, fabric, knit or mesh. This will permit high flexibility with low weight. The fluid conductor 60 can have an outer cross-sectional diameter of e. g. between 3 and

10 mm, especially for areas, where much heat shall transfer through the walls of the fluid conductor 60, while the fluid is transported through the fluid conductor 60. The fluid conductor 60 can have an outer cross-sectional diameter of e. g. between 26 and 36 mm, especially for sections, where the fluid 44 shall pass through the fluid conductor 60 with a minimum heat transfer via the walls of the fluid conductor 60.

At least one fluid conductor 60 serves as a supply tube to supply at least one air exchange surface 35 with thermally conditioned air. In summer this air is cooled by the temperature control device 70. In winter it is heated. Especially big air exchange surfaces 35 are better supplied with a multitude of supply tubes. It is possible to connect each air exchange surface 35 with its own supply tube. But in one preferred embodiment the air exchange surface 35A of a central seat cushion are supplied via two main branches 60A and 60B having a multitude of side branches 62.

In a not shown vehicle, cabin or building the invention could be used to control the temperature of a bed, a cover sheet or a mattress. For that purpose one or a multitude of air exchange surfaces 35 are arranged in one or more of these subjects. Preferably an air exchange surface 35 in an area of a head of a user is provided with cooled air. Additionally or alternatively an area of feet of a user is warmed. A simultaneous combination is be possible, e. g. if at least one air exchange surface 35 is warmed in the waste air stream of the heat removal device or if the waste air is directed to the feet of the user.

Any application described above can also be used for heating purpose just by changing the operation direction of the heat pipes, by inverting the circulation direction of the air and/or by switching the polarity of temperature control device 70.

## List of reference numerals

1	vehicle
2	climate conditioned object
5	seat
6	seat part
7	backrest
8	cushion
9	cover
10	climate conditioning device
20, 20'	climate control device
30	surface
35, 35A	air exchange surface
44	fluid
57	air moving device
60	fluid conductor
60 A, B	air guiding branches
62	side branches
70	temperature control device
74	hollow space
82	main channel
88	through-holes
90	air guiding device

## Claims

1. Climate conditioning device (10) for a climate conditioned object (2), the climate conditioning device (10) having at least one of the following components:
  - a) a temperature control device (70) to heat or cool the climate conditioned object (2),
  - b) an air moving device (57) to generate an air stream to exchange thermal energy with the surrounding.
2. Climate conditioned object (2), provided with at least one climate conditioning device (10) in accordance with claim 1, climate conditioned object (2) being suited for a use as at least one of the following elements: a seat, a bed, a cup holder.
3. Vehicle (1), having at least one device in accordance with one of the preceding claims.

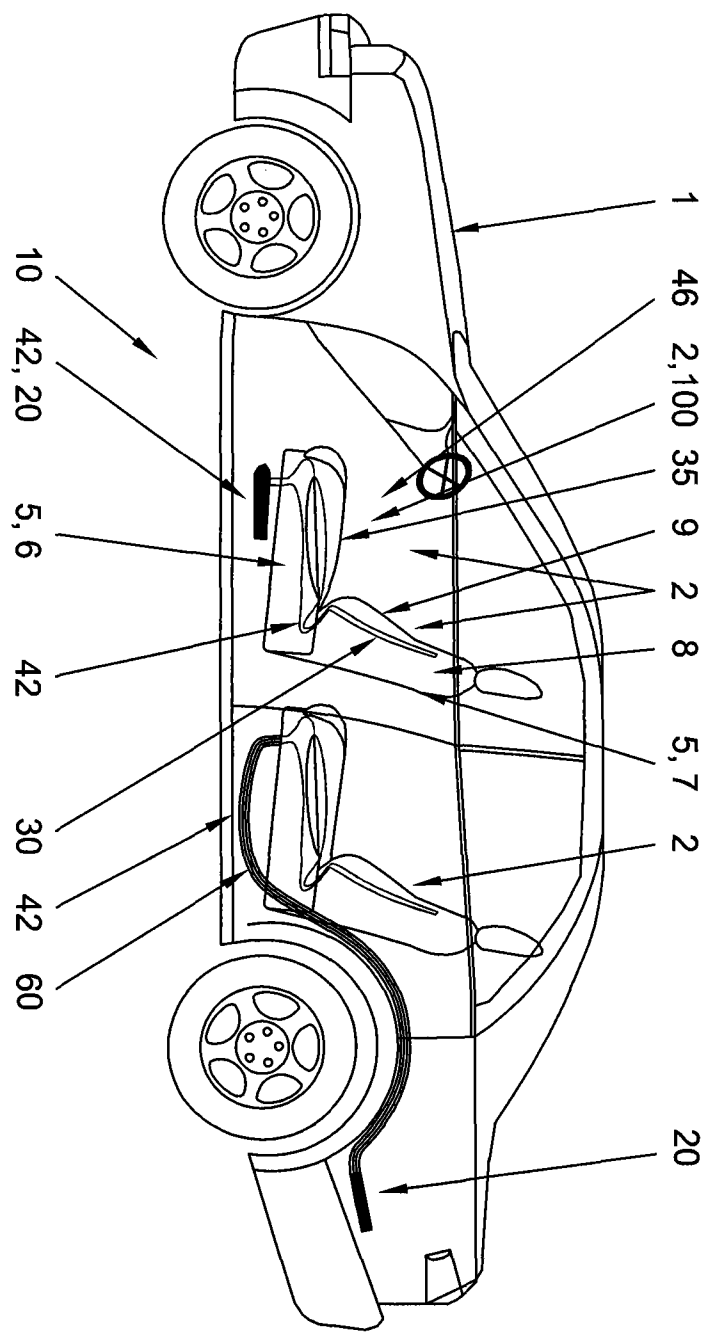


Fig. 1

Fig. 2

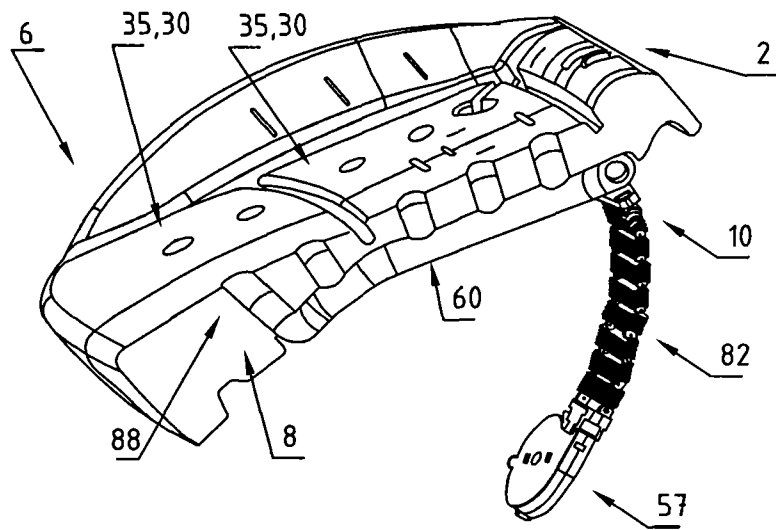


Fig. 3

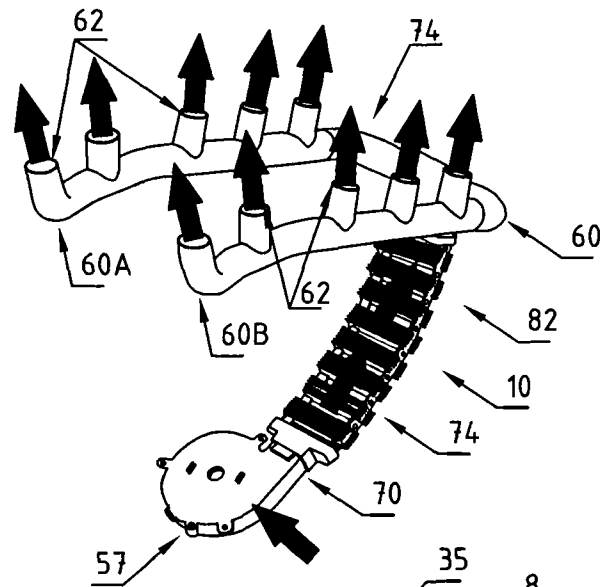
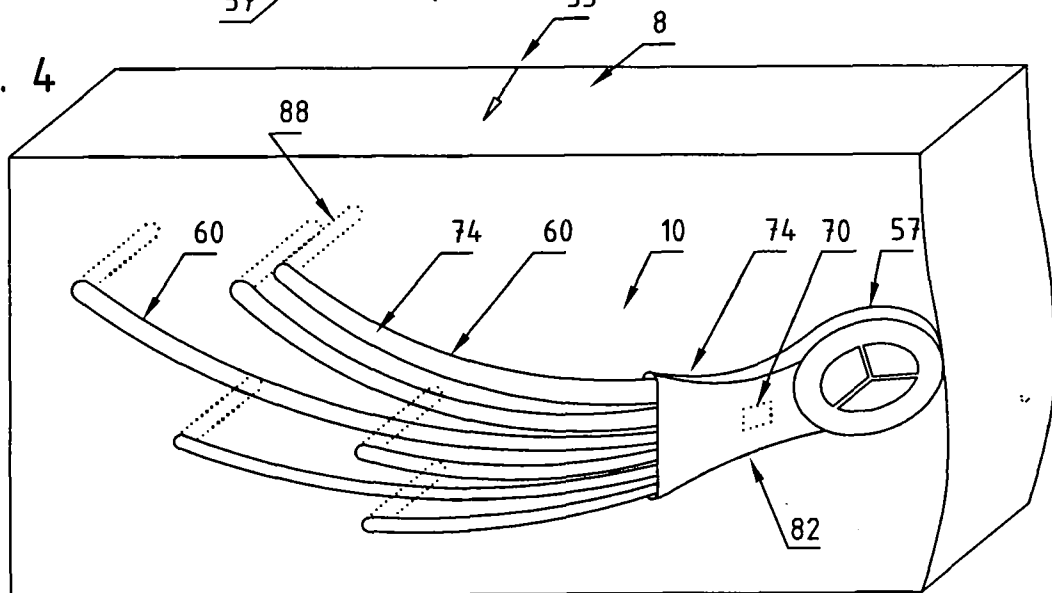


Fig. 4



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2014/095746

**A. CLASSIFICATION OF SUBJECT MATTER**

B60N 2/56(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

B60N; A47C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, IEEE, CNPAT, CNKI: seat, cool, heat, air, condition, car, vehicle

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5921100 A (DENSO CORPORATION) 13 July 1999 (1999-07-13) description, column 2, line 60–column 3, line 38, Figures 1, 2	1-3
X	US 5924767 A (PIETRYGA, ZENON) 20 July 1999 (1999-07-20) description, column 3, line 65–column 5, line 27, Figures 1, 2	1-3
A	CN 1982119 A (BYD CO., LTD.) 20 June 2007 (2007-06-20) the whole document	1-3
A	CN 1121790 A (WEN, ZHENGZHONG) 08 May 1996 (1996-05-08) the whole document	1-3
A	CN 202806461 U (WANG, YU ET AL.) 20 March 2013 (2013-03-20) the whole document	1-3
A	CN 203186155 U (MU, DELONG) 11 September 2013 (2013-09-11) the whole document	1-3



Further documents are listed in the continuation of Box C.



See patent family annex.

\* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

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“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

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Name and mailing address of the ISA/CN

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P.R.CHINA  
6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing  
100088, China

Facsimile No. (86-10)62019451

Authorized officer

KONG, Wei

Telephone No. (86-10)01061648128

**INTERNATIONAL SEARCH REPORT**  
**Information on patent family members**

International application No.

**PCT/CN2014/095746**

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
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				DE	19824191	A1	10 December 1998
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CN	1982119	A	20 June 2007	None			
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